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| **Folder Title:** | Sergipe Fertilizer Project - Brazil - Loan 1406 - P006281 - Correspondence |
| **Folder ID:** | 1196208 |
| **Project ID:** | P006281 |
| **Dates:** | 07/30/1976 - 05/17/1985 |
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BRAZIL. SERGIPE FERTILIZER 4/86 2918.03







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# BRAZIL

# SERGIPE NITROGEN FERTILIZER PROJECT

# LOAN NO. 1406-BR

# PROJECT COMPLETION REPORT

References

President Report No. P-1988a-BR, Dated April 6, 1977
Appraisal Report No. 1414a-BR, Dated April 6, 1977

Industry Department
January 1985

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

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This report was prepared by Mr. Vinod K. Goel of the Industry Department and Mr. Turgut Ogmen (Consultant).

ANNEXES



Industry Department
January 1985

# BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

## PROJECT COMPLETION REPORT

## PREFACE

1. On April 19, 1977 the Bank approved a loan of US$64.0 million equivalent to Petrobras Fertilizantes S.A., (PETROFERTIL) to assist in the financing of the Sergipe Nitrogen Fertilizer Project (Loan 1406-BR). The loan was guaranteed by the Government of Brazil. At PETROFERTIL's request, as of November 4, 1981,the Bank cancelled US$12.0 million equivalent from the loan reducing it to US$52.0 million equivalent. In January 1982, with the agreement of the Bank, the Project ownership was transferred to Fertilizantes Nitrogenados do Nordeste S.A. (NITROFERTIL), a subsidiary of PETROFERTIL. As a consequence of the transfer, the repayment and other obligations under the Loan Agreement were assumed by NITROFERTIL.

2. Following the closing of the loan on May 31, 1983, IND Staff visited Brazil in December 1983 for the preparation of the Project Completion Report (PCR) and had discussions with the Government, PETROBRAS and NITROFERTIL, the Project implementing agency. A follow-up mission visited Brazil in October 1984 to finalize the draft PCR prepared by NITROFERTIL. This report reflects the findings of these missions as well as a review of the project files and related documents.

# BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

## PROJECT COMPLETION REPORT

## BASIC DATA SHEET

### KEY PROJECT DATA
(US$ million)

| | Original | Amended | Disbursed | Cancelled | As of December 31, 1984 b/ Repaid | Outstanding |
|---|---|---|---|---|---|---|
| Loan No. 1406-BR | 64.0 | - | 52.0 a/ | 12.0 | 16.56 | 34.99 |

### CUMULATIVE LOAN DISBURSEMENT

| | | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|---|
| (i) | Planned | 3.7 | 29.0 | 55.0 | 64.0 | 52.0 c/ | 52.0 | 52.0 | 52.0 | 52.0 |
| (ii) | Amended | - | - | - | - | - | - | - | - | - |
| (iii) | Actual | - | 5.0 | 8.0 | 24.5 | 33.4 | 49.7 | 51.5 | 51.5 | 52.0 |
| (iv) | (iii) as % of (i) | - | 17 | 15 | 38 | 64 | 96 | 99 | 99 | 100 |

### PROGRAM/PROJECT DATA

| | Original Loan/ Credit Date(s) | Actual or Loan Agreements |
|---|---|---|
| Board Approval | April 19, 1977 | - |
| Loan Agreement | April 29, 1977 | - |
| Effective Date | August 31, 1977 | - |
| Loan Closing | November 30, 1981 | May 31, 1983 d/ |
| Date of Physical Completion | December 1980 | July 1982 |
| Completion Time (in months) | 48 | 66 |
| Time Overrun (%) - range - | - | 37.5% (18 months) |
| Date of Start-up of Operations | March 1981 | September 1982 |
| Total Project Cost (US$ million) | 283.4 | 244.7 |
| Cost Overrun (Underrun) (%) | - | (13.7) |
| Financial Rate of Return (%) | 18.6 | 8.9 |
| Economic Rate of Return (%) | 17.0 | 14.9 |

a/ Including US$462,701.56 being disbursed in January 1985.
b/ As of December 31, 1984, amount disbursed was US$51.55 million.
c/ Following cancellation of US$12 million as of November 4, 1981.
d/ Although the formal closing date of the loan was May 31, 1983, the borrower was allowed to submit the final disbursement application up to December 31, 1984.

## MISSION DATA

| | Month/Year | No. of Weeks | No. of Persons | Man Weeks | Report Date |
|---|---|---|---|---|---|
| Identification | 5/75 | 2.9 | 5 | 14.5 | 05/22/75 |
| Preparation | 6/75 | 1.4 | 2 | 2.8 | 07/09/75 |
| Preappraisal | 4/76 | 1.4 | 3 | 4.2 | 05/10/76 |
| Appraisal | 7/76 | 3.7 | 3 | 11.1 | 04/06/77 |
| Post Appraisal | 9/76 | 1.5 | 1 | 1.5 | 04/06/77 |
| Supervision | 6/77 | 0.3 | 1 | 0.3 | 06/14/77 |
| Supervision | 10/78 | 1.4 | 1 | 1.4 | 11/28/78 |
| Supervision | 11/79 | 0.6 | 2 | 1.2 | 12/19/79 |
| Supervision | 9/80 | 0.6 | 3 | 1.8 | 09/29/80 |
| Supervision | 8/81 | 0.6 | 2 | 1.2 | 08/28/81 |
| Supervision | 6/82 | 0.7 | 2 | 1.4 | 06/11/82 |
| Completion | 12/83 | 1.2 | 1 | 1.2 | 01/18/85 |
| Completion Report Update | 10/84 | 1.0 | 1 | 1.0 | 01/18/85 |

## OTHER DATA

| | Original Plan | Actual |
|---|---|---|
| Borrower | PETROFERTIL | NITROFERTIL |
| Executing Agency | PETROFERTIL | NITROFERTIL |

## CURRENCY EQUIVALENTS

| | | | |
|---|---|---|---|
| At Appraisal | March 1977 | US $1 = | Cr$ 12.98 |
| Intervening Years, As of December 31 | 1977 | = | 16.05 |
| | 1978 | = | 20.92 |
| | 1979 | = | 42.53 |
| | 1980 | = | 65.00 |
| | 1981 | = | 127.80 |
| Mechanical Completion Year Average | 1982 | = | 200.00 |
| As of December 31 | 1982 | = | 252.67 |
| | 1983 | = | 984.00 |
| Completion Report Year Average | 1984 | = | 2,120.00 |
| As of December 31 | 1984 | = | 3,168.00 |

## WEIGHTS AND MEASURES

| | | |
|---|---|---|
| 1 Metric Ton | = | 907 kilogram (kg) |
| 1 Short Ton | = | 1,000 kg |
| 1 Pound (lb) | = | 0.453 kg |
| 1 Standard Cubic Foot (scf) | = | 0.02831 Normal cubic meter ($Nm^3$) |
| 1 Kilo Calorie (Kcal) | = | 4.19 $10^3$ Joule (KJ) |
| 1 British Thermal Unit (BTU)/lb | = | 2.326 KJ/kg |
| 1 Ton of Heavy Fuel Oil (on calorific value basis) | = | 39,942 scf natural gas |

## ABBREVIATIONS

PETROBRAS = Petroleo Brasileiro S.A.
PETROFERTIL = Petrobras Fertilizantes S.A.,
NITROFERTIL = Fertilizantes Nitrogenados do Nordeste, S.A.

## FISCAL YEAR

January 1 to December 31

# BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

## PROJECT COMPLETION REPORT

## HIGHLIGHTS

1. Brazil's agricultural policy aims to increase agricultural output by expanding the area under cultivation and using intensive agricultural practices supported by extension programs, increased fertilizer application, better credit availability and use of improved seeds. In this context the Government has encouraged domestic production of fertilizers to reach self-sufficiency to ensure their reliable supply to farmers (para 1.01).

2. In pursuit of this policy, PETROBRAS, a Government-owned petroleum company, was entrusted the task of expanding nitrogenous fertilizer production in Brazil. In March 1976, PETROBRAS organized PETROFERTIL, a subsidiary, to build, own and operate the Sergipe Nitrogen Fertilizer Project (the Project) as well as two other ammonia/urea projects. The Project was appraised in July 1976 following a request from PETROBRAS. The Board approved a Bank loan of US$64.0 million equivalent to PETROFERTIL at an interest rate of 8.2% per annum (p.a.) with a maturity of about 15 years, including a grace period of 4 years. The loan, which became effective on August 31, 1977, was guaranteed by the Government for a fee of 1.8% p.a. (para 1.03-2.02).

3. The Project comprises an ammonia plant of 300,000 tons per year (tpy) and a urea plant of 363,000 tpy capacity with the necessary utilities, and infrastructure. The Project facilities were mechanically completed in July 1982, 18 months behind the original schedule. Commissioning and start-up of the plant were carried out smoothly and units exceeded their rated capacity without difficulty (para 2.03-3.01).

4. The Project employs 482 people. The majority of operating manpower was recruited and trained by NITROFERTIL, a subsidiary of PETROFERTIL created in January 1982 with the agreement of the Bank, to own and operate the facilities. The performance of foreign engineering firms was generally satisfactory. Local firms provided detailed engineering services under the supervision of foreign licensors (para 3.04-3.06).

5. PETROFERTIL followed generally acceptable procurement procedures for construction, equipment, erection and civil works. With Bank assistance, difficulties encountered at initial stages of Project implementation were eliminated by completely reorganizing the procurement department and establishing efficient procurement procedures. Through a special agreement with Brazilian Vendors Association for some specific

items on the reserve list, international competitive bidding (ICB) procedures were applied for Brazilian manufacturers, resulting in lower costs. Although the performance of the local vendors was in general satisfactory, delays in deliveries by some Brazilian manufacturers fabricating sophisticated equipment for the first time in Brazil were unavoidable (para 3.07-3.09).

6. Total Project cost at appraisal was estimated at US$283.4 million. At Project completion the actual cost was US$244.7 million representing a 14% underrun mainly due to: (i) some reduction in Project scope, (ii) use of ICB procedures for some of the reserve list equipment, and (iii) major devaluation of the Cruzeiro in December 1979 against the US Dollar. Of the total Bank loan of US$64.0 million equivalent, the actual utilization was only US$52.0 million equivalent. At the request of PETROFERTIL, as of November 4, 1981, US$12.0 million equivalent of the loan was cancelled (para 3.11-3.12).

7. Due to the depressed fertilizer demand in 1983 in the wake of the Brazilian recession, the capacity utilization of the plant was restricted to avoid building up high inventory levels; annual capacity usage for ammonia and urea units were 81% and 67%, respectively. In 1984, however, the fertilizer market situation improved and units capacity utilization reached 88.5% and 80% (estimated), respectively; utilization rates in 1985 and thereafter are expected to be over 90% (para 4.01-4.04).

8. The financial rate of return (FRR) for the Project is now estimated at 8.9% compared to the appraisal estimate of 18.6%. The reduction in FRR is mainly due to the Government's current pricing policy. At the time of appraisal urea/feedstock price ratio was about 5.9, whereas the prevailing ratio in 1984 was only 2.8. The Project's financial results are consolidated with NITROFERTIL's financial statements; NITROFERTIL has satisfactory financial ratios meeting the financial covenants agreed upon with the Bank. The economic rate of return is now estimated at 14.9%, slightly lower than the appraisal estimate of 17% inspite of the completion delays. The net annual foreign exchange savings from the Project are estimated to be about US$87 million. In addition, the Project has resulted in substantial technology transfer to Brazilian firms (para 5.01-6.04).

9. Beginning from the early phases and all through the implementation period of the Project, the Bank played a significant role in helping PETROFERTIL to arrange Project financing, improve Project management, organization and procedures, especially in procurement area, and constantly monitoring the Project to identify the weak points in the implementation. The Project has been successfully implemented meeting its main objectives of: (i) ensuring timely and economical supply of fertilizers to farmers by converting a natural resource to a much needed and imported commodity; and (ii) improving the Northeast region's economic structure (para 7.01-8.04).

# BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

## PROJECT COMPLETION REPORT

## I. INTRODUCTION

1.01 Brazil's agricultural policy aims to increase agricultural production to make Brazil one of the world's foremost producers and exporters of agricultural commodities. Brazil plans to achieve this objective both by expanding the area under cultivation and by using intensive agricultural practices supported by extension programs, increased fertilizer application, better credit availability and use of improved seeds. From the mid 1960's, as a result of rural credit expansion as well as subsidized inputs needed to modernize Brazil's agricultural sector, fertilizer consumption increased rapidly. Annual fertilizer consumption growth rates which had been negligible before 1966, improved to an average rate of 35% annually through 1972 and moderated to 14% annually during 1973-80. Until 1974, Brazil's fertilizer industry consisted of a large number of relatively small companies, mainly concentrating on importing, blending and distribution of fertilizers. In 1974, the Government launched the National Fertilizer Program for a major expansion of production capacity based on large-scale, efficient plants to achieve self-sufficiency by the mid-1980s. The Bank supported three of these projects - the gas-based ammonia/urea complex in Sergipe, Salvador, in the Northeast (Loan 1406-BR), the fuel oil-based ammonia/urea project near Araucaria, Parana, in the Southeast (Loan 1256-BR), and the Valefertil phosphate fertilizer project near Uberaba, Minas Gerais, in the Centerwest (Loan 1411-BR). Other projects included in the National Fertilizer Program, and not supported by the Bank, were not implemented.

1.02 Fertilizer consumption in Brazil has grown rapidly but erratically, responding to changes in the country's economic conditions. The fertilizer nutrient consumption in Brazil increased from 2.5 million tons in 1976 to 4.0 million tons in 1980, but decreased to 2.2 million tons in 1983, due to the poor foreign and domestic economic situation of the country and the elimination of subsidies for agriculture. In fact, the high inflation rates, large public deficit, and the increased volumes of subsidized rural credits forced the Government, in 1980-81, to review its rural credit policies for agricultural investment and production. As a result, Brazilian agriculture faced a new reality of non-subsidized financial costs for agricultural inputs and investments. Faced with this situation the Brazilian farmer in the first year (1981) of the new rural credit policies depleted his fertilizer inventories and in the second year (1982) started cutting back on fertilizer application. This resulted in very sharp decrease in demand during 1981-83 - nearly 36% - dropping present consumption level to that prevailing in 1976-77. This transition period coincided with the initial production years of the two new nitrogenous fertilizer projects supported by the Bank, which as

a result could not be operated at their target capacities. The recent recovery of international prices for agricultural commodities traditionally exported by Brazil opens up a new horizon for the internal fertilizer demand; consumption trend in 1984 seems to support this development. By 1990, Brazil's fertilizer consumption is expected to reach 4.0 million tons of nutrients per year, the level achieved in 1980; representing an annual growth rate of 9%. This growth rate appears reasonable given the fact that fertilizer demand in Brazil grew at an average rate of 35% p.a. during 1966-72 and 14% p.a. during 1973-80.

1.03 The expansion of nitrogenous fertilizer production in Brazil was entrusted to Petroleo Brasileiro S.A. (PETROBRAS), a Government-owned petroleum company responsible for the exploration and exploitation of the country's hydrocarbon resources. PETROBRAS was already substantially involved in the chemical industry through its subsidiary, Petrobras Quimica S.A., (PETROQUISA) which had responsibility for PETROBRAS interests in the chemical and petrochemical industries. In view of the growing fertilizer activities, PETROBRAS organized, in March 1976, a new subsidiary, Petrobras Fertilizantes S.A. (PETROFERTIL) to foster the development of the domestic fertilizer industry, and in particular to own and operate the proposed Project in Sergipe and also the two other fertilizer projects supported by the Bank.

## II. PROJECT BACKGROUND

### A. Project Identification, Preparation, Appraisal, Approval and Loan Effectiveness

2.01 Following a request from PETROBRAS for Bank participation in the Project, a Bank identification mission visited Brazil in May 1975. The Project was jointly prepared by PETROBRAS and PETROFERTIL and was appraised in July 1976. The process technology, engineering features, procurement procedures, and co-financing arrangements were extensively discussed with the Bank during and after appraisal. The Bank was also concerned with the availability of gas for the Project and engaged a consultant to review the matter independently. Since the selected location was in a remote area without any supporting infrastructure, the Bank also studied the related infrastructural requirements such as fresh water supply system, railroad transportation facilities and natural gas collecting, treating and transportation systems.

2.02 On April 19, 1977 the Bank Board approved a loan of US$64 million equivalent to PETROFERTIL at an interest rate of 8.2% p.a. and a maturity of about 15 years, including four years of grace. The Government, for a fee of 1.8% p.a.,guaranteed the loan bringing the cost of the loan to PETROFERTIL to 10% p.a. The loan became effective on August 31, 1977.

### B. Project Description and Objectives

2.03 The major objective of the Project was to contribute towards the growth of the agricultural sector of Brazil by reliably providing

fertilizers to the farmers at stable and economic prices, and converting a domestic natural resource to displace an important imported commodity. In addition, a secondary objective was to improve the economic structure of the depressed least industrialized Northeast region through the Project's infrastructure and employment opportunities. The Project was designed for 300,000 metric tons per year (tpy) of ammonia and 363,000 tpy urea capacity. At 90% capacity level, of the total ammonia production, 190,000 tpy was for captive use in the urea facility with the balance of about 80,000 tpy for direct sale. The Project includes the following main facilities: (i) ammonia plant-907 tpd (1,000 short tons/day); (ii) Urea plant-1,100 tpd; (iii) storage and handling facilities, including 30,000 metric tons bulk urea storage; (iv) bagging facilities and 10,000 tpy refrigerated ammonia storage; (v) water supply system from the Sao Francisco river including a connecting 90 km pipeline; (vi) a railroad spur line and loading facilities; and (vii) effluent disposal system.

2.04 Originally, the principal raw materials to be consumed by the Project were the natural gas and vacuum gas oil at an annual rate of 215 million normal cubic meter ($Nm^3$) and 109,000 tons, respectively and about 50,000 tpy Bunker C fuel for steam generation. Later PETROBRAS decided to supply sufficient natural gas to meet all feed and fuel requirements of the plant. Now, at its rated capacity (90%), the plant will consume 305 million ($Nm^3$) of natural gas per year.

## III. PROJECT IMPLEMENTATION AND MANAGEMENT

### A. Achievement of Project Objectives

3.01 The Project has been completed successfully and has achieved its major objective of producing fertilizers at economic prices - thus contributing to the growth of the agricultural sector in Brazil. The facilities were mechanically completed in July 1982, about 18 months behind the original schedule but at costs 14% lower than estimated. The pre-operational phase was short and the plant was able to reach commercial production within one month (para 4.01).

### B. Project Scope

3.02 There has been no significant change in the Project scope except for the following minor modifications, made with the approval of the Bank, which helped to reduce the investment cost without affecting the economy, efficiency and safety of the plant:

(a) replacement of steam turbine drivers of the ammonia compressor by an electric motor. This change was made to minimize liquid fuel use, which reduced the size of steam producing facilities;

(b) increase of electric power supply to meet the additional demand as per para (a) above;

(c) replacement of the originally designed liquid effluent treatment system by a liquid disposal pipeline to ensure more safety in pollution control;

(d) addition of an ammonia spherical tank;

(e) replacement of the originally designed inert gas generator by purchased nitrogen supply;

(f) change in the urea coating system in order to use a new process tested in Camacari plant; and

(g) decrease in urea bagging system capacity from 200 tons per hour (tph) to 30 tph and deletion of two-thirds of the bagged urea storage capacity from 3,000 tons to 1,000 tons.

C. Project Ownership and Management

3.03 The Project was implemented under the supervision of PETROFERTIL which, in turn, contracted PETROBRAS for conducting some project and construction management activities. Purchasing and general project coordination and control was done by PETROFERTIL. In the beginning, PETROFERTIL tried to use its permanent staff to control Project implementation but this did not prove successful. After consultation with the Bank, a complete and separate Project coordination and control team was formed and entrusted with the overall management and coordination of the Project. This decision was particularly effective with respect to procurement activities which were completely reorganized with Bank assistance. In 1980, PETROFERTIL decided to contract NITROFERTIL, its another subsidiary, for pre-commissioning, commissioning start-up, and operation of the new plants. In January 1982, the Project ownership was transferred, with Bank agreement, from PETROFERTIL to NITROFERTIL. As a consequence of the transfer, NITROFERTIL assumed the repayment and other obligations under the Loan Agreement. The Project management and NITROFERTIL organization is shown in Annex 1.

D. Manpower Development and Training

3.04 At appraisal, the Project's manpower requirement was estimated as 384 jobs, most of them professional, skilled or semi-skilled. At present, the Project employs 482 people. Annex 2 shows the distribution of manpower as foreseen during appraisal and operation. The increase in manpower was mainly due to the fact that maintenance personnel and utilities operators estimated at appraisal were low as results of the design changes in this section during implementation were not included in the original estimate. The current staffing is satisfactory.

3.05 The majority of the operating manpower was recruited and trained by NITROFERTIL. Included in the training program was a period in Camacari

where NITROFERTIL has ammonia and urea plants in operation. Supervisory staff was recruited partly from Camacari plant. The devised training program was detailed and comprehensive considering that very few skilled labor was available locally. A total of 236 people were trained of which 154 were employed. In addition, 24 engineers in different disciplines were hired and trained during this period.

E. Performance of Engineering Contractors

3.06 Project execution was supervised by PETROFERTIL's Sergipe Nitrogen Fertilizer Project Team, supported by PETROBRAS' fertilizer project implementation unit, Construcao de Fertilizantes Nitrogenado (COFEN) and by PETROBRAS' engineering department. One engineering firm of USA and one of Japan took the responsibilities of providing licenses, basic engineering, erection, pre-operation and start-up supervision for the ammonia and urea units, respectively. Two Brazilian engineering companies undertook the execution of detailed engineering of the ammonia and urea units and ancillary facilities, under the supervision of the respective process licensors. PETROFERTIL was, in general, satisfied with the services provided by the contractors. At the initial phase of the Project implementation, some coordination problems between foreign and domestic engineering companies surfaced but were solved in time.

F. Procurement and Performance of Suppliers

3.07 PETROFERTIL followed generally acceptable contracting and procurement procedures. It used international competitive biddings (ICB) procedures in accordance with Bank guidelines for procuring foreign equipment and material. Among foreign suppliers the most important country of origin was the USA (Annex 3); the latter won about 42 of the total contracts financed by the Bank.

3.08 At the initial stage of Prject implementation, PETROFERTIL had difficulties in understanding and following the Bank guidelines. Later, with Bank assistance the procurement department was completely reorganized and systems were established for more effective procurement activities. In addition, a special agreement for this Project was made with the Brazilian Vendors Association (Participation Agreement) whereby instead the of traditional two-way division of items into imported and domestic which existed in Brazil at the time, a third category was introduced under which a part of the reserve list items were put for ICB. The Brazilian vendors participated in these ICB procedures. This arrangement resulted in increased competition and lower prices for domestic equipment as in the case of rail cars and some other high pressure equipment.

3.09 During appraisal, it was estimated that 65% of the total procurement of equipment, materials and services (by value) would be domestic against 35% foreign. The actual results were close to the estimates at 62% local and 38% foreign (para 3.11). Although the

performance of the vendors was in general satisfactory, there were delays in deliveries by some Brazilian manufacturers fabricating sophisticated equipment for the first time in Brazil. However, as illustrated by the case of ammonia converter fabrication, the local manufacturers took quick measures to shorten the delays and agreed to complete final welds at site to comply with the construction schedule. There were no problems in obtaining equipment supplier's cooperation and assistance in carrying out the required minor repairs/modifications related to the equipment problems encountered during commissioning and initial operation.

G. Project Implementation Schedule

3.10 The mechanical completion and commissioning dates of the units are given below.

| Facility | Mechanical Completion | Start-up Date |
|---|---|---|
| Appraisal Estimate (Total Project) | December 1980 | March 1981 |
| Utilities | September 1981 | October 1981 |
| Ammonia Unit | July 1982 | September 1982 |
| Urea Unit | July 1982 | September 1982 |

The Project was mechanically completed in July 1982, 18 months behind the appraisal schedule. The above delay was mainly due to the following factors: (i) delays in getting the official approvals by Industrial Property Institute (INPI)[1/] and Banco do Brazil for the signing of the process know-how contracts; (ii) delays in finalizing the approved vendors list; (iii) delays in finalizing the "Participation Agreement" with Brazilian Vendors Association and in obtaining CACEX approval; (iv) delays in the delivery of locally produced machinery and equipment; and (v) delays due to inefficacy of "package units" suppliers. The major delays took place at the very beginning of the Project and arose principally from the cumbersome processing of the permits required by Brazilian regulations. The Project management team tried successfully to overlap the testing and commissioning with the final stages of the construction activities to reduce delays. The contribution of NITROFERTIL's operating experience resulted in smooth testing and commissioning and enabled the plant to reach commercial operation within a month.

H. Capital Costs, Disbursements and Financing

3.11 A table summarizing the Project's capital costs is presented below.

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1/ INPI is responsible for ensuring that no contracts are approved involving payment of foreign licence fees unless the licensor holds patents registered in Brazil. Toyo patent was approved for registration in October 1977.

Summary of Project Capital Costs
(US$ million)

| | Appraisal Estimate | | | Actual | | | % |
|---|---|---|---|---|---|---|---|
| | Local | Foreign[a]/ | Total | Local | Foreign[a]/ | Total | Change |
| Equipment & Materials (CIF) | 55.22 | 54.52 | 109.74 | 40.73 | 53.57 | 94.30 | -14 |
| Engineering & License | 10.92 | 9.10 | 20.02 | 12.00 | 6.90 | 18.90 | -6 |
| Land & Improvement | 5.57 | - | 5.57 | 3.60 | - | 3.60 | -35 |
| Infrastructure | 3.07 | 0.54 | 3.61 | 5.48 | 1.82 | 7.30 | +102 |
| Civil Works | 11.62 | 2.04 | 13.66 | 13.05 | 4.35 | 17.40 | +27 |
| Erection | 23.66 | 4.18 | 27.84 | 17.78 | 5.92 | 23.70 | -15 |
| Pre-Operating Expenses | 16.37 | - | 16.37 | 23.20 | - | 23.20 | +42 |
| Basic Cost | 126.43 | 70.38 | 196.81 | 115.84 | 72.56 | 188.40 | -4 |
| Physical Contingency | 10.97 | 6.14 | 17.11 | - | - | - | - |
| Price Contingency | 21.40 | 7.79 | 29.19 | - | - | - | - |
| Installed Cost | 158.80 | 84.31 | 243.11 | 115.84 | 72.56 | 188.40 | -23 |
| Interest during Construction | 7.76 | 17.59 | 25.35 | 11.10 | 25.90 | 37.00 | +40 |
| Working Capital | 14.95 | - | 14.95 | 13.90 | - | 13.90 | -7 |
| Taxes[b]/ | - | - | - | 5.40 | - | 5.40 | - |
| Total Cost | 181.51 | 101.90 | 283.41 | 146.24 | 98.46 | 244.70 | -14 |

a/ Includes US$32 million of indirect foreign exchange costs for appraisal estimates and US$25.7 million for actual costs.

b/ Taxes related to payments in foreign currency.

Total actual Project cost was US$244.7 million, 14% lower than the appraisal estimate of US$283.4 million. The decrease in capital cost was mainly due to: (i) minor modifications in Project scope (para 3.02); (ii) use of ICB for local procurement; and (iii) a major devaluation of the Cruzeiro in December 1979 against the US Dollar. The following table summarizes the variations in Project cost by categories.

Cost Variations by Categories

| | Amount (US$ million) |
|---|---|
| REDUCTIONS IN | |
| Physical & Price Contingencies | (46.30) |
| Equipment & Materials | (15.44) |
| Erection | (4.14) |
| Land & improvement | (1.97) |
| Engineering & license | (1.12) |
| Working capital | (1.05) |
| Subtotal | (70.02) |
| INCREASES IN | |
| Interest during construction | 11.65 |
| Pre-Operating Expenses | 6.83 |
| Taxes and Duties | 5.40 |
| Civil Works | 3.74 |
| Infrastructure | 3.69 |
| Subtotal | 31.31 |
| TOTAL | (38.71) |

3.12 Of the total Bank loan of US$64 million equivalent the actual utilization was only US$52 million equivalent. At the request of PETROFERTIL, US$12 million equivalent of the loan was cancelled as of November 4, 1981. The cumulative disbursement pattern for the Bank loan as estimated at the time of appraisal and the actual pattern are summarized below:

Cumulative Bank Loan Disbursement
(US$ million)

| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|
| Appraisal Est. | 3.7 | 29.0 | 55.0 | 55.0 | 52.0 a/ | 52.0 | 52.0 | 52.0 | 52.0 |
| Actual | - | 5.0 | 8.0 | 24.5 | 33.4 | 49.7 | 51.5 | 51.5 | 52.0 b/ |
| Actual as % of Estimate | - | 17.2 | 14.5 | 38.3 | 64.2 | 95.6 | 99.0 | 99.0 | 100.0 |

a/ After cancelling US$12 million equivalent as of November 4, 1981.
b/ US$462,701.56 equivalent to be disbursed before January 31, 1985.

The late start of foreign procurement activities and delays in completion of the Project as noted in para 3.10 above, caused longer than estimated loan disbursement period. The Project cost disbursement schedule is given in Annex 4.

3.12 Total Project cost of US$244.7 million has been financed with equity provided by PETROFERTIL of US$114.0 million and FINOR[2]/ US$2.8 million, and borrowings--US$47.6 million from local sources and US$80.3 million from foreign sources. Details of the Project financing plan are given in Annex 5.

## IV. OPERATING PERFORMANCE

### A. Commissioning and Start-up

4.01 As mentioned earlier (para 3.10), the Project facilities were mechanically completed in July 1982 about 18 months behind appraisal schedule, but the Project recovered part of the delay by overlapping the final stages of construction with testing and commissioning. This was possible due to the earlier completion of the utility facilities. The commissioning of the plants went smoothly. After feedstock feed-in, in 33 days the plant produced ammonia (September 15, 1982) and was able to achieve full capacity operation. The Urea plant produced its first urea (September 29, 1982) after nine hours of feed in. The ammonia plant passed the acceptance tests in October 1982. Plant performance, product quality, capacity usage and production cost were within the guaranteed limits. The urea plant's first acceptance test in December 1982 presented some minor problems in product quality, but this was corrected by the NITROFERTIL operating team with the active assistance of the licensor. The plants were formally accepted without achieving an 80% capacity utilization for at least two months as stipulated in the Loan Agreement. Subsequently the plants have operated well.

4.02 The production levels achieved during 1982-84 are given in Annex 6-1. During the first month of operation (October 1982) the ammonia plant achieved a capacity utilization of 58%, and the urea plant 50%. During the first year of operation (1983), the ammonia and urea plants produced a total of 243,624 and 242,458 tons of ammonia and urea, respectively, corresponding to 81% and 67% of capacity usage, respectively. Capacity utilization of the ammonia plant exceeded 100% of rated capacity in August 1983 and in November 1983 the plant achieved 120% capacity usage. The urea unit reached 100% capacity utilization by September 1983 and was able to operate at 110% of capacity during November 1983.

### B. Build-up of Production

4.03 It is estimated that the plant will produce 264,750 tons of ammonia and 292,630 tons of urea in 1984; in the first nine months of 1984 production reached 187,000 and 203,000 tons of ammonia and urea, respectively. Expected production for 1985 is 272,730 tons ammonia and 312,300 tons of urea which corresponds to 91% and 86% capacity usage,

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2/ Fundo de Investimentos do Nordeste (Sudene).

respectively. Thereafter, the plants should be able to maintain a 90% capacity utilization. Although the plants could have operated at their design ratings in 1983-84, the lower capacity usage has been mainly due to market conditions. In 1983, the ammonia and urea plants were down for 54 and 58 days, respectively, due to the high inventory levels at the plants. This situation, however, was temporary because of the start of production both at Araucaria and Sergipe plants at the same period. The sales and inventory levels of Sergipe plant is given in Annex 6-2. Production estimates for the next four years, considering the expected market growth for the Project is summarized below:

Planned Production
('000 tons)

| | 1984 | | 1985 | | 1986 | | 1987 | | 1988 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Amount | % | Amount | % | Amount | % | Amount | % | Amount | % |
| Ammonia | 265 | 88 | 273 | 91 | 273 | 91 | 273 | 91 | 273 | 91 |
| Urea | 293 | 80 | 312 | 86 | 326 | 90 | 326 | 90 | 326 | 90 |

C. Marketing Aspects

4.04 As discussed in Chapter I earlier, the development of fertilizer market in Brazil was rapid but erratic, and also distributed in the country unevenly. The fertilizer demand of the Northeast region is low compared to the available production facilities in the area, therefore, some part of the production has to be shipped to the South where the demand is high. However, through the Government's development plans for the Northeast region, it is expected that by 1990 the production of the existing plants would be absorbed locally. The existing nitrogenous production capacity and fertilizer consumption (past and projected) are given in Annex 7.

## V. FINANCIAL PERFORMANCE

A. Pricing Policies

5.01 Since the input and output prices for the fertilizer industry are set by the Government, the financial performance of the Project depends upon the Government's pricing policies. Price controls by the Government started in September 1975 with NPK blends and in 1977 were extended to basic fertilizers and raw materials as well. These controls prevailed until December 1980. Periodic adjustments were made on the basis of changes in production cost. In 1981-82, prices were partially deregulated, with controls remaining only on raw materials. However, in 1983 price regulations were reestablished for the fertilizer sector as a whole. Under the current system, ex-factory prices for locally-produced fertilizers are set quarterly by the Government's Interministral Prices Council (GIPC) using a cost-plus system that theoretically allows a most efficient

producer a 18.8% before tax average return on investment. The presently designated most efficient producer is Camacari plant which was however, built many years ago at lower capital costs and has been substantially depreciated. Therefore, under this formula the ex-factory prices fixed by GIPC do not permit an efficient producer with more recent facilities which have higher asset value to earn a satisfactory financial rate of return and these prices also tend to be below international prices (CIF). This policy may be in conflict with the understanding reached with the Government during loan negotiations and recorded in the Guarantee Agreement. However, such shift in the Government policy needs to be looked in light of the current economic situation in Brazil where the Government, in its efforts to control inflation, is trying to keep the prices under control. Nevertheless, the Bank should take up the matter with the Government.

B. Financial Rate of Return

5.02 The financial rate of return (FRR) has been calculated using actual prevailing prices, corrected to 1983 constant dollars. The operating costs and revenues as well as the prices of inputs and outputs are given in Annex 8. The FRR for the Project is now estimated at 8.9% (Annex 9), much lower than the appraisal estimate of 18.6%. As noted in para 5.01 above, the main reason for this difference is the Government's pricing policy with the resulting changes in the input-output price ratios. At appraisal, the urea/natural gas price ratio was 5.9. In 1983, this ratio was 3.7 and in 1984 it further decreased to 2.8, resulting in the low FRR for the Project. In addition, despite the cost underrun, the 18 months delay in Project completion and depressed fertilizer demand in 1983 have also contributed towards lower FRR. As noted in the economic analysis, if ex-factory fertilizer prices in Brazil were to be adjusted to international levels (CIF price), the financial rate of return will increase to 12%.

C. Financial Results

5.03 As mentioned earlier (para 3.03) in January 1982 the Project ownership was transferred from PETROFERTIL to NITROFERTIL. In addition to the Project, NITROFERTIL operates other fertilizer facilities including a substantially depreciated ammonia/urea facility at Camacari which yields good financial results. Income statements and balance sheets for the Project and NITROFERTIL are presented in Annex 10. Selected financial data for NITROFERTIL are presented below.

SELECTED FINANCIAL DATA - NITROFERTIL
(in millions Cr$)

| | 1982 | 1983 | 1984* |
|---|---|---|---|
| Net Sales | 24,105.0 | 73,358.7 | 145,462.2 |
| Net Income | (2,361.7) | 3,099.8 | 4,843.2 |
| Depreciation | 3,371.8 | 12,692.7 | 28,525.7 |
| Internal Cash Generation | 1,010.1 | 15,792.5 | 33,368.9 |
| Current Assets | 14,924.3 | 49,135.7 | 64,185.0 |
| Total Assets | 93,742.8 | 260,398.7 | 403,575.5 |
| Current Liabilities | 15,231.5 | 34,400.6 | 42,002.5 |
| Long-Term Debt | 41,965.1 | 104,622.8 | 150,460.2 |
| Equity | 36,546.2 | 115,335.3 | 211,112.8 |
| Current Ratio | 0.99 | 1.43 | 1.53 |
| Debt Service Coverage Ratio | 0.95 | 0.98 | 0.46 |

* Estimate.

NITROFERTIL's financial position is sound and meets the loan covenants of maintaining a debt/equity ratio of 60:40 or better, and current of ratio not less than 1.2. However, due to major devaluations, it fell short of the agreed minimum debt service coverage ratio of 1.5. The situation is however, expected to improve in 1985 and thereafter with greater capacity utilization; the debt service coverage ratio in 1985 is expected to be 2.1.

## VI. ECONOMIC PERFORMANCE

### A. Economic Rate of Return

6.01 The Project's economic rate of return (ERR) has been determined using the input and output price assumptions summarized in Annex 11. Tradeable items have been priced on the basis of projected international prices allowing for transportation and handling charges. Prices for non-traded items have been assumed to be the same as the financial prices. The natural gas has been valued on the basis of its calorific value equivalent of fuel oil. Due to the limited fertilizer demand of the Northeast region, part of the product produced in that region has to be shipped to the South. With Sergipe plant in operation, the Camacari plant had to divert its Northeast supply to the South incurring an additional transportation cost. To correctly assess the economic viability of the Project the incremental transport cost are also considered and the Project is penalized in the calculation of ERR as done at appraisal. Project costs and benefits are shown in Annex 12. The ERR for the Project is now estimated at 14.9% slightly lower than the appraisal estimate of 17% and is satisfactory in spite of the completion delays.

B. Foreign Exchange Savings

6.02 The average annual foreign exchange value of the Project's production, with the facilities operating at 90% capacity, is about US$89 million (in 1983 constant dollars). Most of the materials, including feed and fuel, and services used in the Project are of domestic origin, except for chemicals, catalyst, spares, etc., the cost of which is estimated at US$ 1.5 million p.a.. Therefore, the net foreign exchange savings before debt service will be about US$87 million per year (in 1983 constant dollars) compared to the appraisal estimate of US$91 million (in 1983 constant dollars); in 1976 constant dollars this figure was US$65 million. The debt service payments on foreign loans will average about US$12.5 million annually in the first ten years.

C. Technology Transfer

6.03 The Project has been implemented with substantial involvement of Brazilian engineering firms and manufacturers. Using know-how and basic design obtained from process licensors, the detailed engineering was carried out by Brazilian firms. Several equipment for the Project were also obtained from Brazilian suppliers. Very sophisticated multi-wall high pressure equipment such as reactors, exchangers as well as some rotary equipment were manufactured for the first time in Brazil under license agreements with reputable foreign firms. The heavy equipment manufacturing industry of the Brazil benefited immensely by obtaining the technology and know-how to supply such equipment and machinery to the Project. The engineering firms as well as engineering staff of the Project absorbed very effectively the technology transferred to them and now should have significant capabilities in carrying out similar projects.

D. Environmental Aspects

6.04 The Project facilities were designed in conformity with environmental regulations and norms agreed to during Project appraisal. However, during Project implementation, it was realized that the rivers in the plant neighborhood have large residence time and therefore could not handle the pollutant levels the plant would discharge. To overcome this problem, the design was changed and a 30 km underground and 4 km undersea discharge pipelines were constructed for safe disposal of pollutants into the ocean. With regard to air pollution, the plant is operating comfortably below the allowable limits of urea dust and ammonia emissions. The height of furnace and boiler stacks were designed on the basis of high sulfur fuel oil. The plant, however, is using natural gas with the result that sulfur emmission is negligible.

## VII. BANK ROLE

7.01 At various phases of the Project, the Bank worked closely with PETROFERTIL and NITROFERTIL. During Project appraisal and the early stages

of Project implementation, the Bank participated in formulating the project financing arrangements especially for the foreign exchange component. At the initial phase of the Project the Bank provided technical advice to organize procurement activities and also advised on the development of Project organization. The Project sets a good example of a project in which dedicated work by the Project management aided by Bank support has resulted in a successful project meeting its economic objectives and contributing to the needs of the country.

## VIII. CONCLUSIONS AND LESSONS LEARNED

8.01 Apart from the 18 months delay in Project completion, the Project was successful in: (i) keeping the Project cost under control; (ii) achieving a short commissioning and start-up period; (iii) reaching the design rates of the individual units during acceptance tests; (iv) obtaining excellent operating performance with plants running more than a year without major problems; and (v) maintaining good operating cost performance by consuming feed and utilities at or below design norms. The delay in Project completion occurred at the initial phase of Project implementation due to administrative problems, delays in the delivery of equipment manufactured by the Brazilian suppliers (para 3.10). But once the initial problems were solved and a capable efficient Project Coordination and Control Team was formed, the Project was implemented efficiently.

8.02 Notwithstanding the delays in Project completion, which were mainly due to factors outside the control of Project management, the Project has been completed successfully due to the ability of PETROFERTIL and NITROFERTIL management groups, which carried out the Project with enthusiasm and dedication. The management facilitated utilization of the expatriate expertise to full advantage and there has been smooth and useful transfer of technology.

8.03 The financial performance of the Project is below the appraisal estimates. This is because of the Government's current pricing policy which is based upon a cost plus formula for a designated efficient producer in the country, which was built many years ago at lower capital costs and whose facilities have been substantially depreciated. This policy gives the Project prices lower than the appraisal estimate (paras. 5.01 and 5.02). These prices are also below the international (CIF) prices. In addition, completion delays and depressed fertilizer demand in Brazil in 1983 have contributed to lower financial returns for the Project. Although the Project gets a lower financial rate of return given the present pricing policy it, nevertheless, continues to make significant contribution to Brazil's economy given its 14.9% economic rate of return, by helping on the one hand in the development of the Northeast region, and on the other hand in converting economically a natural resource into a much needed fertilizer and saving the country much needed foreign exchange.

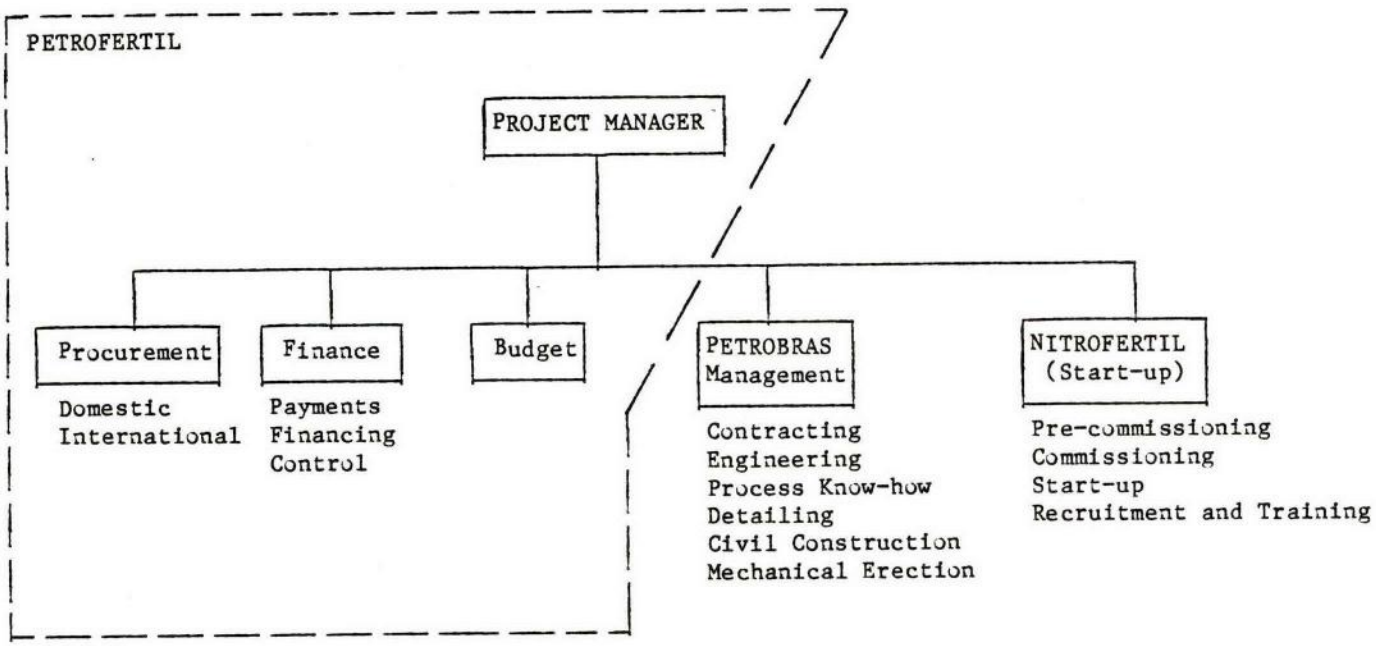
8.04 Overall, the Project is considered as a satisfactory accomplishment achieved through close coordination of efforts between PETROFERTIL/NITROFERTIL managers and the Bank staff. The Project has met its main objectives and under the expert direction of NITROFERTIL management can be relied upon to continue to be a successful industrial enterprise in Brazil. A lesson which this Project illustrates is that a capable and dedicated Project Management, under a project unit concept with sufficient authority and autonomy, and the involvement of an operating company with experienced staff during commissioning of the plant, can have a dramatic impact on the success of Project implementation.

ANNEX 1-1

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

PROJECT ORGANIZATION CHART

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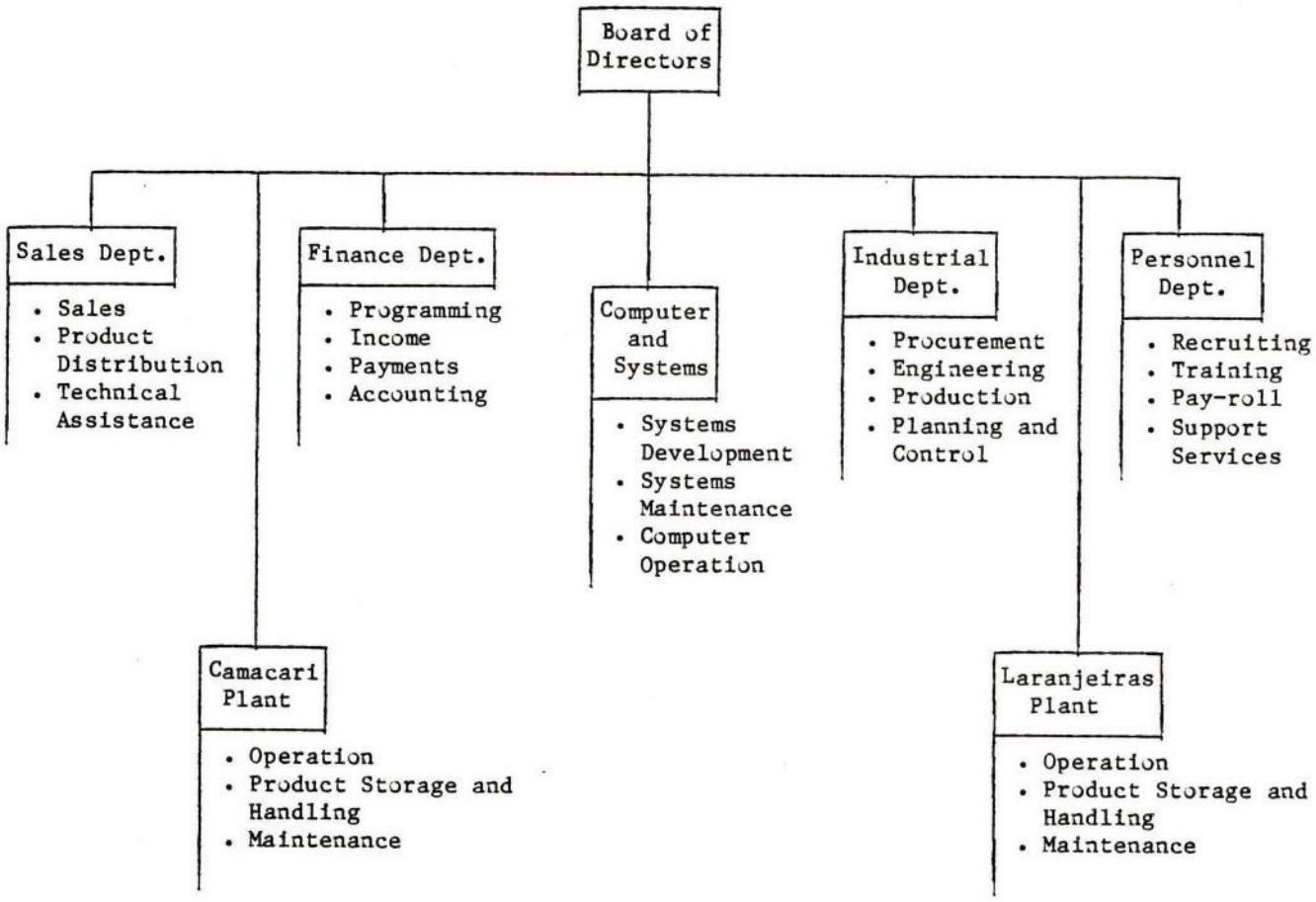
January 1985

ANNEX 1-2

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

NITROFERTIL ORGANIZATION CHART

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ANNEX 2

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

PROJECT MANPOWER NEEDS

| CATEGORY | APPRAISAL ESTIMATE | ACTUAL |
|---|---|---|
| Management | | |
| Directors | 3 | - |
| Managers and support | - | 4 |
| Administrative support | | |
| Personnel | 15 | 31 |
| Finance | 25 | 20 |
| Administration | 97 | 65 |
| Sales | 19 | - |
| Technical support | | |
| Laboratory control | 32 | 21 |
| Maintenance | 80 | 167 |
| Engineering | - | 26 |
| Production | | |
| Ammonia plant | 81 | 42 |
| Urea plant | 21 | 43 |
| Bagging and handling | 11 | 23 |
| Operating division | - | 6 |
| Utilities | - | 34 |
| Total | 384 | 482 |

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ANNEX 3

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

BANK-FINANCED PROCUREMENT OF GOODS AND SERVICES

BY COUNTRY OF ORIGIN

| | Amount (US$ million) | Percentage |
|---|---|---|
| Equipment, Materials and Spares | 43.3 | 100.0 |
| Brazil | 18.3 | 42.3 |
| USA | 15.1 | 34.9 |
| Germany | 6.8 | 15.7 |
| Japan | 2.5 | 5.8 |
| UK | 0.3 | 0.7 |
| Holland | 0.2 | 0.4 |
| Others | 0.1 | 0.2 |
| Engineering and Othe Services | 6.9 | 100.0 |
| USA | 5.6 | 81.2 |
| Japan | 1.3 | 18.8 |

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ANNEX 4

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

PROJECT COST DISBURSEMENT SCHEDULE
(US$ million)

| Year | | Appraisal Estimate | Actual | | | | |
|---|---|---|---|---|---|---|---|
| | | | Basic Cost | Interest during Construction | Taxes Fees | Working Capital | Total |
| 1977 | I | - | - | - | - | - | - |
| | II | 14.0 | - | - | - | - | - |
| 1978 | I | 30.0 | 5.2 | - | - | - | 5.2 |
| | II | 41.0 | 9.8 | 1.0 | - | - | 10.8 |
| 1979 | I | 76.4 | 15.4 | 2.4 | 1.1 | - | 18.9 |
| | II | 51.0 | 17.7 | 2.9 | 0.3 | - | 20.9 |
| 1980 | I | 42.6 | 29.8 | 1.4 | 1.5 | - | 32.7 |
| | II | 28.4 | 13.8 | 2.6 | - | - | 16.4 |
| 1981 | I | - | 31.4 | 3.3 | 1.3 | - | 36.0 |
| | II | - | 21.0 | 10.2 | - | - | 31.2 |
| 1982 | I | - | 25.8 | 5.6 | 0.2 | 6.95 | 38.5 |
| | II | - | 18.5 | 7.6 | 1.0 | 6.95 | 34.7 |
| 1983 | I | - | - | - | - | - | - |
| Total | | 283.4 | 188.4 | 37.0 | 5.4 | 13.9 | 244.7 |

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ANNEX 5

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

PROJECT FINANCING PLAN

| | US$ million | | | Percentage | |
|---|---|---|---|---|---|
| | Appraisal | Actual | Difference | Appraisal | Actual |
| Equity: | | | | | |
| PETROFERTIL | 123.4 | 114.0 | (9.4) | 43 | 47 |
| FINOR | - | 2.8 | 2.8 | - | 1 |
| Sub-total equity | 123.4 | 116.8 | (6.6) | 43 | 48 |
| Loans, foreign: | | | | | |
| IBRD | 64.0 | 51.5[c]/ | (12.5) | 23 | 21 |
| Foreign Loans[b]/ | 25.0 | 28.8 | 3.8 | 9 | 12 |
| Loans, Domestic | | | | | |
| BNDES | 71.0 | 29.9 | (41.1) | 25 | 12 |
| FINAME[d]/ | - | 5.1 | 5.1 | - | 2 |
| BNB[e]/ | - | 12.6 | 12.6 | - | 5 |
| Subtotal Loans | 160.0 | 127.9 | (32.0) | 100 | 100 |
| TOTAL FINANCING | 283.4 | 244.7 | | | |

a/ Fundo de Investimentos do Nordeste (Sudene).
b/ Commercial Banks.
c/ US$0.5 million to be disbursed in January 1985 and US$12.0 million was cancelled on November 4, 1981.
d/ Agencia Especial de Financiamento Industrial.
e/ Banco do Nordeste do Brazil.

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ANNEX 6-1

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

OPERATING PERFORMANCE

| MONTH | PRODUCTION (IN 000 TONS) | | | | CAPACITY UTILIZATION (%) | |
|---|---|---|---|---|---|---|
| | MONTH | | ACCUMULATED | | MONTH | |
| | AMMONIA | UREA | AMMONIA | UREA | AMMONIA | UREA |
| 1982 | | | | | | |
| SEP | 2.136 | - | - | - | 8.6 | - |
| OCT | 14.460 | 15.170 | 16.596 | 15.170 | 58.0 | 50.1 |
| NOV | 8.518 | 10.421 | 25.114 | 25.591 | 34.2 | 34.4 |
| DEC | 13.310 | 18.195 | 38.424 | 43.786 | 53.4 | 60.1 |
| 1983 | | | | | | |
| JAN | 5.769 | 2.976 | 44.193 | 46.762 | 23.1 | 9.8 |
| FEB | 24.336 | 25.879 | 68.529 | 72.641 | 97.6 | 85.6 |
| MAR | 21.545 | 24.217 | 90.074 | 96.858 | 86.4 | 80.1 |
| APR | 22.595 | 27.577 | 112.669 | 124.435 | 90.6 | 91.2 |
| MAY | 2.188 | 1.692 | 114.857 | 126.127 | 8.8 | 5.6 |
| JUN | 1.774 | - | 116.631 | 126.127 | 7.1 | - |
| JUL | 23.171 | 17.628 | 139.802 | 143.755 | 92.9 | 58.3 |
| AUG | 27.239 | 19.023 | 167.041 | 162.778 | 109.2 | 62.9 |
| SEP | 28.416 | 30.540 | 195.457 | 193.318 | 113.9 | 100.1 |
| OCT | 25.746 | 28.366 | 221.203 | 221.684 | 103.2 | 93.8 |
| NOV | 29.881 | 33.311 | 251.084 | 254.995 | 119.8 | 110.1 |
| DEC | 30.964 | 31.249 | 282.048 | 286.244 | 118.3 | 99.2 |
| 1984 | | | | | | |
| JAN | 21.132 | 22.085 | 303.180 | 308.329 | 93.2 | 80.2 |
| FEB | 28.300 | 31.705 | 331.480 | 340.034 | 100.1 | 92.9 |
| MAR | 14.119 | 14.461 | 345.599 | 354.495 | 53.6 | 45.3 |
| APR | 23.266 | 23.572 | 368.865 | 378.067 | 82.7 | 69.1 |
| MAY | 27.110 | 26.348 | 395.975 | 404.415 | 99.6 | 79.8 |
| JUN | 25.854 | 30.160 | 421.829 | 434.575 | 91.9 | 88.4 |
| JUL | 19.823 | 24.078 | 441.652 | 458.653 | 72.8 | 72.9 |
| AUG | 2.517 | 2.090 | 444.169 | 460.743 | 8.9 | 6.1 |
| SEP | 24.636 | 28.630 | 468.805 | 489.373 | 87.6 | 83.9 |
| OCT * | 24.000 | 28.000 | 492.805 | 517.373 | 88.2 | 84.8 |
| NOV * | 25.500 | 29.000 | 518.305 | 546.373 | 93.7 | 87.9 |
| DEC * | 28.500 | 32.500 | 546.805 | 578.873 | 104.7 | 98.5 |
| 1985 | | | | | | |
| JAN * | 20.400 | 23.400 | 567.205 | 602.273 | 75.0 | 70.1 |
| FEB * | 25.300 | 29.000 | 592.505 | 631.273 | 93.0 | 87.9 |
| MAR * | 22.900 | 26.200 | 615.405 | 657.473 | 84.2 | 79.4 |
| APR * | 25.300 | 29.000 | 640.705 | 686.473 | 93.0 | 87.9 |
| MAY * | 24.500 | 28.000 | 665.205 | 714.473 | 90.0 | 84.8 |
| JUN * | 25.300 | 29.000 | 690.505 | 743.473 | 93.0 | 87.9 |
| JUL * | 24.500 | 28.000 | 715.005 | 771.473 | 90.0 | 84.8 |
| AUG * | 25.300 | 29.000 | 740.305 | 800.473 | 93.0 | 87.9 |
| SEP * | 25.300 | 29.000 | 765.605 | 829.473 | 93.0 | 87.9 |
| OCT * | 24.500 | 28.000 | 790.105 | 857.473 | 90.0 | 84.8 |
| NOV * | - a/ | - | 790.105 | 857.473 | - | - |
| DEC * | 29.400 | 33.700 | 819.173 | 891.173 | 108.0 | 102.1 |

* Estimate

a/ Annual turnaround.

ANNEX 6-2

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

SALES AND INVENTORIES
(In 000 tons)

| MONTH | SALES | | | | INVENTORY LEVEL (END OF MONTH) | |
|---|---|---|---|---|---|---|
| | MONTH | | ACCUMULATED | | | |
| | AMMONIA | UREA | AMMONIA | UREA | AMMONIA | UREA |
| 1982 | | | | | | |
| SEP | - | - | - | - | 2.136 | - |
| OCT | - | 269 | - | 269 | 7.259 | 15.138 |
| NOV | 1.108 | 7.343 | 1.108 | 7.612 | 8.341 | 18.090 |
| DEC | 7.285 | 5.730 | 8.393 | 13.342 | 3.595 | 24.263 |
| 1983 | | | | | | |
| JAN | 3.743 | 10.886 | 12.136 | 24.228 | 3.457 | 15.353 |
| FEB | 3.316 | 13.828 | 15.452 | 38.056 | 9.333 | 27.404 |
| MAR | 8.514 | 29.354 | 23.966 | 67.410 | 8.426 | 22.267 |
| APR | 6.464 | 17.395 | 30.430 | 84.805 | 8.484 | 32.162 |
| MAY | 2.424 | 6.571 | 32.854 | 91.376 | 7.310 | 27.282 |
| JUN | 5.581 | 5.014 | 38.435 | 96.390 | 3.174 | 22.318 |
| JUL | 12.797 | 13.152 | 51.232 | 109.542 | 3.274 | 26.794 |
| AUG | 13.343 | 26.756 | 64.575 | 136.298 | 6.160 | 19.061 |
| SEP | 10.934 | 31.699 | 75.509 | 167.997 | 5.962 | 17.902 |
| OCT | 10.001 | 46.065 | 85.510 | 214.062 | 5.310 | 242 |
| NOV | 14.306 | 33.333 | 99.816 | 247.395 | 1.598 | 260 |
| DEC | 13.698 | 31.184 | 113.514 | 278.579 | 1.109 | 533 |
| 1984 | | | | | | |
| JAN | 8.352 | 21.062 | 121.866 | 299.641 | 1.779 | 748 |
| FEB | 9.802 | 28.324 | 131.668 | 327.965 | 2.117 | 4.130 |
| MAR | 7.392 | 18.514 | 139.060 | 346.479 | 652 | 76 |
| APR | 8.759 | 19.502 | 147.819 | 365.981 | 1.622 | 4.149 |
| MAY | 9.063 | 26.781 | 156.882 | 392.762 | 4.506 | 3.715 |
| JUN | 10.306 | 28.284 | 167.188 | 421.046 | 2.611 | 5.591 |
| JUL | 5.741 | 20.049 | 172.929 | 441.095 | 2.815 | 9.670 |
| AUG | 1.758 | 3.550 | 174.687 | 444.645 | 2.310 | 3.024 |
| SEP | 7.518 | 27.615 | 182.205 | 472.260 | 3.060 | 4.040 |
| Year 1985 * | - | - | 73.359 | 326.700 | - | - |
| Year 1986 * | - | - | 73.359 | 326.700 | - | - |
| Year 1987 * | - | - | 73.359 | 326.700 | - | - |

* Estimate

Industry Department
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ANNEX 7-1

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

NITROGENOUS FERTILIZER PRODUCTION CAPACITY IN BRAZIL

| PLANTS | | PRODUCT | CAPACITY PRODUCT tpd | CAPACITY PRODUCT tpy | CAPACITY NUTRIENT (N) tpy |
|---|---|---|---|---|---|
| Camacari I | | Urea | 250 | 82,500 | 37,000 |
| Camacari II | | " | 800 | 264,000 | 119,000 |
| Laranjerias | | " | 1,100 | 363,000 | 163,000 |
| Araucaria | | " | 1,500 | 495,000 | 222,000 |
| | UREA: | Subtotal | 3,650 | 1,204,500 | 541,000 |
| Piacaguera | | AN | 1,315 | 434,088 | 145,000 |
| Cubartao | | " | 352 | 116,160 | 38,000 |
| | AN: | Subtotal | 1,667 | 550,248 | 183,000 |
| Cubatao | | CAN | 550 | 181,500 | 49,000 |
| | CAN: | Subtotal | 650 | 181,500 | 49,000 |
| Metacril | | AS | - | 30,000 | 6,000 |
| Nitrocarbono | | " | - | 61,000 | 13,000 |
| IAP | | " | - | 158,000 | 32,000 |
| | AS: | Subtotal | | 249,400 | 51,000 |
| | TOTAL NITROGENOUS CAPACITY | | | 218,648 | 824,000 |
| | DAP/MAP | | | | 326,000 |
| | TOTAL NUTRIENT CAPACITY | | | | 1,150,000 |

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ANNEX 7-2

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

FERTILIZER CONSUMPTION

| YEAR | PRODUCT | NUTRIENTS (x 1000 tons) | | | | AVERAGE FORMULA | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | N | P | K | NPK | N | P | K | NPK |
| 1979 | 8,331 | 779 | 1,581 | 1,103 | 3,463 | 9.4 | 19.0 | 13.2 | 41.6 |
| 1980 | 9,775 | 905 | 1,851 | 1,306 | 4,062 | 9.3 | 18.9 | 13.4 | 41.6 |
| 1981 | 6,813 | 667 | 1,216 | 766 | 2,649 | 9.8 | 17.8 | 11.2 | 38.9 |
| 1982 | 6,612 | 640 | 1,087 | 875 | 2,602 | 9.7 | 16.4 | 13.2 | 39.4 |
| 1983 | 5,833 | 564 | 929 | 727 | 2,220 | 9.7 | 15.9 | 12.5 | 38.1 |
| 1984* | | 768 | 1,162 | 996 | 2,926 | | | | |
| Avg.(79/83) | 7,473 | 711 | 1,333 | 955 | 2,999 | 9.5 | 17.8 | 12.8 | 40.1 |

* Estimate

Source: PETROBRAS, ANNUAL INFORMATION 1984, pp. 102.

FERTILIZER CONSUMPTION PROJECTION

| YEAR | ARABLE LAND (1,000 ha) | | CONSUMPTION (NPK) | | |
|---|---|---|---|---|---|
| | | | | (x '000) ton/year | |
| | 1% p.a. increase | 2% p.a. increase | kg/ha | 1% p.a. | 2% p.a. |
| 1985 | 44.299 | 45.180 | 65.00 | 2,880 | 2,937 |
| 1987 | 45.190 | 47.006 | 70.63 | 3,192 | 3,320 |
| 1990 | 46.559 | 49.883 | 80.00 | 3,724 | 3,990 |
| 1993 | 47.970 | 52.936 | 92.97 | 3,980 | 4,392 |
| 1995 | 48.934 | 55.075 | 85.00 | 4,159 | 4,681 |
| 1997 | 49.917 | 57.300 | 87.00 | 4,343 | 4,985 |
| 2000 | 51.430 | 60.807 | 90.00 | 4,628 | 5,472 |

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ANNEX 8

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

SUMMARY OF INPUT AND OUTPUT PRICES AND VALUES FOR FINANCIAL AND ECONOMIC ANALYSIS
(in constant 1983 US$)

INPUTS

| | Financial | | | | | Economic | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Natural Gas | | Utilities | Fixed | Total Operating | Natural Gas | | Utilities | Fixed | Total Operating |
| Year | Price $/Ton | Cost MM$ | & Bags MM$ | Cost MM$ | Cost MM$ | Price $/Ton | Cost MM$ | & Bags MM$ | Cost MM$ | Cost MM$ |
| 1982 | 44.46 | 1.9 | 0.6 | 2.9 | 5.4 | 121.8 | 5.2 | 0.5 | 2.4 | 8.1 |
| 1983 | 41.58 | 11.1 | 3.2 | 11.7 | 26.0 | 122.6 | 32.8 | 2.8 | 9.9 | 45.5 |
| 1984 | 43.42 | 12.8 | 3.7 | 11.7 | 28.2 | 109.1 | 32.2 | 2.3 | 9.9 | 44.4 |
| 1985 | 43.42 | 13.2 | 3.9 | 11.7 | 28.8 | 95.0 | 28.8 | 3.4 | 9.9 | 42.1 |
| 1986 | 43.42 | 13.2 | 3.9 | 11.7 | 28.8 | 99.3 | 30.1 | 3.4 | 9.9 | 43.4 |
| 1987 | 43.42 | 13.2 | 3.9 | 11.7 | 28.8 | 103.7 | 31.4 | 3.4 | 9.9 | 44.7 |
| 1988 | 43.42 | 13.2 | 3.9 | 11.7 | 28.8 | 108.3 | 32.8 | 3.4 | 9.9 | 46.1 |
| 1989 | 43.42 | 13.2 | 3.9 | 11.7 | 28.8 | 113.0 | 34.2 | 3.4 | 9.9 | 47.5 |
| 1990 | 43.42 | 13.2 | 3.9 | 11.7 | 28.8 | 117.6 | 35.6 | 3.4 | 9.9 | 48.9 |
| 1991 | 43.42 | 13.2 | 3.9 | 11.7 | 28.8 | 125.3 | 38.0 | 3.4 | 9.9 | 51.3 |
| 1992 | 43.42 | 13.2 | 3.9 | 11.7 | 28.8 | 133.3 | 40.4 | 3.4 | 9.9 | 53.7 |
| 1993 | 43.42 | 13.2 | 3.9 | 11.7 | 28.8 | 142.0 | 43.0 | 3.4 | 9.9 | 56.3 |
| 1994 | 43.42 | 13.2 | 3.9 | 11.7 | 28.8 | 151.1 | 45.8 | 3.4 | 9.9 | 59.1 |

OUTPUTS

| | Financial | | | | Economic | | | |
|---|---|---|---|---|---|---|---|---|
| | | Urea $/Ton | | Revenue US$ | | Urea $/Ton | | Revenue US$ |
| Year | Ammonia $/Ton | Bulk | Bagged | million | Ammonia $/Ton | Bulk | Bagged | million |
| 1982 | 163 | 173 | 188 | 9.8 | 191 | 167 | 182 | 10.1 |
| 1983 | 133 | 155 | 170 | 52.1 | 172 | 148 | 163 | 54.4 |
| 1984 | 121 | 124 | 139 | 49.4 | 201 | 177 | 192 | 72.3 |
| 1985 | 130 | 151 | 166 | 61.4 | 207 | 183 | 198 | 77.9 |
| 1986 | 130 | 151 | 166 | 61.4 | 226 | 202 | 217 | 85.7 |
| 1987 | 130 | 151 | 166 | 61.4 | 240 | 216 | 231 | 91.3 |
| 1988 | 130 | 151 | 166 | 61.4 | 254 | 230 | 245 | 96.9 |
| 1989 | 130 | 151 | 166 | 61.4 | 270 | 246 | 261 | 103.0 |
| 1990 | 130 | 151 | 166 | 61.4 | 287 | 263 | 278 | 110.3 |
| 1991 | 130 | 151 | 166 | 61.4 | 289 | 265 | 280 | 111.2 |
| 1992 | 130 | 151 | 166 | 61.4 | 291 | 267 | 282 | 112.2 |
| 1993 | 130 | 151 | 166 | 61.4 | 293 | 269 | 284 | 112.9 |
| 1994 | 130 | 151 | 166 | 61.4 | 295 | 271 | 286 | 113.5 |

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ANNEX 9

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

CASH FLOW FOR FINANCIAL RATE OF RETURN
(in millions of constant 1983 dollars)

| Year | Capital Cost | Working Capital | Fixed Cost | Variable Cost | Revenues | Net Cash Flow |
|---|---|---|---|---|---|---|
| 1978 | 16.5 | | | | | (16.5) |
| 1979 | 34.2 | | | | | (34.2) |
| 1980 | 41.2 | | | | | (41.2) |
| 1981 | 51.1 | | | | | (51.1) |
| 1982 | 44.1 | 6.5 | 2.9 | 2.5 | 9.8 | (46.2) |
| 1983 | | 7.3 | 11.7 | 14.3 | 52.1 | 18.8 |
| 1984 | | | 11.7 | 16.5 | 49.4 | 21.2 |
| 1985 | | | 11.7 | 17.1 | 61.4 | 32.6 |
| 1986 | | | 11.7 | 17.1 | 61.4 | 32.6 |
| 1987 | | | 11.7 | 17.1 | 61.4 | 32.6 |
| 1988 | | | 11.7 | 17.1 | 61.4 | 32.6 |
| 1989 | | | 11.7 | 17.1 | 61.4 | 32.6 |
| 1990 | | | 11.7 | 17.1 | 61.4 | 32.6 |
| 1991 | | | 11.7 | 17.1 | 61.4 | 32.6 |
| 1992 | | | 11.7 | 17.1 | 61.4 | 32.6 |
| 1993 | | | 11.7 | 17.1 | 61.4 | 32.6 |
| 1994 | (3.6) | (13.8) | 11.7 | 17.1 | 61.4 | 50.0 |

Financial Rate of Return 8.9%

Note: Due to its location in Northest Region Sergipe plant is exempt from income tax.

Industry Department
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ANNEX 10-1

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

NITROFERTIL - BALANCE SHEETS
(in million Cr$)

| ITEM | 1979 | 1980 | 1981 | 1982 | 1983 | 1984* |
|---|---|---|---|---|---|---|
| **Assets** | | | | | | |
| Cash and Banks | 51.9 | 139.6 | 148.6 | 298.6 | 10,463.5 | 6,798.7 |
| Accounts Receivable | 279.2 | 792.8 | 2,419.3 | 7,853.0 | 16,556.3 | 21,730.4 |
| Inventory | 186.5 | 738.0 | 2,561.0 | 5,237.9 | 10,932.0 | 16,137.9 |
| Other Receivables | 149.0 | 248.4 | 1,875.7 | 1,534.5 | 11,183.9 | 19,518.0 |
| Total Receivables | 666.6 | 1,918.8 | 7,004.6 | 14,924.3 | 49,135.7 | 64,185.0 |
| Long-Term Receivables | 175.9 | 228.8 | 251.9 | 907.6 | 2,547.0 | 5,858.1 |
| Fixed Assets | 4,169.7 | 6,781.6 | 13,429.8 | 66,190.8 | 165,687.7 | 297,905.0 |
| Depreciation | 596.9 | 1,411.6 | 3,801.4 | 10,128.3 | 38,988.7 | 89,858.6 |
| Net Fixed Assets | 3,572.8 | 5,370.0 | 9,628.4 | 56,062.5 | 126,699.0 | 208,046.4 |
| Deferred Charges | 2,541.3 | 3,662.0 | 6,382.8 | 21,848.4 | 82,017.0 | 125,486.0 |
| TOTAL ASSETS | 6,956.6 | 11,179.1 | 23,267.7 | 93,742.8 | 260,398.7 | 403,575.5 |
| **Liabilities and Equity** | | | | | | |
| Accounts Payable | 25.5 | 429.9 | 217.9 | 1,047.9 | 1,591.0 | 2,378.0 |
| Short-Term Portion of Long-Term Debt | 321.4 | 700.6 | 1,684.2 | 3,095.3 | 20,093.5 | 34,959.0 |
| Short-Term Debt | 297.3 | 810.9 | 2,541.3 | 7,666.5 | 1,765.0 | 1,585.7 |
| Other Accounts Payable | 236.8 | 1,048.2 | 1,988.4 | 3,421.2 | 10,951.1 | 3,079.8 |
| Total Current Liabilities | 881.0 | 2,989.6 | 6,431.8 | 15,231.5 | 34,400.6 | 42,002.5 |
| Long-Term Debt | 3,179.6 | 2,978.8 | 5,630.9 | 33,248.4 | 91,419.8 | 126,308.7 |
| Other Long-Term Payables | - | 361.5 | 2,110.8 | 8,716.7 | 13,243.0 | 24,151.5 |
| Total Long-Term Debt | 3,179.6 | 3,339.8 | 7,741.7 | 41,965.1 | 104,662.8 | 150,460.2 |
| Share Capital | 2,146.2 | 4,022.1 | 6,297.4 | 22,566.9 | 65,577.1 | 142,076.9 |
| Reserves | 749.8 | 1,739.6 | 5,958.3 | 22,964.8 | 76,499.8 | 99,453.4 |
| Retained Reserves | - | (912.1) | (3,161.5) | (8,985.5) | (20,741.6) | (30,417.5) |
| Total Equity | 2,896.0 | 4,849.6 | 9,094.2 | 36,546.2 | 115,335.3 | 211,112.8 |
| TOTAL LIABILITIES AND EQUITY | 6,956.6 | 11,179.0 | 23,267.7 | 93,742.8 | 260,398.7 | 403,575.5 |

*Estimate

Industry Department
January 1985

ANNEX 10-2

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

NITROFERTIL - STATEMENTS OF INCOME
(in million Cr$)

| | ITEM | 1979 | 1980 | 1981 | 1982 | 1983 | 1984* |
|---|---|---|---|---|---|---|---|
| Gross Revenue | | | | | | | |
| (+) | Sales | 1,587.1 | 4,787.6 | 10,959.7 | 25,416.5 | 76,920.0 | 153,042.6 |
| (-) | Deduction and Taxes on Sales | 62.9 | 209.2 | 525.6 | 1,311.5 | 3,561.3 | 7,580.4 |
| (=) | Net Sales | 1,524.2 | 4,578.4 | 10,434.4 | 24,105.0 | 73,358.7 | 145,462.2 |
| (-) | Cost of Products Sold | 1,012.7 | 3,378.7 | 6,763.8 | 14,230.0 | 39,012.0 | 85,409.7 |
| (=) | Gross Profit | 511.5 | 1,199.7 | 3,670.3 | 9,875.0 | 34,346.7 | 60,052.5 |
| (-) | Operating Expenses | 2,491.1 | 3,567.7 | 8,604.2 | 20,148.3 | 33,690.0 | 59,457.3 |
| | Selling Expenses | 95.5 | 119.4 | 365.6 | 1,970.2 | 6,280.3 | 4,000.0 |
| | General and Administrative Expenses (1) | 2,089.8 | 2,978.8 | 7,406.4 | 16,258.0 | 20,344.3 | 34,258.6 |
| | Depreciation and Amortization of Pre-operating Expenses | 306.2 | 469.5 | 832.2 | 1,920.1 | 7,065.4 | 21,198.7 |
| (=) | Operating Result | (1,979.6) | (2,368.0) | (4,933.9) | (10,243.3) | 656.7 | 595.2 |
| | Nonoperating Income | 31.2 | 27.5 | 120.6 | 78.0 | 78.1 | 141.4 |
| (-) | Monetary Variation on Long Term Loans and Financing | - | - | - | - | 53,823.0 | 94,498.2 |
| | Monetary Correction | 752.8 | 1,416.5 | 3,408.7 | 7,833.6 | 56,188.0 | 98,604.8 |
| | On Permanent Assets | 1,995.3 | 3,016.0 | 8,189.3 | 18,152.3 | 115,231.0 | 183,539.1 |
| (-) | Of Shareholders Equity | 1,242.5 | 1,599.5 | 4,780.6 | 10,318.7 | 59,043.0 | 84,934.3 |
| (=) | Net Result for the year | (1,195.6) | (924.0) | (1,404.6) | (2,361.7) | 3,099.8 | 4,843.2 |
| (1) | Only financial expenses | 159.5 | 494.4 | 718.4 | 3,357.4 | 6,913.7 | 16,843.2 |

*Estimate

Industry Department
January 1985

ANNEX 10 -3

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

NITROFERTIL - STATEMENT OF SOURCE AND APPLICATION OF FUNDS
(in million Cr$)

| ITEM | 1979 | 1980 | 1981 | 1982 | 1983 | 1984* |
|---|---|---|---|---|---|---|
| SOURCES | | | | | | |
| Net loss for the year | (1,195.6) | (924.0) | (1,404.6) | (2,361.7) | 3,099.8 | 4,843.2 |
| From capital increase-capital paid up | 306.9 | 1,278.3 | 866.3 | 15,776.0 | 23,506.2 | 33,796.9 |
| Long-Term debt increase | 1,354.2 | 1,027.3 | 3,278.7 | 31,877.7 | 13,867.9 | 10,908.5 |
| Monetary variation on long-term loans and financing | 1,182.3 | 1,277.7 | 2,786.7 | 17,059.2 | 64,807.8 | 34,888.9 |
| Monetary restatement of permanent assets and shareholders equity | (752.8) | (1,416.5) | (3,408.7) | (7,833.6) | (56,195.1) | (98,604.8) |
| Depreciation and amortization | 528.2 | 807.0 | 1,442.3 | 3,371.8 | 12,692.7 | 28,525.8 |
| Decrease in long-term assets | (748.1) | (2,131.1) | (1,502.0) | (14,625.5) | (13,770.6) | - |
| TOTAL SOURCES | 675.1 | (81.3) | 2,058.7 | 43,263.9 | 48,008.7 | 14,358.5 |
| APPLICATIONS | | | | | | |
| Addition to property | 191.3 | 487.9 | 247.6 | 22,916.8 | 1,231.9 | 3,600.0 |
| Pre-operation and Pre-industrial expenses | 21.5 | 226.7 | 54.7 | 20,490.1 | 30,474.3 | - |
| Long-Term assets increase | 21.7 | 60.5 | 112.7 | 737.0 | 1,260.2 | 3,311.1 |
| TOTAL APPLICATIONS | 234.5 | 775.1 | 415.0 | 44,143.9 | 32,966.4 | 6,911.1 |
| Increase (decrease) in working capital | 440.6 | (856.4) | 1,643.7 | (880.0) | 15,042.3 | 7,447.4 |
| Repayment of long-term debts | 268.7 | 971.9 | 1,533.0 | 4,065.7 | 14,154.0 | 22,837.7 |

*Estimate

Industry Department
January 1985

ANNEX 10-4

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

SERGIPE PROJECT: BALANCE SHEET
(US$ thousands)

| ITEM | 1982 | 1983 | 1984* |
|---|---|---|---|
| **Assets** | | | |
| Cash and Banks | 3.9 | 1,220.7 | 544.6 |
| Accounts Receivable | 1,477.4 | 11,086.7 | 678.1 |
| Inventory | 7,373.3 | 4,415.0 | 488.3 |
| Other Receivables | 2,007.8 | 4,529.1 | 857.3 |
| Total Receivables | 10,862.4 | 21,251.5 | 3,568.3 |
| Long-Term Receivables | 2,111.1 | 1,144.8 | 432.9 |
| Fixed Assets | 154,602.0 | 98,586.6 | 59,877.3 |
| Depreciation | 1,147.7 | 9,670.7 | 11,340.8 |
| Net Fixed Assets | 153,454.3 | 88,916.0 | 48,536.5 |
| Deferred Charges | 43,468.9 | 42,912.2 | 22,655.6 |
| TOTAL ASSETS | 209,896.7 | 154,224.5 | 75,203.3 |
| **Liabilities and Equity** | | | |
| Accounts Payable | 2,622.0 | 1,226.7 | 663.8 |
| Short-Term Portion of Long Term Debt | 15,878.5 | 10,624.8 | 8,435.8 |
| Short-Term Debt | - | - | - |
| Other Accounts Payable | 27,534.7 | 5,911.6 | 865.4 |
| Total Current Liabilities | 46,035.2 | 17,763.1 | 9,965.0 |
| Long-Term Debt | 97,928.5 | 82,446.2 | 38,593.1 |
| Other Long-Term Payables | 13,121.5 | 1,871.8 | 2,060.0 |
| Total Long-Term Debt | 111,050.0 | 84,318.0 | 40,653.1 |
| Share Capital | 34,790.0 | 15,418.1 | 13,760.4 |
| Reserves | 16,988.6 | 35,088.1 | 9,193.8 |
| Retained Earnings | 1,032.9 | 1,637.2 | 1,631.0 |
| TOTAL EQUITY | 52,811.5 | 52,143.4 | 24,585.2 |
| TOTAL LIABILITIES AND EQUITY | 209,896.7 | 154,224.5 | 75,203.3 |

* Estimate

Industry Department
January 1985

ANNEX 10-5

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

SERGIPE PROJECT: INCOME STATEMENT
(US$ thousands)

| ITEM | 1982 | 1983 | 1984* |
|---|---|---|---|
| Gross Revenue | | | |
| (+) Sales | 1,207.5 | 8,663.7 | 21,166.0 |
| (-) Deduction and Taxes on Sales | 25.3 | 101.4 | 353.7 |
| (=) Net Sales | 1,182.2 | 8,562.3 | 20,812.3 |
| (-) Cost of Products Sold | 634.0 | 4,183.1 | 10,492.3 |
| (=) Gross Profit | 548.2 | 4,379.2 | 10,320.0 |
| (-) Operating Expenses | 3,106.0 | 12,738.4 | 9,430.8 |
| Selling Expenses | 42.3 | 307.9 | 399.4 |
| General and Administrative Expenses | 2,200.1 | 8,095.6 | 3,815.5 |
| Depreciation and Amortization of Pre-operating Expenses | 863.6 | 4,334.9 | 5,215.9 |
| (=) Operating Results | (2,557.8) | (8,359.2) | 889.2 |
| Nonoperating Income | 0.4 | - | - |
| (-) Monetary Variation on Long Term Loans and Financing | 8,035.0 | 41,847.5 | 27,215.8 |
| Monetary Correction | 11,626.2 | 51,566.9 | 26,949.9 |
| On Permanent Assets | 13,887.7 | 72,427.3 | 36,558.6 |
| (-) Of Shareholders Equity | 2,261.5 | 20,860.4 | 9,608.7 |
| (=) Net Result For The Year | (1,033.0) | (1,360.2) | (623.3) |

* Estimate

Industry Department
January 1985

ANNEX 10-6

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

SERGIPE PROJECT: STATEMENTS OF SOURCE AND APPLICATION OF FUNDS
(US$ Thousands)

| SOURCES | 1982 | 1983 | 1984* |
|---|---|---|---|
| Net Loss for the Year | 1,032.9 | 1,360.2 | 623.3 |
| From Capital Increase - Capital Paid up | 49,517.1 | 18,356.1 | 12,434.1 |
| Long-Term Debt Increase | 103,014.2 | 13,955.2 | 1,382.4 |
| Monetary Variation on Long-Term Loans and Financing | 8,035.7 | 41,847.4 | 10,353.0 |
| Monetary Restatement of Permanent Assets and Shareholders equity | (11,626.2) | (51,566.8) | (26,949.8) |
| Depreciation and Amortization | 863.5 | 4,334.8 | 10,231.9 |
| Decrease in Long-Term Assets | - | 4,024.0 | - |
| TOTAL SOURCES | 150,837.2 | 30,316.6 | 8,074.9 |
| APPLICATIONS | | | |
| Addition to property | 139,566.6 | - | 397.3 |
| Pre-opration and Pre-Industrial Expenses | 44,332.5 | 17,092.4 | - |
| Long-Term Assets Increase | 2,110.0 | 704.3 | 18.3 |
| TOTAL APPLICATIONS | 186,010.1 | 17,796.7 | 415.6 |
| Increase (Decrease) in Working Capital | (35,172.9) | 12,519.9 | 7,659.3 |

* Estimate

Industry Department
January 1985

ANNEX 11

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

ASSUMPTIONS FOR ECONOMIC AND FINANCIAL RATE OF RETURN CALCULATIONS

1. Economic price of natural gas is assumed to be equal to the price of heavy fuel oil on a calorific value equivalent basis.

2. It is assumed that ammonia and bulk urea prices will retain 1:1 relation at international market.

3. For bagging US$15 is added to bulk urea prices.

4. The Project benefits are reduced by incremental transportation cost of displaced production of Camacari due to the limited demand of the Northeast region which will be supplied by the Project.

5. For shadow pricing, local components of capital cost and other inputs and services are adjusted by using standard conversion factor of 0.83 for Brazil.

6. Local operating cost items, utilities, fixed costs are converted to 1983 constant dollars, and assumed to remain constant in dollar terms.

7. For financial rate of return, actual input and output prices (as of January 1, 1985) are expressed in constant 1983 dollars and assumed to remain constant for the life of the Project.

Industry Department
January 1985

ANNEX 12

BRAZIL - SERGIPE NITROGEN FERTILIZER PROJECT (LOAN 1406-BR)

PROJECT COMPLETION REPORT

ECONOMIC COST AND BENEFIT STREAMS
(in millions of constant 1983 dollars)

| Year | Capital Cost | Working Capital | Fixed Cost | Variable Cost | Incremental Transport Cost | Revenues | Net Cash Flow |
|---|---|---|---|---|---|---|---|
| 1978 | 14.5 | | | | | | (14.5) |
| 1979 | 30.1 | | | | | | (30.1) |
| 1980 | 36.3 | | | | | | (36.3) |
| 1981 | 45.0 | | | | | | (45.0) |
| 1982 | 39.1 | 0.1 | 2.4 | 5.7 | 0.2 | 10.1 | (37.4) |
| 1983 | | 0.4 | 9.9 | 35.6 | 2.9 | 54.4 | 5.6 |
| 1984 | | | 9.9 | 34.5 | 2.5 | 72.3 | 25.4 |
| 1985 | | | 9.9 | 32.2 | 2.1 | 77.9 | 33.7 |
| 1986 | | | 9.9 | 33.5 | 2.1 | 85.7 | 40.2 |
| 1987 | | | 9.9 | 34.8 | 2.1 | 91.3 | 44.5 |
| 1988 | | | 9.9 | 36.2 | 2.1 | 96.9 | 48.7 |
| 1989 | | | 9.9 | 37.6 | 2.1 | 103.0 | 53.4 |
| 1990 | | | 9.9 | 39.0 | 0.7 | 110.3 | 60.7 |
| 1991 | | | 9.9 | 41.4 | 0.7 | 111.2 | 59.2 |
| 1992 | | | 9.9 | 43.8 | 0.7 | 112.2 | 57.8 |
| 1993 | | | 9.9 | 46.4 | 0.7 | 112.9 | 55.9 |
| 1994 | (3.1) | (0.2) | 9.9 | 49.2 | 0.7 | 113.5 | 57.0 |

Economic Rate of Return 14.9%

Industry Department
January 1985

INFORMATION ON PROJECT

1. Name of Country/Project: BRAZIL-Sergipe Fert.
2. Loan/~~Credit~~ Number: 1406-BR
3. Loan/Credit Amount: $64 m
4. Board Date: 04/19/77
5. Signing Date: 04/29/77
6. Date of Effectiveness: 08/15/77
7. Closing Date: 05/31/82
8. Completion Date: 01/18/85
9. Project Brief: _____
10. Issues Paper: 07/30/76
11. Decision Memo: 08/24/76
12. Loan Committee Comments/VP Memoranda: _____
13. Staff Appraisal Reports/No. 08/17/77 President's Reports/No. P-1988a-BR

    Yellow Cover: _____
    Green Cover: 01/31/77
    Gray/Buff Cover: 04/06/77

    Yellow Cover: _____
    Gray/Buff Cover: 04/06/77

14. Notice of Invitation to Negotiate: _____
15. Minutes of Negotiations: _____
16. Legal Documents

    Project Agreement: _____
    Development Credit/Loan Agreement: 04/29/77

17. Dates of Supervision Reports: _____, _____, 12/06/78, 09/29/80, 08/27/81, 06/11/82
    PCR: 01/18/85

INDD2

THE WORLD BANK/INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

DATE January 18, 1985

TO Mr. Yukinori Watanabe, Director, OED

FROM Isaac Sam, Acting Division Chief, INDD2

EXTENSION 74935

SUBJECT BRAZIL - Sergipe Nitrogen Fertilizer Project (Loan No 1406-BR)
Project Completion Report

1. I am pleased to send you the final version of the Project Completion Report on the above Project (Loan No 1406-BR).

2. In transmitting the report, I would like to state the following:

(i) The report has been cleared by the responsible Assistant Director of the LAC Projects Department and by the relevant Programs Division;

(ii) Comments in the report concerning consultants and/or contractors have been cleared with the Legal Department and would have no legal implications for the Bank; and

(iii) The report has been sent for translation into Portuguese.

Attachment

| | | | |
|---|---|---|---|
| cc: Messrs. | Rajagopalan | Messrs./Mmes. | Dherse (EISVP) |
| | Hittmair | | IND Director |
| | Van der Meer | | IND Division Chiefs/ |
| | Wessels | | Unit Chiefs |
| | Martinusen | | IND Advisors |
| | Gue | | McCarthy (EGY) |
| | Gonzalez-Cofino | | Iskander (EGY) |
| | Lecuona | | Cumming |
| | Thompson | | Venkataraman |
| | Cucullu | | Loos |
| | Barahona | | Krishnamurthy |
| | Collell | | Vedamuthu |
| | Santos | | Goel |

EISIC
LACIC
BB

VKGoel:mg

Miscellaneous/
Side Letters

THE WORLD BANK/INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

(1) Mr. ~~Goel~~ (CP1)
(2) Division BB

**DATE:** May 17, 1985

**TO:** Mr. Roberto Gonzalez Cofino, Chief, LC2BR

**FROM:** Joan B. Vincent, Operations Assistant, LC2BR

**EXTENSION:** 72086

**SUBJECT:** BRAZIL - Loan 1406-BR (Sergipe Fertilizer Project)
Cancellation of Loan Proceeds and Revised
Amortization Schedule

1. In our telex to Nitrofertil dated December 20, 1984, we reminded the Borrower that pending disbursements claims would have to be submitted to the Bank no later than December 31, 1984 and that thereafter, the remaining unused balance, if any, would be cancelled and the Loan Account closed.

2. All claims have been received and final disbursements made for this Loan. The attached letter informs the Borrower that, effective as of January 31, 1985, the unused proceeds of the Loan amounting to US$1,426.16 were cancelled from the Loan. The revised Amortization Schedule attached to the letter reflects the foregoing cancellation.

3. May I have your signature on the attached documents.

clw&cc: Messrs. Lecuona, LC2BR
Cucullu , LEG
Barahona, LOA
Venkataraman, INDD2

cc: Mr. Markham, LOA

JBVincent:cfk

COPY

**The World Bank** / 1818 H Street, N.W., Washington, D.C. 20433, U.S.A. • Telephone: (202) 477-1234 • Cables: INTBAFRAD

May 20, 1985

Exmo. Sr. Diretor Superintendente
Fertilizantes Nitrogenados do Nordeste, S.A.
Rua Edistio Pondeh, 259 Pituba
CEP40000 Salvador, Bahia, Brazil

Re: Loan No. 1406-BR (Sergipe Fertilizer Project)
Cancellation of Loan Proceeds and Revised
Amortization Schedule

Dear Sir:

Please refer to the Loan Assumption Agreement dated January 4, 1982, between the International Bank for Reconstruction and Development (the Bank) and Fertilizantes Nitrogenados do Nordeste - NITROFERTIL (the Borrower).

In accordance with our telex dated December 20, 1984, the Bank hereby informs you that effective January 31, 1985, the unused proceeds of the referenced Loan amounting to US$1,426.16 were cancelled and the Loan Account closed.

Please confirm your agreement with the foregoing cancellation by signing the form of confirmation on the enclosed copy of the revised Amortization Schedule and returning it to us.

Because his signature is also required, a copy of this letter and attachment is being sent to the Minister of Finance as representative of the Guarantor, the Federative Republic of Brazil. Because of their interest in this matter, copies of the letter and revised schedule are being sent to the Morgan Guaranty Trust Company, London, the Secretary of SUBIN, and the Procuradoria Geral da Fazenda Nacional.

Sincerely yours,

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

Roberto Gonzalez Cofino
Acting Director
Country Program II Department
Latin America and Caribbean

Superintendente - NITROFERTIL

May 20, 1985

CONFIRMED:

FEDERATIVE REPUBLIC OF BRAZIL

By _____ Date: _____
Authorized Representative

NITROFERTIL - FERTILIZANTES
NITROGENADOS DO NORDESTE

By _____ Date: _____
Authorized Representative

cc:

Exmo. Sr. Francisco Neves Dornelles
Ministro da Fazenda
Ministerio da Fazenda
Esplanada dos Ministerios
Bloco 5, 5° andar
70048 Brasilia, DF, Brasil

Morgan Guaranty Trust Company
33 Lombard Street
London, England

Exmo. Sr. Embaixador
Gilberto Velloso
Cooperacao Economica e Tecnica Internacional - SUBIN
Esplanada dos Ministerios, Bloco K
Brasilia, DF, Brasil

Dr. Cid Heraclito Queiroz
Procurador Geral da Fazenda Nacional
Ministerio da Fazenda
Esplanada dos Ministerios, Bloco 1
Brasilia, D.F., Brasil

clw&cc: Messrs. Lecuona, LC2BR
Cucullu , LEG
Barahona, LOA
Venkataraman, INDD2

cc: Mr. Markham, LOA

JBVincent:cfk

C O P Y

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

AMORTIZATION SCHEDULE

LOAN NO. 1406 BR

(Sergipe Fertilizer Project)

(Expressed in U.S. dollars)*

| Date Payment Due | Original Schedule 3 | Amount Previously Cancelled | Amount Now Cancelled | Revised Schedule 3 |
|---|---|---|---|---|
| On each June 1 and December 1 | | | | |
| beginning December 1, 1981 through December 1, 1984 | 2,910,000 | 546,000 | - | 2,364,000.00 |
| On June 1, 1985 | 2,910,000 | 546,000 | 1,426.16 | 2,362,573.84 |
| beginning December 1, 1985 through December 1, 1991 | 2,910,000 | 546,000 | - | 2,364,000.00 |
| On June 1, 1992 | 2,890,000 | 534,000 | - | 2,356,000.00 |

* To the extent that any portion of the Loan is repayable in a currency other than dollars (see General Conditions, Section 4.02), the figures in these columns represent dollar equivalents determined as for purposes of withdrawal.

CONFIRMED:

NITROFERTIL - FERTILIZANTES NITROGENADOS DO NORDESTE

By: _____
(Authorized Representative)

Date: _____

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

By: _____
(Authorized Representative)

Date: May 20/85

FEDERATIVE REPUBLIC OF BRAZIL

By: _____
(Authorized Representative)

Date: _____

WORLD BANK / INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

Mr. Loble (0/R
Della / Division Blank Book

TO: Mr. Nicolas Ardito Barletta
(through Mr. E. Lerdau, Director, LC2)

DATE: January 18, 1982

FROM: Dennis Koromzay, Acting Division Chief, LC2

SUBJECT: BRAZIL - Loan No. 1406-BR (Sergipe Fertilizer Project)

As requested in the attached memorandum, dated January 18, 1982, from Mr. Rigo, I would appreciate your signing on behalf of the Bank the attached Agreements relating to the above project. These Agreements relate to the assumption by "NITROFERTIL" of the obligations of our borrower ("PETROFERTIL"), consequent to a reorganization of Brazil's fertilizer sector, previously approved by Mr. Stern. They are entirely of a formal nature.

Attachments

cc: Messrs. Kohli, IPD
Loos, IPD
Rigo, LEG

DKoromzay:nps

FORM NO 27-60R
(11-78)

WORLD BANK OUTGOING MESSAGE FORM (Telegram, Cable, Telex)

IMPORTANT (PLEASE READ INSTRUCTIONS BELOW BEFORE TYPING FORM.)

Loos Division Black Book

Class of Service: TELEX Date: NOVEMBER 19, 1981

Telex No.: Originators Ext: 72086

12 10

START HERE 1

TO PETROFERTIL

CITY/COUNTRY PRACA MAHATMA GANDHI NO. 14, 10 ANDAR

MESSAGE NO 20.000 RIO DE JANEIRO, RJ, BRAZIL

4 ATTENTION MR. LEOPOLDO G. BARCANTE, FINANCIAL MANAGER.

5 RE LOAN 1406-BR AND YOUR TELEX OF NOVEMBER 17, 1981

6 ACKNOWLEDGING OUR RECENT TELEX WHICH CANCELLED US$12.0 MILLION

7 IN LOAN PROCEEDS, EFFECTIVE NOVEMBER 4, 1981. WE ARE PLEASED

8 TO INFORM YOU THAT THE BANK HAS AGREED TO YOUR REQUEST TO

9 REDUCE THE FIRST PRINCIPAL AMORTIZATION DUE ON DECEMBER 1, 1981

10 BASED ON THE CANCELLATION. THEREFORE, THE CANCELLATION WILL

11 BE APPLIED ON A PRORATA BASIS BEGINNING WITH THE DECEMBER 1, 1981

12 PAYMENT PERIOD AS FOLLOWS COLON TOTAL REDUCTION IN FIRST

PRINCIPAL PAYMENT DUE DECEMBER 1, 1981 WILL BE USDOLLARS

14 546,000. CONSEQUENTLY, WITH REFERENCE TO OUR CONTROLLER'S

15 STATEMENT OF OCTOBER 20, 1981, PRINCIPAL PREVIOUSLY DUE BANK

16 USDOLLARS 2,878,548.74 NOW REDUCED TO USDOLLARS 2,332,548.74,

17 AND TOTAL PREVIOUSLY DUE BANK IN USDOLLARS 3,128,087.26 NOW

18 REDUCED TO USDOLLARS 2,582,087.26. REVISED AMORTIZATION SCHEDULE

19 WILL REFLECT THE FOREGOING AND WILL BE FORWARDED TO YOU SHORTLY

20 REGARDS KOROMZAY, ACTING DIVISION CHIEF, INTBAFRAD

21 END OF TEXT

22

NOT TO BE TRANSMITTED

SUBJECT: Loan No. 1406-BR

DRAFTED: BJBVincent:nps

CLEARANCES AND COPY DISTRIBUTION:
C/W&cc: Messrs. Drake/Subramanian, LOA
Rigo, LEG
cc: Messrs. Kohli/Loos, IPD
DeBoeck, CSH
Bararia, CSH
Ms. Augusto, LOA

AUTHORIZED: Dennis Koromzay

DEPARTMENT: LAC II

SECTION BELOW FOR USE OF CABLE SECTION

CHECKED FOR DISPATCH

DISTRIBUTION: WHITE — File Copy WHITE — Transmittal Copy CANARY — Bill Copy BLUE — Originator to Keep

Per: Sean Black Brazil

Mr. Robert F. Skillings, Division Chief, LC2 November 13, 1981

Joan B. Vincent, Operations Assistant, LC2

BRAZIL - Loan 1406-BR (Sergipe Fertilizer Project)
Cancellation

1. Based on the results of a recent evaluation of the investment costs for the Laranjeiras (Sergipe) ammonia and urea plant, PETROFERTIL, the Borrower, conducted a reformulation of the financing scheme. The results of the reformulation indicated that US$12.0 million cannot be utilized for project related expenditures and, therefore, PETROFERTIL has requested (letter dated October 29, 1981 attached) that this amount be cancelled.

2. The Departments concerned agree with this decision. If you concur, please sign the attached cable. I would then submit the following entry to the next Semi-Monthly Report to the Executive Directors:

> "US$64.0 Million (Sergipe Fertilizer) Loan of April 29, 1977 (Ln. 1406): At the request of the Borrower, an amount of US$12.0 million has been cancelled, effective November 4, 1981, since this amount could not be utilized for project-related expenditures. As of October 31, 1981, US$30.7 million remained undisbursed (R81-228)."

Attachments

Cleared with and cc: Messrs. Kohli, IPD
Papadopoulos, LC2
Rigo, LEG
Ms. Augusto, LOA

cc: Messrs. Koromzay, LC2 (o/r)
Loos, IPD (o/r)

JBVincent:nps

FORM NO. 27 - OCR
(11-78)

# WORLD BANK OUTGOING MESSAGE FORM (Telegram, Cable, Telex)

IMPORTANT (PLEASE READ INSTRUCTIONS BELOW BEFORE TYPING FORM.)

Mr. Kohli
Loot
Dinesh Bank Book

Class of Service: TELEX Date: NOVEMBER 13, 1981

Telex No.: Originators Ext: 72086

12 10

START HERE TO: BOOK OF FOUR (SEE ATTACHED TEXT)

CITY/COUNTRY:

MESSAGE NO:

1) DR. PAULO VIEIRA BELOTTI
PRESIDENTE
PETROBRAS FERTILIZANTES S.A. - PETROFERTIL
PRACA MAHATMA GANDHI NO. 14, 10 ANDAR
20.000 RIO DE JANEIRO, RJ, BRAZIL

2) MINISTRO JOSE BOTAFOGO GONCALVES
SECRETARIO
SEPLAN/SUBIN
BRASILIA, DF, BRAZIL

3) DR. CID HERACLITO QUEIROZ
PROCURADOR GERAL DA FAZENDA NACIONAL
MINIFAZ
BRASILIA, DF, BRAZIL

4) MORGAN GUARANTY TRUST COMPANY
33 LOMBARD STREET
LONDON, ENGLAND

END OF TEXT

NOT TO BE TRANSMITTED

| SUBJECT: | DRAFTED BY: |
|---|---|
| CLEARANCES AND COPY DISTRIBUTION: | AUTHORIZED BY (Name and Signature): |
| | DEPARTMENT: |
| | SECTION BELOW FOR USE OF CABLE SECTION |
| | CHECKED FOR DISPATCH |

DISTRIBUTION: WHITE

FORM NO. 27 - OCR
(11-78)

# WORLD BANK OUTGOING MESSAGE FORM (Telegram, Cable, Telex)

IMPORTANT (PLEASE READ INSTRUCTIONS BELOW BEFORE TYPING FORM.)

Class of Service: _____ Date: NOVEMBER 13, 1981

Telex No.: _____ Originators Ext: 72086



12 10

START 1 HERE

TO ADDRESSED PETROBRAS FERTILIZANTES S.A. - PETROFERTIL RIO DE

CITY/COUNTRY JANEIRO FOR DR. PAULO VIEIRA BELOTTI, PRESIDENTE. INFORMATION

MESSAGE NO MORGAN GUARANTY TRUST COMPANY LONDON, SEPLAN/SUBIN BRASILIA

FOR MINISTRO JOSE BOTAFOGO GONCALVES SECRETARIO, AND MINIFAZ

BRASILIA FOR DR. CID HERACLITO QUEIROZ PROCURADOR GERAL DA

FAZENDA NACIONAL. RE LOAN 1406-BR, LOAN AGREEMENT DATED

APRIL 29, 1977, AND PETROFERTIL LETTER NO. DLB-65/81 OF 29

OCTOBER 1981. IN ACCORDANCE WITH PETROFERTIL'S REQUEST,

THE BANK HAS CANCELLED USDOLLARS 12.0 MILLION EFFECTIVE

NOVEMBER 4, 1981. REVISED AMORTIZATION SCHEDULE WILL BE

SENT TO YOU IN DUE COURSE REGARDS SKILLINGS, INTBAFRAD

END OF TEXT

NOT TO BE TRANSMITTED

SUBJECT: Loan No. 1406-BR
(Sergipe Fertilizer Project)

CLEARANCES AND COPY DISTRIBUTION:
C/W&cc: Messrs. Kohli, IPD; Papadopoulos, LC2; Rigo, LEG;
Ms. Augusto, LOA
cc: Messrs. Koromzay, LC2 (o/r)
Loos, IPD (o/r)

JBVincent:nps

AUTHORIZED BY: Robert H. Skillings

DEPARTMENT: LAC II

SECTION BELOW FOR USE OF CABLE SECTION
CHECKED FOR DISPATCH

Program

DIV. FILE

April 18, 1977

BOARD PRESENTATION FOR

THE SERGIPE NITROGEN FERTILIZER PROJECT

The loan before you today represents a continuing effort on the part of the Bank to help Brazil achieve its planned objective of self-sufficiency in fertilizer production. This is the second fertilizer project in Brazil presented to you. A loan of $50 million was approved last May for the Araucaria project which was made also to Petrobras Fertilizantes, the proposed borrower. Documents for another loan in this sector, but to another borrower, have already been circulated to you for consideration next week. When these three projects are all on stream, they will make a significant contribution towards reducing Brazil's dependency on fertilizer imports, stabilizing the supply as well as prices of fertilizers and building up institutions capable of undertaking large expansion projects such as the one before you today.

Brazil is the world's largest producer of coffee and sugar, second largest supplier of soya beans, and ranks among the leading exporters of coffee, sisal, cocoa and orange juice. The Government has set a goal of raising agricultural output to a point permitting Brazil to become one of the world's foremost producers and exporters of foodstuffs. While doing this it also plans to give greater emphasis to raising small-farm productivity especially in the Northeast, the poorest and the least industrialized region in the country. The proposed project will help to attain both goals. It will increase the supply of fertilizer

Bond Issues

Flat or type foreign

Public Bond

Private - IFC

Private Loans - IFC syndicate

IFC equity / IBRD or

Gov. guarantee available

to the agricultural sector by producing 270,000 tons per year of ammonia and 327,000 tons per year of urea which should help to significantly increase agricultural output by using domestically produced fertilizers. Since its main area of consumption would be the Northeast region, its output will increase and assure the availability of fertilizers at stable and predictable prices which should raise small-farm productivity in that poverty-stricken area.

Recognizing that intermediate and capital goods imports place a growing burden on the balance of payments, the Government has given renewed impetus to longer term programs to promote import substitution in these key industries aimed at attaining self-sufficiency in such products as fertilizers, steel, paper and cellulose, chemicals and other non-ferrous metals. The Bank is already supporting the steel and mining sectors where it has made a significant contribution. Our present involvement with the nitrogen project in Araucaria, the present proposed loan and the one coming before you next week will go a long way in making Brazil self-sufficient in fertilizers thereby easing the pressures on its balance of payments. The proposed project alone should save Brazil $65 million annually in net foreign exchange once it goes into production.

Another notable feature of our lending for industry in Brazil has been institution building which in turn has served to generate greater confidence in the international financial community. Increasing interest in providing private foreign financial assistance to Brazil in association with Bank-financed projects is now becoming apparent. In the steel sector we

Kadenga

Fast for reg to Bd
cooperate th Liberia.

Battiery

1) Impt role of growth of fdt use
- of price as reserve to forex
- network of services (interop)
(1) support for price
(2) extension service
- ~~crop~~ more
- know-how

Reynolds

Trust Fund!

Ionin

Cofinancing between Bank/IFC
ROR
IFC focused
Bank Group approach
- other programmes i.
- Donor labor between IFC/Bank.

IFC - 10% 7 ↓
for micro to buy for IFC
would draw IFC the 1st and most
GOB project - IFC standby funds

have assisted the steel companies initiate large expansion programs. Subsequently, the Bank of America acting as agent for different groups of banks made two loans, one of $55 million and another of $50 million to these companies. In the fertilizer sector we have assisted Petrobras in building up the management of Petrobras Fertilizantes while preparing the Araucaria project. Petrobras Fertilizantes' management team has now been consolidated and the firm has recently acquired Brazil's three existing ammonia-based fertilizer plants. It already has responsibility for the country's three new ammonia/urea projects including the one before you today and will no doubt become the country's leading producer of nitrogen fertilizers. The fertilizer sector like the steel sector has also begun to attract foreign private loans particularly through Petrobras Fertilizantes. The Bank of America has reached an advanced stage of negotiations with it for a loan of $25 million to finance the Araucaria project in co-financing arrangements with us. Similar arrangements are expected to be worked out in connection with the financing of the proposed project and for the one to be presented to you next week. I think it is safe to say that the Bank has been an effective catalyst in the flow of international private finance to Brazilian companies.

I think that it is also safe to say that the Bank has made and is continuing to make a significant contribution to assisting Brazil attain its goal of self-sufficiency in fertilizers and reducing the burden on its balance of payments.

1) Lowvia -

para 31.

Price of fuel.

Prod. costs hurt the export

para 29 - 50 small etc

and 31. large scale plants -

the large ones will not survive

WH will hope to 80 plants

+ this plants

2) Al Togar

Self-support / Oppose / project

Cost about import

~~Subsidy~~ local + export = world

well some equity apply to Segya

Tomas need to buy

Elasticity (+ substitutes) cost carried

by local authority 17% charged to

project storage? How realistic

to ROR?

Price - international $170/ton - 1976 $

close current

World could expand capacity

supply weakened - 1980s

IFC middle - equity - Project

will do well -

why not Pralon?

need to put extra cost

Blank Bonds

Mr. E. H. Rotberg, Treasurer

March 17, 1977

Robert F. Skillings, Division Chief, LAC2

BRAZIL - Proposed Loan of US$64.0 Million to Petrobras Fertilizantes S.A.

1. Borrower: Petrobras Fertilizantes S.A.

2. Guarantor: Federative Republic of Brazil.

3. Amount: The equivalent in various currencies of US$64.0 million.

4. Purpose: The Project consists of the construction of an ammonia plant at Laranjeiras, Sergipe, with a manufacturing capacity of about 907 metric tons per day and a urea plant with a manufacturing capacity of about 1100 metric tons per day, and all related ancillary facilities. It also includes facilities for the storage and transportation of ammonia and for the bagging, storage and transportation of urea.

5. Disbursements:

| Calendar Year | US$ Million |
|---|---|
| 1977 | 3.7 |
| 1978 | 25.3 |
| 1979 | 26.0 |
| 1980 | 9.0 |

6. Source of Supply: For goods to be financed under the proposed loan, procurement would follow Bank Guidelines. The proceeds of the Bank loan would finance expenditures for: (a) equipment and materials procured through international competitive bidding (US$29.9 million), (b) imported critical and highly specialized items with restricted bidders' lists (US$13.0 million), (c) imported items and packages costing less than US$100,000 each procured through international shopping (US$12.0 million), and (d) foreign engineering and advisory services (US$9.1 million).

7. Interest Rate: Standard.

8. Maturity: Amortization Schedule attached.

9. Date of Executive Directors' Consideration: Probably April 26, 1977. Subject to confirmation.

Attachment

cc: European Office (Attention: Mr. Carriero)
Tokyo Office (Attention: Mr. Maede)

cc: Messrs. Dewey, NDP
Brown, NDP
Cabezas, LEG
Carpio, NDP
Mole, CTR

KKwaku:glw

SCHEDULE 3

Amortization Schedule

| Date Payment Due | Payment of Principal (expressed in dollars)* |
|---|---|
| On each June 1 and December 1 beginning December 1, 1981 through December 1, 1991 | 2,910,000 |
| On June 1, 1992 | 2,890,000 |

---

* To the extent that any portion of the Loan is repayable in a currency other than dollars (see General Conditions, Section 4.02), the figures in this column represent dollar equivalents determined as for purposes of withdrawal.

# OFFICE MEMORANDUM

Blank Books

TO: Files

DATE: February 18, 1977

FROM: N. C. Hughes, Loan Officer, LAC II

SUBJECT: BRAZIL - Proposed Sergipe Fertilizer Project
Loan Committee Comments

1. Mr. Baum has requested that during negotiations the Bank should seek to receive from the Government an explicit statement regarding the Government's overall fertilizer pricing policy, and that such policy should be consistent with sound sectoral and economic objectives.

2. Mr. Baum also had the following comments to make about the President's Report:

(i) mention should be made of the status of the first Fertilizer Project (Araucaria), in order to keep the Executive Directors informed of the project's progress;

(ii) mention should also be made of the Borrower's pricing policy;

(iii) in regard to reserved procurement, it was important to mention its effect not only on total project cost, but on total equipment cost as well; and

(iv) footnote (b) on page 19, which refers to the indirect exchange portion of the foreign exchange costs of the project, was unnecessary and should be deleted.

cc: Messrs. Baum, CPSVP
Wiese, LC2
Fuchs, NDP
Dewey, NDP
Petry, NDP
Skillings, LC2
Mirza, LC2

NCHughes:glw

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

Blank Book (Seigre)

TO: Files

DATE: February 10, 1977

FROM: Neil C. Hughes, Loan Officer, LC2

SUBJECT: BRAZIL - Fertilizer Project
Loan Committee Review

1. The Loan Committee today approved the loan documents relating to the proposed loan of US$64 million to Petrobras Fertilizantes S.A. for a Fertilizer Project, subject to the change noted below. Accordingly, the Executive Directors are being informed of the Bank's intention to invite Petrobras Fertilizantes S.A., Petroleo Brasileiro S.A. and the Federative Republic of Brazil to send representatives to negotiate the proposed loan.

2. Mr. Baum suggested that during negotiations an understanding should be reached with the Government regarding its policies with respect to prices of farm products and of major farm inputs such as fertilizer, so that increased agricultural production would be fostered, as well as the use of fertilizer and other inputs necessary to achieve such an increase in output.

cc: Mr. J. Burke Knapp (3)
Mr. I.P.M. Cargill (2)
Mr. W. E. Baum (3)
Mr. A. Broches (2)

cc: Messrs. Krieger (o/r)
Fuchs, NDP
van der Meer, LCP
van der Tak, CPS
Wiese, LC2
Holsen, LCNVP
Glaessner, LCP
Cancio, LEG
Dewey, NDP
Skillings, LC2
Earwaker, LC2
Petry, NDP
Çabezas, LEG
Mole, CTR

NCHughes:glw

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

TO: Mr. S. M. L. van der Meer
Acting Regional Vice President, LAC

DATE: February 1, 1977

FROM: Gunter K. Wiese, Director, LAC II

SUBJECT: BRAZIL - Green Cover Documents for Proposed Sergipe Fertilizer Project

M. Are the Green Cover docs in the Black Book - with a copy of this memo?

1. I attach for your approval the following documents relating to the proposed loan of US$64 million to Petrobras Fertilizantes S.A. for the Sergipe Fertilizer Project:

a) the advance green cover draft of the President's Report;

b) the advance green cover draft of the Appraisal Report (the Main Report);

c) the yellow cover Appraisal Report;

d) the draft Loan, Guarantee and Shareholder Agreements;

e) a draft memorandum from you to the Loan Committee.

2. For ease of reading, the Appraisal Report (Main Report) has been re-issued in green cover. However, the yellow cover report is also included for reference to the annexes, which will be up-dated only for the grey cover.

3. I should like to call your attention to the following matters:

Project Objectives

4. The project would be the second Bank loan to Petrobras Fertilizantes S.A. (FERTILIZANTES) for a nitrogen fertilizer project in Brazil. It would increase Brazil's nitrogen fertilizer production by about one-fourth and would significantly contribute to Brazil's goal of becoming self-sufficient in fertilizers. Since agricultural growth in Brazil will have to depend to an increasing extent on raising productivity of areas presently under cultivation, the use of fertilizer is becoming increasingly important in achieving the Government's growth targets for agriculture.

The Proposed Loan

5. The proposed loan of US$64 million would cover 64% of total foreign exchange costs of about US$101 million, and 22% of total project financing requirements estimated at US$288 million. US$55 million of the loan would be disbursed for equipment and materials and US$9 million for foreign engineering services. Co-financing arrangements with private foreign lenders would provide part of the remaining foreign exchange requirements, including interest during construction. The local currency needs of the project would be met by new share capital from Petroleo Brasileiro S.A. (PETROBRAS), FERTILIZANTES' parent company, and by a BNDE loan.

Procurement

6. Equipment and materials amounting to US$55 million (including freight and insurance) would be purchased in accordance with the Bank's procurement guidelines. Brazilian suppliers are estimated to win about one-quarter of this amount. In addition, equipment estimated to cost US$73 million equivalent would be reserved for procurement from Brazilian manufacturers, subject to the Bank's being satisfied regarding the technical feasibility of local manufacture. Reserving this equipment for Brazilian suppliers is expected to increase the total cost of the project by about 5% above what it would be if all equipment suitable for international competitive bidding were procured on that basis.

Retroactive Financing

7. It is expected that prior to the signing of the loan, advance contracting will amount to US$9.1 million for foreign engineering services. The Bank would be asked to finance retroactively an amount not exceeding US$1.5 million for such services. No advance contracting or retroactive financing of equipment and materials is proposed.

Raw Materials and Utilities

8. In order to ensure that a sufficient continuous supply of natural gas will be available for operation of the project PETROBRAS would be required to dedicate a minimum of 3.1 billion $NM^3$ of gas from its reserves for the exclusive use of the project, sufficient for 15 years operation at full capacity. Satisfactory arrangements for the supply of other raw materials (vacuum gas, and Bunker C fuel oil) and for the construction of water and electricity supply facilities will be conditions of loan effectiveness.

Grace Period and Final Maturity

9. The loan would have a maturity of 15 years, and a grace period of 4 years. The length of the grace period (6 months longer than standard for a country with Brazil's per capita income) is justified by the long construction time for the project, and would be counterbalanced by a 3-year maturity for the proposed loan of US$82 million for a phosphate fertilizer project which is also scheduled for the present fiscal year.

Economic Situation

10. The economic section of the President's Report (paras. 2 to 11) is identical to that used in the President's Report dated December 29, 1976, on the Minas Gerais Integrated Rural Development Project. An up-to-date Economic Memorandum on Brazil will be circulated to the Executive Directors in the next few days.

Attachments

Cleared with and cc: Messrs. Perram, Acting Division Chief, NDP
Petry, NDP
Cabezas, LEG
Dambski, CTR

cc: Messrs. Krieger (o/r)
van der Tak,CPS (3)
Fuchs, NDP
Rotberg, TRE
Holsen, LAC
Cancio, LEG
Glaessner, LCP
Skillings, LC2
Greene, LC2
Ms. Guerard, LC2

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

Mr Dewey P1050
Black Books

# OFFICE MEMORANDUM

TO: Files

DATE: December 17, 1976

FROM: Humayun Mirza, Loan Officer, LAC II

SUBJECT: BRAZIL - Sergipe Fertilizer Project

1. Mr. Knapp called a meeting on December 9 to discuss the procurement issue of the above project. Those present at the meeting were Messrs. Krieger, Wiese, van der Meer, Glaessner and Mirza, from the LAC Region and Messrs. Baum, (CPS) and Fuchs and Dewey from Industrial Projects.

2. This issue had been posed in Mr. Fuchs' memorandum to Mr. Wiese dated December 1, 1976, which was sent to Mr. Knapp for consideration by Mr. Wiese under cover of his memorandum of December 2, supplemented by his memorandum, also to Mr. Knapp, of December 7, 1976.

Reserve List

3. The discussion centered around whether we should continue to accept large percentages of equipment value being reserved for domestic procurement when making Bank loans to Brazil. The arguments against our accepting large Brazilian reserve procurement were that by so doing we would not be helping Brazilian industry as this would encourage inefficiencies in the industry and put pressure on the balance of payments. The arguments in favor of accepting the present Brazilian proposal to reserve 60% of the total equipment value for Brazilian procurement for this project turned on the support that Brazilian industry needed to generate profits so as to expand capacity and reduce employment and on the present difficult position of the Brazilian balance of payments. It was argued that presently the Brazilian Government is subsidizing fertilizers and it is therefore difficult politically for the Brazilian Government to oppose pressures from the Brazilian capital goods industry, furnishing machinery for the fertilizer industry, for some support.

4. Mr. Knapp felt that we should not attempt in this instance to intervene in what the Brazilians feel is right for their industrial development. Since the increase in the total cost of the project by accepting the reserve list of 60% of the total equipment value is estimated to be less than 8%, he felt that we should accept the Brazilian position on this project. It was of course understood that the goods on the reserve list would have to be acceptable from the technical and delivery standpoints.

5. Mr. Knapp also confirmed that he does not think it advisable to negotiate a percentage with the Brazilian Government in regard to the differential between international and domestic procurement below which reserved procurement would be acceptable to us. (See Mr. Wiese's memorandum to Mr. Knapp of December 7.) The policy decision, therefore, for industrial projects in Brazil rests on our getting a clear statement regarding the extent to which the Brazilians propose to reserve equipment for domestic procurement on a particular project and then determining whether we can live with it. In

doing this we should ensure that the increase in the total cost of the project would not exceed 10%. The matter would, therefore, be considered on a case-by-case basis using this ruling as a guide.

Railway Cars

6. The meeting felt that this issue had probably resolved itself with the most recent position of the Brazilian Government, namely, that the amount of the reserve list would be reduced from 75% to the present 60% of the total equipment value since there will be some items that would now have to come out of the reserve list and which would no doubt also end up with Brazilian suppliers, it was felt that it was not necessary to single out the railway cars for exclusion.

Financing of Local Consultants

7. Mr. Knapp asked why we were proposing to finance the cost of local consultants in this project, amounting to about $3.8 million. He was told that this was justified in the light of our trying to develop the local consultants' industry and that in the previous project we had also financed the cost of local consultants. From a technical viewpoint, the consultants were acceptable particularly since they would be supervised by foreign engineering firms. We had assumed that the Bank's objective was to build up the local consulting industry and this was being recommended in pursuance of Bank policy. Mr. Knapp accepted this position at the meeting, but subsequently asked that this item be deleted from the loan except insofar as it had a foreign exchange component.

Co-Financing

8. Mr. Knapp wanted to know whether the securing by Petrobras Fertilizantes of US$20 million, which we hoped would come from commercial banks, was a condition of our loan. He was informed that while we are pressing the Borrower to obtain private foreign commercial loans in this amount we are not making this a condition of our lending. He accepted this position.

Interest During Construction

9. Mr. Knapp asked why we were not proposing to include interest during construction in our loan. He was informed that since Petrobras Fertilizantes is a going concern we felt that it should be able to finance interest during construction out of its own resources. We would only propose financing interest during construction in Brazil when we are dealing with a new borrower whose financial situation warrants its inclusion. Mr. Knapp accepted this explanation.

Amount of Proposed Bank Loan

10. After the decisions reported above had been made Mr. Knapp asked what would be their effect on the amount of the Bank loan. The meeting did not have access to detailed figures on the project but a notional amount of $65 million was mentioned. Mr. Knapp felt that this would be acceptable.

However, additional calculations made subsequent to the meeting indicate that, if a 40% share of total equipment is submitted to ICB, a Bank loan of about $70 million at present seems justified (see table attached). Such a loan would be $34 million less than the total foreign exchange cost of the project (including $19 million of foreign exchange component of the reserved list). The gap of $34 million would be financed by proposed foreign private bank loans ($25 million) and domestic funds. The Bank loan would be disbursed against (a) the full costs of foreign consultants, and (b) the total cost of contracts awarded after international competitive bidding.

Attachment

Cleared with and cc: Mr. Knapp

cc: Mr. Krieger
Mr. Wiese, LAC II
Mr. van der Meer, LACP
Mr. Skillings, LAC II
Mr. Baum
Mr. Fuchs, NDP
Mr. Dewey, NDP
Mr. Carpio, NDP
Mr. Petry, NDP
Mr. Cabezas, LEG

HMirza:glw

BRAZIL - SERGIPE FERTILIZER PROJECT

| | | (US$ Million) |
|---|---|---|
| A. | Total Financing Required | 277 |
| | of this: in foreign currency | 104 |
| | in local currency | 173 |
| B. | Total Foreign Currency Required | 104 |
| | of this: direct foreign exchange | 76 |
| | indirect foreign exchange | 28 |
| C. | Estimated Indirect Foreign Exchange Content of Equipment and Materials Reserved for Local Procurement | 19 |
| | Foreign Currency Requirements Excluding Indirect Foreign Exchange of Reserved Procurement | 85 |
| D. | Total Equipment and Materials (FOB) | 126 |
| | of this: reserved for local procurement (60%) | 75 |
| | procured through ICB (40%) | 51 |
| | of this: Brazilians are expected to win | 10 |
| | foreign suppliers are expected to win | 41 |
| E. | Items Eligible for Bank Financing 1/ | |
| | Equipment and Materials Procured through ICB (FOB) | 51 |
| | Freight and Insurance | 9 |
| | Erection (Vendors' Services) | 2 |
| | Foreign Engineering Services | 8 |
| | | 70 |

1/ The foreign exchange component of local engineering services is negligible. It is therefore not included here.

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

TO: Mr. Chauncey F. Dewey, Division Chief, NDP DATE: January 7, 1977

FROM: Robert F. Skillings, Division Chief, LAC II

SUBJECT: BRAZIL - Sergipe Fertilizer Project

Mr. Petry was good enough to seek our comments on the memo which you are sending to Mr. van der Meer transmitting the yellow cover Appraisal Report for the Sergipe Fertilizer Project. We suggested that the memo record the fact that the Programs Department does not believe the Bank will accept financing of local engineering services. We suggested to Mr. Petry that our position be recorded in your memo but he thought it would be better that we write a separate note to you. That is the purpose of the present memo.

cc: Messrs. Fuchs, NDP
van der Meer, LACP
Wiese, LAC II

WORLD BANK / INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

TO: Files

FROM: N. Petry P. Industrial Projects Department

DATE: November 23,1976

Black Book

SUBJECT: BRAZIL: Sergipe Fertilizer Project

For the discussions with the Brazilian representatives from Petrobras Fertilizantes (FERTILIZANTES) I did some calculations which should be useful for understanding the implications of the procurement problem we are presently faced with in this project. The calculations offered below are for two positions that can be taken on the procurement of machinery and equipment valued at about US$120 million required for this project. The two positions are:

I. All items suitable for ICB are to be procured under Bank procurement guidelines, the remainder is to be reserved for domestic suppliers. Our estimate is that about US$75 million would be suitable to be put out to ICB leaving about US$45 million reserved for local industry.

II. All items that can be produced in Brazil are to be put on a reserve list leaving only those items that have to be imported for international procurement. FERTILIZANTES estimates that about 75% of the equipment or machinery could be produced locally which would mean a reserve list of US$90 million and imports of US$30 million. FERTILIZANTES indicated that it might be possible to transfer US$8 million for railway cars from the reserve list to ICB which would result in US$82 million reserved for domestic procurement, US$8 million to be procured under ICB and probably won by Brazilians, and US$30 million to be procured under ICB without any Brazilian participation.

These two positions are analyzed below with respect to their effect on:

A. The amount of the proposed Bank loan;

B. The cost of the project;

C. Effect on the balance of payments;

D. The composition of the proposed Bank loan

## A. The Amount of the Proposed Bank Loan

Taking Position I, the following Bank loan amount can be derived:

| | (US$ million) |
|---|---|
| Total Value of Equipment | 120.0 |
| Of this suitable for ICB | 75.0 |
| Less Proposed Bilateral Financing | 25.0 |
| Leaves equipment financing for Bank | 50.0 |
| plus engineering services eligible for Bank financing | 13.0 |
| Amount of Bank Loan | 63.0 |

Under Position II the Bank loan amount could be:

| | |
|---|---|
| Total value of equipment | 120.0 |
| Of this submitted to ICB | 38.0 |
| Less proposed bilateral financing | 15.0 |
| Leaves equipment financing for Bank | 23.0 |
| plus engineering services eligible for Bank financing | 13.0 |
| Amount of Bank Loan | 36.0 |

B. The Cost of the Project

The difference between Positions I and II which affects the cost of the project is the higher proportion of equipment on the reserve list which is estimated to cost 25-40% more than equipment procured under ICB. The additional cost to the project can therefore be assessed as follows:

| | (US$ million) |
|---|---|
| Value of equipment on reserve list | |
| Position I | 45.0 |
| Position II | 82.0 |
| Difference | 37.0 |
| Additional cost assuming: | |
| 25% higher costs | 9.3 |
| 40% higher costs | 14.8 |

Compared to an estimated total financing required of US$265 million this would mean a project cost increase of 3-6%.

C. The Effect on the Balance of Payments

The total foreign exchange cost resulting from taking Position I can be estimated as follows:

| | | (US$ million) |
|---|---|---|
| (a) | Value of equipment | 120.0 |
| | procured through ICB | 75.0 |
| | won by offshore suppliers | 48.5 |
| | won by Brazilian suppliers | 26.5 |
| | Procured through reserve list: | 45.0 |
| (b) | Direct foreign exchange cost | 48.5 |
| | Indirect foreign exchange cost assuming 25% as the indirect foreign exchange cost component (45.0 + 26.5) x 0.25 | 17.8 |
| | Total foreign exchange for equipment | 66.3 |
| | Plus foreign engineering services | 9.0 |
| | Total Foreign Exchange Cost | 75.3 |

The above assumes that of the US$75 million, US$30 million would be procured under ICB with no Brazilian participation, US$8 million for the railcars would be under ICB and won by Brazilians and a further US$37 million would be under ICB assuming that half would be won by Brazilian and the other half by foreign suppliers.

The foreign exchange financing under Position I (excluding untied cofinancing) would total US$88 million. The net gain on the balance of payments would therefore be the difference between the foreign exchange financing and the foreign exchange cost or US$12.7 million.

For Position II, the total foreign exchange cost would be:

| | | (US$ million) |
|---|---|---|
| (a) | Value of equipment | 120.0 |
| | procured through ICB | 38.0 |
| | procured through reserve list | 82.0 |
| (b) | Direct foreign exchange cost | 30.0 |
| | Indirect foreign exchange cost (82.0 + 8.0) x 0.25 | 22.5 |
| | Total foreign exchange cost for equipment | 52.5 |
| | Add for engineering services | 9.0 |
| | Total foreign exchange cost | 61.5 |

This foreign exchange cost compares to an amount of foreign exchange financing of US$51 million. The drain on the balance of payments would therefore be about US$10.5 million.

Comparing the two positions, US$12.7 million could be gained under Position I while US$10.5 would be an additional burden to the balance of payments under Position II. A difference of US$23.2 million.

D. Composition of the Bank Loan

The allocation of the Bank loan under Position I would be:

| | (US$ million) |
|---|---|
| Equipment | 50.0 |
| Engineering Services | 13.0 |
| | 63.0 |

Of this about US$37 million would be to cover foreign exchange costs and US$26 million would be for local costs.

Under Position II the allocation of the Bank loan would be:

| | (US$ million) |
|---|---|
| Equipment | 23.0 |
| Engineering Services | 13.0 |
| | 36.0 |

Of this US$32 million would be to cover foreign exchange costs while US$4 million would be for financing a portion of the local engineering costs.

NPetry:mmcm

cc: Messrs. Fuchs, Dewey, Perram, Carpio, Brown, Evans, Loos
Venkataraman, Skilings, Mirza

INTERNATIONAL DEVELOPMENT ASSOCIATION | INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT | INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

TO: Files

DATE: September 3, 1976

FROM: Eldon E. Senner, Acting Division Chief, LAC II

SUBJECT: BRAZIL - Sergipe Fertilizer Project

Mr. Horsley called me on August 31 and informed me that the Acting Senior Vice President, Operations, was in agreement with the conclusions of the Decision Memorandum of August 24, 1976, on the above project and that after the proposed discussions with the Government and the company on the several outstanding issues, a supplemental Issues Paper/Decision Memorandum should be issued.

cc: Messrs: Krieger
Horsley
van der Meer, LACP
Wiese, LAC II
Fuchs, NDP
Glaessner
√Dewey
Renger
Skillings, o/r
Mirza o/r
Petry

UAguirre:ur

D1050

Supervision
Report

WORLD BANK / INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

TO: Mr. Edilberto Segura, Acting Division Chief, IPDD2 DATE: June 11, 1982

FROM: K. M. Loos and S. Venkataraman

SUBJECT: BRAZIL: Sergipe Fertilizer Project (Loan 1406-BR)
Araucaria Fertilizer Project (Loan 1256-BR)
Supervision Reports

In accordance with the terms of reference dated May 6, 1982, we visited Brazil from May 9 through May 28, 1982 to carry out the supervision of the above-captioned projects. The full supervision reports based on the findings of the mission are attached.

Attachments

cc: Messrs. Lerdau (E923)
Rajagopalan (5) (E1028)
van der Meer (A813)
Glaessner (A807)
Goffin (A813)
Renger (B802)
van der Heijden (E928)
Ms. Augusto (I-5-156)
Barker (D1125)
Israel (E1045)
Koromzay (E928)
Lee (D1009)
Santos (N643)
Vincent (E952)

Messrs. Fuchs
Dewey
Tolbert
Cash
Jaffe
Perram
Sheldrick
Ms. Haug
Iskander
Kohli
Rowat
Saunders

IPIC
LACIC

KMLoos;wab

WORLD BANK / INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

TO: Mr. Edilberto Segura, Acting Division Chief, IPDD2 DATE: June 11, 1982

FROM: K. M. Loos and S. Venkataraman

SUBJECT: BRAZIL: Sergipe Fertilizer Project (Loan 1406-BR)
Aracauria Fertilizer Project (Loan 1256-BR)
Supervision Reports

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Ms. Haug
Iskander
Kohli
Rowat
Saunders

IPIC
LACIC

KMLoos;wab

FORM NO. 590
(1-79)

# THE WORLD BANK
## IBRD AND IDA – SUPERVISION SUMMARY

*For detailed instructions on completion of this form, please see Attachment A to the Annex of OMS 3.50.*

THIS FORM IS A STOCKROOM ITEM.

This summary is
- [ ] the initial summary
- [x] part of a mission report
- [ ] an annual update

| Regional Office: | Project Name: | Project Code: | Loan / Credit No.: | L/C Amount ($xx.xm): |
|---|---|---|---|---|
| LAC | SERGIPE FERTILIZER PROJECT | 6BRAIC02 | Loan [x] Credit [ ] 1406-BR | 64.0 |

| Country: | Borrower/Beneficiary: | Board Date: | Signing Date: | Effective Date: |
|---|---|---|---|---|
| Brazil | PETROBRAS Fertilizantes S.A. | 04/19/77 | 04/29/77 | 08/15/77 |

| Projects Dept./Div. Name: | Org. Code No.: | Projects Officer: | Loan Officer: |
|---|---|---|---|
| IPD/Division II | 305-20 | K. Loos | D. Koromzay |

**SECTION 1: SUMMARY PROJECT DESCRIPTION**

The project is a grass-roots ammonia/urea plant to be built at Laranjeiras (Sergipe) and consisting of a 907 tpd ammonia unit based on natural gas, a 1,100 tpd urea unit, and all supporting facilities.

**SECTION 2: PERFORMANCE RATING**

| | This Summary | Last Summary |
|---|---|---|
| STATUS: 1 - Problem-free or Minor Problems; 2 - Moderate Problems; 3 - Major Problems | 1 | 1 |
| TREND: 1 - Improving; 2 - Stationary; 3 - Deteriorating | 2 | 2 |
| TYPES OF PROBLEMS: F - Financial; M - Managerial; T - Technical; P - Political; O - Other *(Explain in Section 6.)* If more than one type of problem, enter most critical factor first. | - | - |
| IMPLEMENTATION STATUS: 1 - Problem-free or Minor Problems; 2 - Moderate Problems; 3 - Major Problems | | |
| Disbursements | 1 | 1 |
| Estimated Cost | 1 | 1 |
| Anticipated Completion | 2 | 2 |
| Compliance with Loan Conditions | 1 | 1 |
| Project Finances | 1 | 1 |
| Management Performance | 1 | 1 |
| Procurement Progress | 1 | 2 |
| Performance of Consultants | 1 | 1 |
| Reporting | 1 | 1 |
| DEVELOPMENT IMPACT: 1 - Problem-free or Minor Problems; 2 - Moderate Problems; 3 - Major Problems | | |
| Expected Benefits | 1 | 1 |
| Rate of Return | 1 | 1 |
| Institution-Building | 1 | 1 |

**SECTION 3: PROJECT DATA**

| Estimated/Actual: | Project Completion (Mo./Yr.) 1/ | Loan/Credit Closing (Mo./Day/Yr.) | Total Project Cost ($xx.xm) 3/ | of which: Foreign Currency ($xx.xm) 4/ | of which: Local Currency ($xx.xm) | Cumulative Disbursements through most recent Quarter ended (03/30/82) ($xx.xm) |
|---|---|---|---|---|---|---|
| Appraisal Est. | 01 81 | 11 30 81 | 243.1 | 52.8 | 190.3 | 64.0 (Est.) |
| Last Summary (08/27/81) | 07,82 | 05 31 82 | 206.9 | 35.6 | 171.3 | |
| Current | 08,82 | 05 31 82 2/ | 206.9 6/ | 35.6 | 171.3 | 40.3 (Actual) 5/ |

**SECTION 4: MISSION SCHEDULE**

| | No. of Staff on Mission | No. of Days in Country | Return to HQ (Mo./Day/Yr.) | Final Report Date (Mo./Day/Yr.) |
|---|---|---|---|---|
| Latest/Present Mission | 2 | 5 | 06 01 82 | 06 11 82 (FS) * |
| Previous Mission | 2 | 4 | 08 17 81 | 08 27 81 (FS) * |

Next Mission Departure (Mo./Yr.) 10 82

Recommended interval between missions (Months) 5

End of period covered by latest progress report (Mo./Day/Yr.) 04 30 82

* *Type of Report: FS = Full Supervision; CS = Combined Full/B-T-O; C = Completion; A = Appraisal; O = Other (explain below)*

| Names of Mission Members | Mission Members' Specializations |
|---|---|
| K. Loos | Financial Analyst |
| S. Venkataraman | Chemical Engineer |

Number of members on both present and previous mission:
- None [ ]
- One [ ]
- Two or More [x]

SECTION 5: COMMENTS *(Explain "Other" in Section 2 and clarify, if necessary, data in Sections 3 and 4.)*

1/ Mechanical completion date.
2/ NITROFERTIL expects to complete disbursement by end August 1982.
3/ Installed costs excluding interest during construction and working capital.
4/ Only direct foreign exchange.
5/ On June 7, 1981, disbursement amounted to US$41.2 million. In January 1982 PETROFERTIL had requested the Bank to cancel US$12 million.
6/ Retained same as estimated by last mission for reasons stated in para.I below.

SECTION 6: SUMMARY OF PROJECT STATUS, TREND AND MAJOR PROBLEMS

I. PHYSICAL EXECUTION OF PROJECT

General. The overall progress of the project was 97.8% (by end April 1982) with ammonia plant 98.0% complete and the urea plant 93.0% complete. The infrastructure required to test and commission the Sergipe facilities have all been completed and commissioned. To minimize the impact of construction delays on project completion, the construction is being phased so that testing and commissioning can be simultaneously carried out. Ammonia and urea production is expected by October 1982.

Status of Construction. The ammonia plant construction has been mostly completed except for some painting and insulation scheduled for completion in June 1982. The only equipment yet to be erected is the heat exchanger on top of the ammonia converter which was damaged during erection and has been sent to the manufacturer's shops for repairs. Its erection is expected to be completed in June 1982. In the case of the urea plant, except for some testing of piping systems and instruments, painting and insulation, the mechanical erection is complete. Many equipment items have also been tested. Except for some work in urea handling and storage the erection of offsites and utilities have been completed.

Status of Commissioning. All the catalysts other than the ammonia synthesis catalyst have been loaded. The boiler feed water and the high pressure steam system have been flushed and chemically cleaned. The reformer burners were lit on May 1, 1982 for refractory dry out. The compressors have been tested. The water treatment plant and cooling water system have been in operation. The offsite boilers have been fired with natural gas and are supplying steam for testing and commissioning. The laboratory and maintenance facilities are already in service.

Personnel. Of the total of 452 persons required for operation, 375 are in position. Most of them have been provided training. Experienced persons have been transferred from the Camacari plant. The rest of the staff will be hired before August 1982. Mr. Alfredo Cavalcanti Goncalves, who has been the Construction Manager of the project, has been designated the General Manager. He and Mr. Jose Eduardo Barretto the Production Manager are responsible for commissioning and operation of the Sergipe facilities.

Status of Related Facilities. The gas pipeline has been completed and commissioned and is now supplying gas to the project. The water pipeline from S. Francisco has been commissioned and is providing water. The 230 KV transmission line, already completed provides power from the Jardim substation. The rail system has been completed and 41 ammonia rail cars have been received. The PETROBRAS tank farms and distribution pipelines have been completed. 30 kms of underground and 4 kms of undersea effluent disposal pipeline has been completed. Sea water contamination will be controlled using radio isotopes and monitored by a Brazilian environmental control authority (CETESB). NITROFERTIL is planting

60 thousand trees around the plant site to improve the environment.

Capital Cost. NITROFERTIL's revised project cost estimate expressed in US dollars does not reflect the proper exchange rates at the time of incurred payments, and subsequently does not provide the true cost of the Project. The mission will advise NITROFERTIL's management on an appropriate methodology for calculating project costs which will allow a meaningful comparison with the appraisal estimate.

## II. OPERATION AND FINANCIAL PERFORMANCE OF NITROFERTIL

Nitrofertil's operating performance continued to be satisfactory in 1981/82. The average capacity utilization of both ammonia/urea complexes at Camacari stabilized at about 85% as can be seen from the table below:

NITROFERTIL - Operating Performance

| Year | Production in 1000 tons | | Capacity Utilization in % | |
|---|---|---|---|---|
| | Ammonia | Urea | Ammonia | Urea |
| 1979 | 221 | 150 | 61 | 43 |
| 1980 | 309 | 273 | 85 | 79 |
| 1981 | 308 | 292 | 86 | 83 |
| 1982 a/ | 318 | 302 | 88 | 86 |
| Sergipe | | | | |
| 1982 b/ | 37 | 45 | 50 | 50 |

a/ Estimated
b/ Assuming 50% stream factor from October through December 1982

In 1981 urea comsumption in Brazil dropped by about 30% as a result of a general slack in fertilizer demand caused by abnormal weather conditions, lower operating margins for farmers, and the introduction of interest charges of 45% p.a. for agricultural credit. In comparison NITROFERTIL's sales volume declined by only 10% as urea imports were more drastically cut back, approximately 50% from previous year level. However, in spite of the relative good sales performance NITROFERTIL could not avoid a substantial - and therefore costly - inventory build-up of urea (almost 3 months of average sales as of December 1981). The increase of inventory is largely due to the government's policy favoring maximum fertilizer production in public sector companies irrespective of immediate demand requirements. NITROFERTIL under the circumstances had to export a total of about 15,000 tons of ammonia to Belgium and Portugal at cash costs although Brazil is still a net importer of ammonia.

Even though NITROFERTIL does not expect a noticeable fertilizer market recovery as a whole, it is reasonably optimistic of achieving its sales targets of about 400,000 tons of urea and 150,000 tons of ammonia, thus not only marketing additional production from the Sergipe Project but also reducing inventories to more normal levels. An increase in sales volume of about 60% can be achieved only by import substitution in large scale provided domestic fertilizers are competitive with CIF prices of imports. Due to the

depressed international urea market, present CIF prices cover only NITROFERTIL's cash costs. Consequently NITROFERTIL management forecasts a substantial operating loss for FY 1982. That NITROFERTIL is still able to project a positive net income is primarily the result of a sizeable monetary correction in connection with the revaluation of fixed assets of the Sergipe Project. The insufficient internal cash generation capability has a serious impact on the company's ability to service its debt (debt service coverage ratio is estimated between 0.5 and 0.7). For this reason NITROFERTIL will continue to depend on its shareholders (mainly PETROBRAS) to consolidate short-term loans and to supply new equity funds (partly by conversion of long term debt into capital).

Under the present government's policy, i.e. maximizing fertilizer production and matching domestic fertilizer prices with CIF import costs, the company's precarious situation could last until either international price levels rise again to reflect more representative operating costs or the cost of inputs (primarily natural gas and utilities provided by PETROBRAS and COPENE respectively) are reduced. The mission was told that PETROBRAS is reviewing its pricing policy for NITROFERTIL inputs to reflect more adequately the Government's fertilizer pricing policy and to ensure NITROFERTIL's financial viability in the long term.

## III. MARKETING AND DISTRIBUTION

In 1982 NITROFERTIL plans to "export" about 50% (80,000 tons) and 60% (250,000 tons) of its ammonia and urea production respectively, from the north eastern region to the central/south region. However in 1983 it will be more difficult to place such large quantities of ammonia/urea in the central/south region with the Araucaria Project operating on full stream.

The fertilizer industry estimates that urea consumption in 1982 will not noticeably increase over previous year's level. Current projections for 1983 show a recovery of urea demand to the 1980 level of about 850,000 tons or an increase of about 40%. Under Brazil's present pricing and credit policies such a substantial increase in demand of urea appears highly optimistic. However, if achieved, the 1983 demand can be met fully from domestic production which would more than double with both Sergipe and Araucaria Projects fully operational by end 1982, as can be seen from the table below:

Brazil - Urea Production/Demand Projections
(in 1000 tons)

| Year | Production | Imports | Demand |
|---|---|---|---|
| 1980 a/ | 273 | 579 | 852 |
| 1981 a/ | 292 | 303 | 595 |
| 1982 | 500 | 100 | 600 |
| 1983 | 865 | 10 | 875 |
| 1984 | 1030 | (10) | 1020 |

a/ Actual

The above table indicates that in the best case Brazil will be approximately self-sufficient from 1983 onward. However, if the demand increase of 45% and 17% projected for 1983 and 1984, respectively, should not materialize, Brazil might be forced to export internationally sizeable quantities of urea at even less favorable prices.

The above mentioned problems are further compounded by the uncertain future ownership of ULTRAFERTIL the owner of Araucaria Project (see Araucaria Supervision Report) and consequently the lack of an overall marketing strategy.

V. COMPLIANCE WITH LOAN COVENANTS

Presently all covenants have been complied with. The financial covenants apply only after project completion which is expected to take place before the end of 1982. The concern is that NITROFERTIL will continue to have little internal cash generation which will not permit a sufficient improvement of the debt service coverage ratio to the desired level of 1.5.

SECTION 7: MISSION RECOMMENDATIONS AND MANAGEMENT ACTION REQUIRED

It is recommended to send a joint completion report mission for the Sergipe and Araucaria Project between September and November 1982. At the same time the mission could review the preparation of a fertilizer industry rehabilitation project.

| NAME OF PREPARING OFFICER: | INITIALS: | DATE: |
|---|---|---|
| S. Venkataraman and K. M. Loos | | 6/11/82 |

# BRAZIL: SERGIPE FERTILIZER PROJECT

## LIST OF ANNEXES



Industry Department
June 1982

ANNEX 1

# BRAZIL: SERGIPE FERTILIZER PROJECT

## SCHEDULE OF DISBURSEMENTS (LOAN 1406-BR)

| Fiscal Year and Quarter | | | Appraisal Estimate 1/ | Last Revised Estimate 2/ | Actual | Current Estimate |
|---|---|---|---|---|---|---|
| ]980 | I | Sept. | 51.0 | | 7.0 | |
| | II | Dec. | 55.0 | 21.3 | 8.2 | |
| | III | March | 59.0 | 27.3 | 12.5 | |
| | IV | June | 62.0 | 35.3 | 20.0 | |
| 1981 | I | Sept. | 63.0 | 45.3 | 23.2 | |
| | II | Dec. | 64.0 | 55.3 | 24.9 | |
| | III | March | | 60.3 | 26.4 | |
| | IV | June | | 62.3 | 29.1 | |
| 1982 | I | Sept. | | 64.0 | 32.0 | |
| | II | Dec. | | | 34.1 | |
| | III | March | | | 40.3 | |
| | IV | June | | | | 43.0 |
| 1983 | I | Sept. | | | | |
| | II | Dec. | | | | 52.0 3/ |
| Closing Dates | | | 11/30/81 | 11/30/81 | | 5/31/82 4/ |

1/ April 1977.
2/ November 1978.
3/ On PETROFERTIL's request the Bank cancelled US$12 million from the loan of US$ 64 million.
4/ Although NITROFERTIL expects to complete disbursement by end of August 1982, an extension of the Closing date is currently considered.

Industry Department
June 1982

ANNEX 2

BRAZIL: SERGIPE FERTILIZER PROJECT

NITROFERTIL - HISTORICAL AND PROJECTED INCOME STATEMENT
(in million Cruzeiros)

| FY ended December 31 | 1978 | 1979 | 1980 | 1981 | 1982 |
|---|---|---|---|---|---|
| | | | audited | | estimated |
| Revenues from Net Sales | 452 | 1,524 | 4,579 | 10,434 | 19,918 |
| Cost of Sales | 349 | 1,013 | 3,379 | 6,764 | 13,700 |
| Gross Profit | 103 | 511 | 1,200 | 3,670 | 6,218 |
| Operating Expenses | 308 | 2,491 | 3,568 | 8,604 | 16,327 |
| Non-operating Income | + 31 | + 31 | + 28 | + 121 | + 24 |
| Monetary Correction | +608 | +753 | +1,417 | +3,409 | +19,587 |
| Income Before Taxes | 434 | (1,196) | ( 923) | (1,404) | 9,501 |
| Taxes | 133 | - | - | - | - |
| Net Income | 301 | (1,196) | ( 923) | (1,404) | 9,501 |
| Ratios | | | | | |
| Gross Margin (%) | 23 | 34 | 26 | 35 | 31 |
| Net Margin | 67 | ( 78) | ( 20) | ( 13) | - |

Industry Department
June 1982

ANNEX 3

BRAZIL: SERGIPE FERTILIZER PROJECT

NITROFERTIL - HISTORICAL BALANCE SHEETS
(in million Cruzeiros)

| FY ended December 31 | 1978 | 1979 | 1980 | 1981 | 1982 a/ |
|---|---|---|---|---|---|
| | audited | | | | estimated |
| **Assets** | | | | | |
| Current Assets | 340 | 667 | 1,919 | 7,004 | 16,354 |
| Investment/Loans | 68 | 224 | 308 | 414 | 535 |
| Gross Fixed Assets | - | - | - | - | 41,867 |
| Less: Accum. Depreciation | - | - | - | - | 2,363 |
| Net Fixed Assets | 2,599 | 3,525 | 5,290 | 9,467 | 39,504 |
| Other Assets & Work in Progress | 1,932 | 2,541 | 3,662 | 6,383 | 26,872 |
| Total | 4,939 | 6,957 | 11,179 | 23,268 | 83,275 |
| **Liabilities and Equity** | | | | | |
| Current Liabilities | 996 | 881 | 2,990 | 6,432 | 12,768 |
| Long-term Debt | 1,704 | 3,180 | 3,340 | 7,742 | 23,475 |
| Net Worth | 2,239 | 2,896 | 4,849 | 9,094 | 47,032 |
| Total | 4,939 | 6,957 | 11,179 | 23,268 | 83,275 |
| **Ratios** | | | | | |
| Current Ratio | 0.34 | 0.76 | 0.64 | 1.1 | 1.27 |
| Long-term Debt/Equity Ratio | 43/57 | 52/48 | 41/59 | 46/54 | 33/66 |

a/ Including Sergipe Project.

Industry Department
June 1982

ANNEX 4

# BRAZIL: SERGIPE FERTILIZER PROJECT

## LIST OF PERSONS MET

### PETROFERTIL

#### Rio de Janeiro

| | |
|---|---|
| Carlos Palmarino Accioly | Technical Director |
| Wilson de Santa Cruz Caldas | Planning Director |
| Bruno Da Costa Soares | Financial Director |
| Luiz de Magalhaes Botelho | Financial Advisor |
| Carlos Frederico Hirsch | Planning Manager |
| Alberto B. C. Land | Planning Department |
| | |
| Leopoldo G. Barcante | Financial Manager |
| Rubem Pereira da Silva | Financial Department |

#### External Auditors

| | |
|---|---|
| | Bouchinhas, Campos & Claro S/C |
| Nilton Claro | Director |
| Mario Jose Antunes | Director |
| Luiz Salle Karam | Director |

### NITROFERTIL

#### Salvador

| | |
|---|---|
| Paulo Roberto Souza de Amorim | Director (Financial and Commercial) |
| Newton L. F. Guimaraes | Director (Industrial) |

#### Laranjeiras

| | |
|---|---|
| Alfredo Cavalcanti Goncalves | General Manager |
| Jose Eduardo L. Barretto | Operations Manager |

Industry Department
June 1982

WORLD BANK / INTERNATIONAL FINANCE CORPORATION

# OFFICE MEMORANDUM

TO: Mr. Harinder S. Kohli, Chief, IPDD2 DATE: August 27, 1981

FROM: K. M. Loos and S. Venkataraman

SUBJECT: BRAZIL: Sergipe Fertilizer Report (Loan 1406-BR)
Supervision Report

In accordance with the terms of reference dated July 24, 1981, we visited Brazil from July 28 through August 17, 1981 to carry out the supervision of the above-captioned project. The full supervision report based on the findings of the mission is attached.

Attachments

cc: Messrs. Lerdau (E923)
Rajagopalan (5) (E1028)
Tolbert (D428)
van der Meer (A813)
Glaessner (A807)
Goffin (A813)
Renger (B802)
Skillings (E928)
Ms. Augusto (I 5-156)
Barker (D1125)
Israel (E1045)
Koromzay (E928)
Lee (D1035)
Rigo (N644)
Vincent (E952)

Messrs. Dewey (o/r)
Cash
Jaffe
Perram
Sheldrick
Ms. Haug
Iskander
Wackman
Segura
Ms. Armstrong (2)

IPIC
LACIC

KMLoos:prs

FORM NO. 590
(1-79)

# THE WORLD BANK
## IBRD AND IDA – SUPERVISION SUMMARY

*For detailed instructions on completion of this form, please see Attachment A to the Annex of OMS 3.50.*

THIS FORM IS A STOCKROOM ITEM.

This summary is [ ] the initial summary [X] part of a mission report [ ] an annual update

| Regional Office: | Project Name: | Project Code: | Loan [X] Credit [ ] No.: | L/C Amount ($xx.xm): |
|---|---|---|---|---|
| LAC | SERGIPE FERTILIZER PROJECT | 6BRAIC02 | 1406-BR | 64.0 |

| Country: | Borrower/Beneficiary: | Board Date: | Signing Date: | Effective Date: |
|---|---|---|---|---|
| Brazil | PETROBRAS Fertilizantes S.A. | 04/19/77 | 04/29/77 | 08/15/77 |

| Projects Dept./Div. Name: | Org. Code No.: | Projects Officer: | Loan Officer: |
|---|---|---|---|
| IPD/Division II | 305-20 | K. Loos | D. Koromzay |

## SECTION 1: SUMMARY PROJECT DESCRIPTION

The project is a grass-roots ammonia/urea plant to be built at Laranjeiras (Sergipe) and consisting of a 907 tpd ammonia unit based on natural gas, a 1,100 tpd urea unit, and all supporting facilities.

## SECTION 2: PERFORMANCE RATING

| | This Summary | Last Summary |
|---|---|---|
| STATUS: 1 - Problem-free or Minor Problems; 2 - Moderate Problems; 3 - Major Problems | 1 | 1 |
| TREND: 1 - Improving; 2 - Stationary; 3 - Deteriorating | 2 | 2 |
| TYPES OF PROBLEMS: F - Financial; M - Managerial; T - Technical; P - Political; O - Other *(Explain in Section 6.)* If more than one type of problem, enter most critical factor first. | - - - - - | - - - - - |
| IMPLEMENTATION STATUS: 1 - Problem-free or Minor Problems; 2 - Moderate Problems; 3 - Major Problems | | |
| Disbursements | 1 | 1 |
| Estimated Cost | 1 | 1 |
| Anticipated Completion | 2 | 2 |
| Compliance with Loan Conditions | 1 | 1 |
| Project Finances | 1 | 1 |
| Management Performance | 1 | 1 |
| Procurement Progress | 2 | 2 |
| Performance of Consultants | 1 | 1 |
| Reporting | 1 | 1 |
| DEVELOPMENT IMPACT: 1 - Problem-free or Minor Problems; 2 - Moderate Problems; 3 - Major Problems | | |
| Expected Benefits | 1 | 1 |
| Rate of Return | 1 | 1 |
| Institution-Building | 1 | 1 |

## SECTION 3: PROJECT DATA

| Estimated/Actual: | Project Completion 1/ (Mo./Yr.) | Loan/Credit Closing (Mo./Day/Yr.) | Total Project Cost 3/ ($xx.xm) | of which: Foreign Currency 4/ ($xx.xm) | of which: Local Currency ($xx.xm) | Cumulative Disbursements through most recent Quarter ended (06/30/81) ($xx.xm) |
|---|---|---|---|---|---|---|
| Appraisal Est. | 01 81 | 11 30 81 | 243.1 | 84.3 | 158.8 | 60.0 (Est.) |
| Last Summary (09 29 80) | 03 82 | 11 30 81 | 245.6 | 85.2 | 160.4 | |
| Current | 07 82 2/ | 05 31 82 | 206.9 | 35.6 | 171.3 | 29.1 (Actual) 5/ |

## SECTION 4: MISSION SCHEDULE

| | No. of Staff on Mission | No. of Days in Country | Return to HQ (Mo./Day/Yr.) | Final Report Date (Mo./Day/Yr.) |
|---|---|---|---|---|
| ~~Past~~/Present Mission | 2 | 4 | 08 17 81 | 08 27 81 (FS)* |
| Previous Mission | 3 | 4 | 09 02 80 | 09 29 80 (FS)* |

Next Mission Departure (Mo./Yr.) 04 82

Recommended interval between missions (Months) 8

End of period covered by latest progress report (Mo./Day/Yr.) 06 30 81

* *Type of Report: FS = Full Supervision; CS = Combined Full/B-T-O; C = Completion; A = Appraisal; O = Other (explain below)*

| Names of Mission Members | Mission Members' Specializations |
|---|---|
| K. Loos | Financial Analyst |
| S. Venkataraman | Chemical Engineer |

Number of members on both present and previous mission:

None [ ]
One [ ]
Two or More [X]

SECTION 5: COMMENTS *(Clarify, if necessary, data in Sections 3 and 4.)*

1/ Mechanical completion date.
2/ PETROFERTIL control date is March 1982.
3/ Installed costs, excluding interest during construction and working capital.
4/ Foreign exchange includes indirect foreign exchange.
5/ On August 1981, disbursement amounted to US$31.5 million. It is likely that PETROFERTIL will utilize only US$50 million from the loan of US$64 million.

SECTION 6: SUMMARY OF PROJECT STATUS, TREND AND MAJOR PROBLEMS

I. PHYSICAL EXECUTION OF PROJECT

General. The overall progress of the project was 81.2% (end June 1981) against the scheduled progress of 87.9% (August 1980 revised schedule). The major delay is in plant erection caused by delays in the delivery of some locally ordered key equipment. As a result, the project can be further delayed by about 4 months.

Status of Engineering Work. The additional delays in project completion has provided adequate additional time to complete the engineering work on the water treatment and effluent handling areas, behind schedule during the last mission. Except for minor field modification drawings, all the engineering work has been completed.

Status of Equipment Procurement. Even though there are some minor purchase requisitions still under processing, all the supplies required for completing the project have been ordered. Except for six fabricated equipment locally ordered and marginal shortages in bulk materials, all the supplies have been received at the site. Items still to be purchased mainly relate to laboratory and maintenance equipment, urea coating facilities, and small number of miscellaneous items. The main equipment yet to be received at site include the reformer steam drum, some exchangers and the ammonia separator. These are now expected to be delivered at the site before October 1981. Any further delays in their delivery--expected to be unlikely--can further delay project completion.

Status of Construction. The progress of construction has only been 68% (end June 1981) against the schedule progress of 78.8% (August 1980 revised schedule). The delay has been mainly due to (a) delayed delivery of some of the locally ordered equipment, (b) transportation problems in moving the ammonia converter to the site and (c) miscellaneous shortages in piping, electrical and instrumentation materials. As a result of the delayed delivery of the six fabricated equipment, construction work around their location has been held up to facilitate the movement and positioning of these equipment. Since the fully assembled ammonia converter was too heavy to be moved from the CONFAB shops outside Sao Paulo to the project site, it has been transported in three pieces and is being welded together at the project site. In view of the high pressure rating (1,500 psi), the site work has to be carried out carefully maintaining good supervision and overall responsibility of CONFAB/Struthers Wells. As a result of inadequate materials management arrangements in the initial periods of project implementation, procurement has not covered all the updated material take-offs and some material shortages have now been identified. These have been covered by supplies from PETROBRAS refineries and by fresh orders. Construction work is scheduled for completion by February 1982 but may be delayed by about three months.

Training and Personnel. The NITROFERTIL operating team has about 290 persons who will be supplemented with technicians now working in the NITROFERTIL Camacari plant and with the construction contractors. All the senior and middle level managers have been hired and are in position. Fifty percent of the maintenance technicians are working with the construction contractors gaining direct experience. Seventy percent of the laboratory technicians have been hired and are being trained in Camacari. Training classes for engineers, supervisors and technicians have been completed. A competent safety team and adequate warehousing staff are already in position. Kellogg and Toyo shift advisers will be arriving by January 1982.

Status of Related Facilities. The natural gas processing and compression station of PETROBRAS has been completed and is in operation. The natural gas pipeline up to the plant site has also been completed. The water supply pipeline has been mostly completed except for small sections due for completion by August 1981. Temporary pumps will be used to test the pipeline and to provide the initial water requirements. The full facilities will be completed

well before end 1981. The power supply transmission lines have been completed and can be energized to meet the project requirements. The effluent treatment facilities are nearing completion in spite of the delay in start of work due to changes stipulated by the state authorities. The major concern relates to the adequacy of the rail system for product movement. The improvement of the rail system in the region expected at the time of project appraisal has not taken place and product movement out of the plant site could face difficulties. Movement of ammonia in rail tank wagons by the rail system passing through Aracaju town would not be desirable. PETROFERTIL is maintaining pressure on the rail company to invest in track improvement without success. The Ports, Railways and Aviation Division of the Regional Projects Department has been requested to review with the Government the status of the rail system and the required improvements.

Overall Project Implementation Schedule. The PETROFERTIL schedule for project completion is April 1982. However, considering the possibilities of further delays in the delivery of the critical locally ordered equipment, project mechanical completion may be further delayed by three months and may be achieved by July 1982. The availability of an adequate operating team and the NITROFERTIL's recent experience in commissioning similar plants at Camacari should facilitate early commissioning of the facilities and rapid capacity build-up, allowing commercial production to start by about October 1982.

## II. OPERATING AND FINANCIAL PERFORMANCE OF NITROFERTIL

During 1980/81 NITROFERTIL, subsidiary of PETROFERTIL and designated owner and operator of the Sergipe Project, was able to stabilize the production of its two ammonia/urea plants at Camacari at a satisfactory level, between 80% and 85% capacity utilization, as shown in the table below:

NITROFERTIL - Operating Performance

| Year | Production in '000 tons | | Capacity Utilization in % | |
|---|---|---|---|---|
| | Ammonia | Urea | Ammonia | Urea |
| 1979 | 221 | 150 | 61 | 43 |
| 1980 | 309 | 273 | 85 | 79 |
| 1981 a/ | 295 | 292 | 81 | 85 |

a/ Estimated.

During the first half of FY81, NITROFERTIL's sales volume dropped by about 10% as a result of a slack in fertilizer demand caused by abnormal weather conditions, narrowing operating margins for farmers, and the introduction of interest charges of 45% p.a. for agricultural credit. However, NITROFERTIL expects fertilizer sales to increase at an accelerated rate during the second half of FY81, so that total sales will match approximately last year's sales of 400,000 product tons of fertilizer. NITROFERTIL projects an increase in sales revenues of about 120%, which is in line with the domestic inflation rate experienced during the last 12 months. In FY81, NITROFERTIL anticipates to break-even from operations and to show a small book profit after monetary corrections are made. The expected improvement of financial results appears to be feasible in the light of the following factors: (i) the Government has agreed to stabilize the price for natural gas (linked to fuel oil price and fixed over 6-month periods), and (ii) the relatively small amount of financial charges (equivalent to 15% of net revenues) since a large

supplier credit from PETROBRAS (equivalent to about 45% of NITROFERTIL's current assets) is interest-free and is assumed to be converted to equity before the end of FY81. The current interest rate for domestic short-term loans is 7.5% per month or 138% p.a.

III. MARKETING AND DISTRIBUTION

NITROFERTIL "exports" presently about 40% of its ammonia/urea production from the Northeastern region to the Central/South region. Although fertilizer demand is expected to grow at an annual rate of 13-14% in the Northeast, after start-up of the Sergipe Project end 1982 further quantities will have to be shipped temporarily to the Central region. With the start-up of the Araucaria Project in the state of Parana this September, PETROFERTIL will have to review and coordinate carefully the marketing strategy and distribution arrangements of its three principal fertilizer subsidiaries, NITROFERTIL, ULTRAFERTIL and FOSFERTIL. Market forecasts indicate that Brazil will still have a small nitrogen deficit even when the Sergipe and Araucaria plants are operating at full capacity.

IV. LOAN UTILIZATION

A large part of the equipment and supplies were ordered from Brazilian suppliers with purchase prices stated in cruzeiros and generally price adjustment clauses based on ORTN indices. The final cruzeiro prices converted at prevailing exchange rates to dollars resulted in lower dollar prices since the ORTN indices did not reflect fully the change in exchange rates. As a result, the loan utilization would be about $14 million lower than the loan amount.

V. COMPLIANCE WITH LOAN COVENANTS

All covenants have been complied with. The NITROFERTIL current ratio for last year was not satisfactory but will improve when PETROBRAS converts its large suppliers' credit to equity before the end of FY81. The financial covenants, however, apply only after project completion.

SECTION 7: MISSION RECOMMENDATIONS AND MANAGEMENT ACTION REQUIRED

The mission has reviewed with the PETROFERTIL management the action required on the likely loan amount that would remain unutilized. The PETROFERTIL management has agreed to request the Bank for cancellation of about $14 million before end September 1981.

The next mission will be planned along with the mission on the Araucaria Project for preparation of the completion report and for appraisal of a possible appraisal of the Valefertil expansion project in March/April 1981.

| NAME OF PREPARING OFFICER: | INITIALS: | DATE: |
|---|---|---|
| K. Loos and S. Venkataraman | SV RL | August 27, 1981 |

BRAZIL: SERGIPE FERTILIZER PROJECT

LIST OF ANNEXES



Industrial Projects Department
August 1981

# BRAZIL: SERGIPE FERTILIZER PROJECT

## SCHEDULE OF DISBURSEMENTS (LOAN 1406-BR)

| Fiscal Year and Quarter | | | Accumulated Disbursements (US$ Million) | | | |
|---|---|---|---|---|---|---|
| | | | Appraisal Estimate 1/ | Last Revised Estimate 2/ | Actual | Current Estimate |
| 1980 | I | Sept. | 51.0 | | 7.0 | |
| | II | Dec. | 55.0 | 21.3 | 8.2 | |
| | III | March | 59.0 | 27.3 | 12.5 | |
| | IV | June | 62.0 | 35.3 | 20.0 | |
| 1981 | I | Sept. | 63.0 | 45.3 | 23.2 | |
| | II | Dec. | 64.0 | 55.3 | 44.9 | |
| | III | March | | 60.3 | 26.4 | |
| | IV | June | | 62.3 | 29.1 | |
| 1982 | I | Sept. | | 64.0 | | 32.0 |
| | II | Dec. | | | | 36.0 |
| | III | March | | | | 40.0 |
| | IV | June | | | | 43.0 |
| 1983 | I | Sept. | | | | 46.0 |
| | II | Dec. | | | | 48.0 |
| | III | March | | | | 50.0 3/ |
| Closing Dates | | | 11/30/81 | 11/30/81 | | 5/31/81 |

1/ April 1977.
2/ November 1978.
3/ Loan is not likely to be fully disbursed.
4/ Extension of Closing Date will be requested by PETROFERTIL at a later date.

Industrial Projects Department
August 1981

# BRAZIL: SERGIPE FERTILIZER PROJECT

## NITROFERTIL - HISTORICAL AND PROJECTED INCOME STATEMENT
(in million Cruzeiros)

| FY ended December 31 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|
| | | audited | | estimated |
| Revenues from Net Sales | 452 | 1,524 | 4,579 | 10,405 |
| Cost of Sales | 349 | 1,013 | 3,379 | 6,584 |
| Gross Profit | 103 | 511 | 1,200 | 3,821 |
| Operating Expenses | 308 | 2,491 | 3,568 | 3,869 |
| Non-operating Income | + 31 | + 31 | 28 | + 32 |
| Monetary Correction | +608 | +753 | +1,417 | +669 |
| Income Before Taxes | 434 | (1,196) | ( 923) | 653 |
| Taxes | 133 | - | - | - |
| Net Income | 301 | (1,196) | ( 923) | 653 |
| Ratios | | | | |
| Gross Margin (%) | 23 | 34 | 26 | 37 |
| Net Margin | 67 | ( 78) | ( 20) | 6 |

Industrial Projects Department
August 1981

BRAZIL: SERGIPE FERTILIZER PROJECT

NITROFERTIL - HISTORICAL BALANCE SHEETS
(in million Cruzeiros)

| FY ended December 31 | 1978 | 1979 | 1980 | 1981 |
|---|---|---|---|---|
| | ----------audited---------- | | | estimated |
| **Assets** | | | | |
| Current Assets | 340 | 667 | 1,919 | 3,950 |
| Investment/Loans | 68 | 224 | 308 | 334 |
| Gross Fixed Assets | - | - | - | 7,931 |
| Less: Accum. Depreciation | - | - | - | 2,717 |
| Net Fixed Assets | 2,599 | 3,525 | 5,290 | 5,214 |
| Other Assets & Work in Progress | 1,932 | 2,541 | 3,662 | 4,501 |
| Total | 4,939 | 6,957 | 11,179 | 13,999 |
| **Liabilities and Equity** | | | | |
| Current Liabilities | 996 | 881 | 2,990 | 2,009 |
| Long-term Debt | 1,704 | 3,180 | 3,340 | 3,918 |
| Net Worth | 2,239 | 2,896 | 4,849 | 8,072 |
| Total | 4,939 | 6,957 | 11,179 | 13,999 |
| **Ratios** | | | | |
| Current Ratio | 0.34 | 0.76 | 0.64 | 1.97 |
| Long-term Debt/Equity Ratio | 43/57 | 52/48 | 41/59 | 33/67 |

Industrial Projects Department
August 1981

# BRAZIL: SERGIPE FERTILIZER PROJECT

## LIST OF PERSONS MET

### PETROFERTIL

#### Rio de Janeiro

| | |
|---|---|
| Porthos Augusto de Lima | President |
| Luiz de Magalhaes Botelho | Director (Finance) |
| Carlos Frederico Hirsch | Planning Manager |
| Alberto B. C. Land | Planning Department |
| Leopoldo G. Barcante | Financial Manager |
| Claude Wuillaume | Financial Department |
| Marcos Henrique Castro de Oliveira | Laranjeiras Project Manager |

#### Laranjeiras

| | |
|---|---|
| Jose Eduardo L. Barretto | Operations Manager |
| Alfredo Cavalcanti Goncalves | Construction Manager, COFEN |

### NITROFERTIL

#### Salvador

| | |
|---|---|
| Paulo Roberto Souza de Amorim | Director (Finaneial and Commercial) |
| Newton L. F. Guimaraes | Director (Industrial) |
| Milton Gaeta | Director (Administrative) |

Industrial Projects Department
August 1981

WORLD BANK / INTERNATIONAL FINANCE CORPORATION

Black book

# OFFICE MEMORANDUM

TO: Mr. Edilberto L. Segura, Acting Chief, IPDD2 DATE: September 29, 1980

FROM: K. M. Loos, A. E. McNamara and S. Venkataraman

SUBJECT: BRAZIL: Sergipe Fertilizer Project (Loan 1406-BR)
Supervision Report

In accordance with the terms of reference dated July 31, 1980 we visited Brazil from August 18 through August 29, 1980 to carry out the supervision of the above-captioned project. The full supervision report based on the findings of the mission is attached.

Attachments

cc: Messrs. Rajagopalan (5)
Israel
Chittleburgh
Lee
Goffin
Cucullu
Lerdau
Glaessner
Tolbert
Skillings
Koromzay
Howlett
Rigo
(Ms) Augusto
Ruisanchez (IFC)
Plant (IFC)
(Ms) Vincent
LACIC

Messrs. Fuchs
Dewey
Jaffe
Perram
Sheldrick
Cash
Nayar
Iskander
Kohli (o/r)
Carpio
(Ms) Armstrong
IPIC

KMLoos:prs

FORM NO. 590
(1–79)

# THE WORLD BANK
## IBRD AND IDA – SUPERVISION SUMMARY

*For detailed instructions on completion of this form, please see Attachment A to the Annex of OMS 3.50.*

THIS FORM IS A STOCKROOM ITEM.

This summary is [ ] the initial summary [x] part of a mission report [ ] an annual update

| Regional Office: | Project Name: | Project Code: | Loan [x] Credit [ ] No.: | L/C Amount ($xx.xm): |
|---|---|---|---|---|
| LC | SERGIPE FERTILIZER PROJECT | 6BRAIC02 | 1406-BR | 64.0 |

| Country: | Borrower/Beneficiary: | Board Date: | Signing Date: | Effective Date: |
|---|---|---|---|---|
| BRAZIL | PETROFERTIL<br>PETROBRAS FERTILIZANTES SA | 04/19/77 | 04/29/77 | 08/15/77 |

| Projects Dept./Div. Name: | Org. Code No.: | Projects Officer: | Loan Officer: |
|---|---|---|---|
| IPD/Div II | 305-20 | K. Loos | D. Koromzay |

**SECTION 1: SUMMARY PROJECT DESCRIPTION**

The project is a grass-roots ammonia/urea plant to be built at Laranjeiras (Sergipe) and consisting of a 907 tpd ammonia unit based on natural gas, a 1,100 tpd urea unit, and all supporting facilities.

**SECTION 2: PERFORMANCE RATING**

| | This Summary | Last Summary |
|---|---|---|
| STATUS: 1 - Problem-free or Minor Problems; 2 - Moderate Problems; 3 - Major Problems | 1 | 1 |
| TREND: 1 - Improving; 2 - Stationary; 3 - Deteriorating | 2 | 2 |
| TYPES OF PROBLEMS: F - Financial; M - Managerial; T - Technical; P - Political; O - Other *(Explain in Section 6.)* If more than one type of problem, enter most critical factor first. | _ _ _ _ _ | _ _ _ _ _ |
| IMPLEMENTATION STATUS: 1 - Problem-free or Minor Problems; 2 - Moderate Problems; 3 - Major Problems | | |
| Disbursements | 1 | 1 |
| Estimated Cost | 1 | 1 |
| Anticipated Completion | 2 | 1 |
| Compliance with Loan Conditions | 1 | 1 |
| Project Finances | 1 | 1 |
| Management Performance | 1 | 1 |
| Procurement Progress | 2 | 1 |
| Performance of Consultants | 1 | 1 |
| Reporting | 1 | 1 |
| DEVELOPMENT IMPACT: 1 - Problem-free or Minor Problems; 2 - Moderate Problems; 3 - Major Problems | | |
| Expected Benefits | 1 | 1 |
| Rate of Return | 1 | 1 |
| Institution-Building | 1 | 1 |

**SECTION 3: PROJECT DATA**

| Estimated/Actual: | Project Completion 1/ (Mo./Yr.) | Loan/Credit Closing (Mo./Day/Yr.) | Total Project Cost 4/ ($xx.xm) | of which: Foreign Currency 5/ ($xx.xm) | of which: Local Currency ($xx.xm) | Cumulative Disbursements through most recent Quarter ended ( 06/ 30/ 80) ($xx.xm) |
|---|---|---|---|---|---|---|
| Appraisal Est. | 01 81 | 11,30,81 | 243.1 | 84.3 | 158.8 | 62.0 (Est.) |
| Last Summary ( 12/ 19/ 79) | 10 81 | 11,30,81 | 245.6 | 85.2 | 160.4 | |
| Current | 03 82 2/ | 11,30,81 3/ | 245.6 | 85.2 | 160.4 | 20.0 6/ (Actual) |

**SECTION 4: MISSION SCHEDULE**

| | No. of Staff on Mission | No. of Days in Country | Return to HQ (Mo./Day/Yr.) | Final Report Date (Mo./Day/Yr.) |
|---|---|---|---|---|
| ~~Latest~~ Present Mission | 3 | 4 | 09,02,80 | 09,29,80 (FS)* |
| Previous Mission | 2 | 4 | 11,15,79 | 12,19,79 (CS)* |

Next Mission Departure (Mo./Yr.) 02,81

Recommended interval between missions (Months) 6

End of period covered by latest progress report (Mo./Day/Yr.) 07,31,80

* *Type of Report: FS = Full Supervision; CS = Combined Full/B-T-O; C = Completion; A = Appraisal; O = Other (explain below)*

| Names of Mission Members | Mission Members' Specializations |
|---|---|
| K. Loos | Financial Analyst |
| A. McNamara | Engineer |
| S. Venkataraman | Engineer |

Number of members on both present and previous mission:
None [x]
One [ ]
Two or More [ ]

SECTION 5: COMMENTS *(Clarify, if necessary, data in Sections 3 and 4.)*

1/ Mechanical completion date.
2/ PETROFERTIL control date is November 1981.
3/ PETROFERTIL requested extension to May 31, 1982.
4/ Installed costs, excluding interest during construction and working capital.
5/ Foreign exchange includes indirect foreign exchange.
6/ Disbursement delay due to non-issuance by Government of import licenses for imported equipment, preventing placement of orders. On September 12, 1980 disbursement amounted to US$22.0 million.

SECTION 6: SUMMARY OF PROJECT STATUS, TREND AND MAJOR PROBLEMS

I. PHYSICAL EXECUTION OF PROJECT

1. Status of Engineering Work

The engineering work for the ammonia and urea units is completed except for possible field changes during construction and minor updating of instrument loops. Three areas in which engineering work remains incomplete are (a) the water treatment system changed to discharge treated effluents to the sea instead of Sergipe river; (b) water treatment system due to the delay in decision on source of water supply; and (c) change to oil coating of urea. The engineering work will be completed by October 1980.

2. Status of Equipment Procurement

Out of a total of 789 requisitions, orders have been placed against 618 requisitions for a total value of US$68.3 million forming about 87% of the total value of supplies. Placing of all the orders could extend to February 1981. But the items yet to be ordered do not include any long delivery items and are mostly locally available. About 30% of the total value of supplies ordered so far will be obtained by imports. Ninety percent of the equipment would have been delivered by March 1981. Most of the items yet to be delivered will be for the urea handling system procured locally. The major process plant items which could affect the completion schedule are two low temperature steel fabricated vessels for which the Brazilian manufacturer has problems in qualifying welders, an overhead crane and ammonia vapor release vessel. The fabricated vessels have been reordered. There could also be delivery problems with ammonia reactor, economizer and some of the exchangers ordered from Brazilian manufacturers*.

3. Status of Erection and Construction

Most of the land development, buildings and civil construction work has been completed. Since the mechanical erection contract was awarded only in January 1980, the contractor has concentrated efforts in mobilizing for the work. He has installed a pipe fabrication shop, set up field office, organized job planning and mobilized the manpower. While the overall progress of construction is about 44%, progress of erection is only 11.3% against the scheduled 27.9%. However, the site activities are well-organized and there should be an improvement in construction rate in the following months.

4. Status of Utilities and Infrastructure

The power supply company has started field work and is expected to complete the supply arrangements by February 1981. According to the present estimates (June 1980) the total gas reserve is 31.674 billion cubic meters with 60% proven, 15% probable and 25% possible reserves. The available reserve is estimated at 7.8 billion cubic meters. The gas supply for the Sergipe plant will be made by shifting the other industrial consumers to alternative gas source. The PETROBRAS assessment of gas reserves and gas delivery program are given in Annexes 4 and 5. The gas processing station has been completed and the pipeline is expected to be completed by December 1980. There has been some delay in the construction of the water pipeline from Sao Francisco river. The work on the water intake facilities has also been delayed. The water supply system is now expected to be ready by mid-1981. The rail siding has been completed up to the plant fence.

5. Overall Project Implementation Schedule

The project is now scheduled for mechanical completion by November 1981 against the earlier PETROFERTIL estimate of August 1981. Given the status of procurement and equipment delivery the mission expects mechanical completion by March 1982.

I. OPERATING AND FINANCIAL PERFORMANCE OF NITROFERTIL

Start-up problems experienced during end 1978 and early 1979 at the second Camacari plant (900 tpd ammonia and 800 tpd urea) have been resolved and NITROFERTIL's operating performance has therefore significantly improved as indicated in the table below:

* PETROFERTIL is keeping a close watch to expedite their delivery.

NITROFERTIL - Historical and Projected Production

| Year | Production in '000 tons | | Capacity Utilization in % | |
|---|---|---|---|---|
| | Ammonia | Urea | Ammonia | Urea |
| 1978 | 121 | 113 | 33 | 33 |
| 1979 | 221 | 150 | 61 | 43 |
| 1980 a/ | 290 | 262 | 80 | 76 |
| 1981 b/ | 306 | 301 | 85 | 87 |

a/ Estimated b/ Projected

Considering that the annual shutdown for maintenance took place during the first half of FY80, the production of 131,000 tons and 114,000 tons of ammonia and urea, respectively, was close to target as of end of June. The improved operations are also reflected in noticeable sales increases (Annex 2). About half of the expected sales increase for FY80 is due to a 52% higher sales volume. The loss of about US$9 million anticipated for FY80 is largely the result of delayed and partly inadequate price adjustments to cover fast rising raw material costs. For instance, NITROFERTIL's ex-factory prices in August 1980 provided only for an operating margin of 5% on ammonia and a negative margin of 4% on urea. Nevertheless, NITROFERTIL expects to work out with the Government a more responsive pricing mechanism and achieve a small profit in FY81. While the expected debt/equity ratio of 42/58 for 1980 is adequate, the anticipated current ratio of 0.7 indicates a tight liquidity position. However, NITROFERTIL is already planning to improve the current ratio to about 1.1 in 1981 by converting a short-term loan from PETROFERTIL into equity and by borrowing about US$10 million of long-term funds to reduce further the short-term debt. The financial covenants will apply only after project completion and transfer of its assets to NITROFERTIL.

III. MARKETING AND DISTRIBUTION

NITROFERTIL is presently "exporting" to the Central and Southern regions of Brazil close to 60% of its total urea output while the balance is marketed in the North/Northeastern region. Although NITROFERTIL will approximately double its urea production by 1985, when the Sergipe Project is in full production, the "export share" is not expected to increase significantly since consumption in the Northeast is expected to double during the same period, assuming an annual growth rate of 13-14%. In the light of the present large fertilizer imports into the Central region, NITROFERTIL does not foresee any problems in marketing the surplus in that area.

IV. COMPLIANCE WITH LOAN COVENANTS

All covenants have been complied with.

SECTION 7: MISSION RECOMMENDATIONS AND MANAGEMENT ACTION REQUIRED

Next Mission

A brief mission is planned for February/March 1981 along with the mission on the VALEFERTIL Project for preparation of the completion report, followed by a full mission in late 1981.

| NAME OF PREPARING OFFICER: | INITIALS: | DATE: |
|---|---|---|
| K. M. Loos, A. E. McNamara, S. Venkataraman | | 09/29/80 |

# BRAZIL: SERGIPE FERTILIZER PROJECT

## LIST OF ANNEXES

# BRAZIL: SERGIPE FERTILIZER PROJECT

## SCHEDULE OF DISBURSEMENTS (LOAN 1406)

| Fiscal Year and Quarter | | | Accumulated Disbursements (US$ Million) | | |
|---|---|---|---|---|---|
| | | | Appraisal Estimate[1] | Last Revised Estimate[2] | New Estimate |
| 1980 | I | Sept. | 51.0 | | 7.0 |
| | II | Dec. | 55.0 | 21.3 | 8.2 |
| | III | March | 59.0 | 27.3 | 12.5 |
| | IV | June | 62.0 | 35.3 | 20.0 |
| 1981 | I | Sept. | 63.0 | 45.3 | 23.0 |
| | II | Dec. | 64.0 | 55.3 | 30.0 |
| | III | March | | 60.3 | 40.0 |
| | IV | June | | 62.3 | 50.0 |
| 1982 | I | Sept. | | 64.0 | 53.0 |
| | II | Dec. | | | 56.0 |
| | III | March | | | 58.0 |
| | IV | June | | | 60.0[3] |
| Closing Dates | | | 11/30/81 | 11/30/81 | 5/31/82[4] |

1/ April 1977.
2/ November 1978.
3/ Loan is not likely to be fully disbursed.
4/ Extension of Closing Date requested by PETROFERTIL.

Industrial Projects Department
September 1980

BRAZIL: SERGIPE FERTILIZER PROJECT

NITROFERTIL - HISTORICAL AND PROJECTED INCOME STATEMENT
(in million Cruzeiros)

| FY ended December 31 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|
| | ----audited--- | | estimated | ----------projected---------- | | | | |
| Revenues from Net Sales | 452 | 1,524 | 3,220 | 4,717 | 6,622 | 7,146 | 7,385 | 7,394 |
| Cost of Sales | 349 | 1,013 | 2,120 | 3,323 | 4,362 | 4,558 | 4,643 | 4,647 |
| Gross Profit | 103 | 511 | 1,100 | 1,394 | 2,260 | 2,588 | 2,742 | 2,747 |
| Operating Expenses | 308 | 2,491 | 1,540 | 1,067 | 1,409 | 1,324 | 1,193 | 1,081 |
| Non-operating Income | + 31 | + 31 | - | - | - | - | - | - |
| Monetary Correction | +608 | +753 | - | - | - | - | - | - |
| Income Before Taxes | 434 | (1,196) | ( 440) | 327 | 851 | 1,264 | 1,549 | 1,666 |
| Taxes | 133 | - | - | 51 | 168 | 290 | 482 | 608 |
| Net Income | 301 | (1,196) | ( 440) | 276 | 683 | 974 | 1,067 | 1,058 |
| Ratios | | | | | | | | |
| Gross Margin (%) | 23 | 34 | 34 | 30 | 34 | 36 | 37 | 37 |
| Net Margin (%) | 67 | (78) | (14) | 6 | 10 | 14 | 14 | 14 |

NITROFERTIL - HISTORICAL BALANCE SHEETS
(in million Cruzeiros)

| FY ended December 31 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|
| | ---audited--- | | estimated | ----------projected---------- | | | | |
| **Assets** | | | | | | | | |
| Current Assets | 340 | 667 | 818 | 1,605 | 1,863 | 1,886 | 1,900 | 1,938 |
| Investment/Loans | 68 | 224 | 261 | 257 | 257 | 257 | 257 | 257 |
| Gross Fixed Assets | - | - | 4,941 | 15,702 | 15,702 | 15,702 | 15,702 | 15,702 |
| Less: Accum. Depreciation | - | - | 1,067 | 1,942 | 3,164 | 4,395 | 5,621 | 6,847 |
| Net Fixed Assets | 2,599 | 3,525 | 3,814 | 13,759 | 12,538 | 11,307 | 10,081 | 8,855 |
| Other Assets & Work in Progress | 1,932 | 2,541 | 2,567 | 2,480 | 3,159 | 4,217 | 5,307 | 6,753 |
| Total | 4,939 | 6,957 | 7,521 | 18,102 | 17,817 | 17,667 | 17,545 | 17,803 |
| **Liabilities and Equity** | | | | | | | | |
| Current Liabilities | 996 | 881 | 1,233 | 1,455 | 1,732 | 1,994 | 1,722 | 1,760 |
| Long-term Debt | 1,704 | 3,180 | 2,640 | 7,437 | 6,135 | 4,858 | 3,842 | 2,803 |
| Net Worth | 2,239 | 2,896 | 3,648 | 9,210 | 9,950 | 10,815 | 11,981 | 13,240 |
| Total | 4,939 | 6,957 | 7,521 | 18,102 | 17,817 | 17,667 | 17,545 | 17,803 |
| **Ratios** | | | | | | | | |
| Current Ratio | 0.34 | 0.76 | 0.66 | 1.10 | 1.08 | 0.95 | 1.10 | 1.09 |
| Long-term Debt/Equity Ratio | 43/57 | 52/48 | 42/58 | 45/55 | 38/62 | 31/69 | 24/76 | 17/83 |

Industrial Projects Department
September 1980

# BRAZIL: SERGIPE FERTILIZER PROJECT

## LIST OF PERSONS MET

### PETROFERTIL

#### Rio de Janeiro

| | |
|---|---|
| Porthos Augusto de Lima | President |
| Luiz de Magalhaes Botelho | Director (Finance) |
| Nilo Jose Buzzati | Assistant Director |
| Carlos Frederico Hirsch | Planning Manager |
| Alberto B. C. Land | Planning Dept. |
| Leopoldo G. Barcante | Financial Manager |
| Claude Wuillaume | Financial Dept. |
| Marcos Henrique Castro de Oliveira | Laranjeiras Project Manager |

#### Laranjeiras

| | |
|---|---|
| Jose Eduardo L. Barretto | Operations Manager |
| Jonas Boechat | Manager, COFEN |
| Alfredo Cavalcanti Goncalves | Construction Manager, COFEN |

### NITROFERTIL

#### Salvador

| | |
|---|---|
| Paulo Roberto Souza de Amorim | Director (Financial and Commercial) |
| Newton L. F. Guimaraes | Director (Industrial) |
| Milton Gaeta | Director (Administrative) |

Industrial Projects Department
September 1980

BRAZIL: SERGIPE FERTILIZER PROJECT

SERGIPE-ALAGOAS REGION - OVERALL GAS RESERVES
(in million cu. meters)

| Balance by | Original Gas Volumes | | | | Recovery Factor of Proven Reserves(%) | Available Reserves |
|---|---|---|---|---|---|---|
| | Proved | Probable | Possible | Total | | |
| December 78 | 19,415 | 5,554 | 11,367 | 36,336 | 45.93 | 8,918 |
| December 79 | 18,906 | 4,650 | 7,863 | 31,378 | 41.63 | 7,871 |
| June 80 | 19,203 | 4,841 | 7,630 | 31,674 | 40.69 | 7,814 |

Industrial Projects Department
September 1980

ANNEX 4

BRAZIL: SERGIPE FERTILIZER PROJECT

SERGIPE-ALAGOAS REGION - GAS DELIVERY PROGRAM
(in million cu. meters)

| | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 |
|---|---|---|---|---|---|---|---|---|---|
| Overall Gas Production | 611.7 | 583.7 | 501.3 | 482.5 | 465.1 | 454.8 | 446.9 | 441.8 | 437.7 |
| Internal Consumption | | | | | | | | | |
| For Energy Use | 101.9 | 112.5 | 99.4 | 89.8 | 81.0 | 76.1 | 71.8 | 68.7 | 66.1 |
| For Non-energy Use | 116.9 | 127.9 | 127.9 | 127.9 | 127.9 | 127.9 | 127.9 | 127.9 | 127.9 |
| Delivery for Consumers | | | | | | | | | |
| In Sergipe/Alagoas (Except Sergipe Proj.) | 62.1 | - | - | - | - | - | - | - | - |
| In Bahia | 281.9 | 57.8 | - | - | - | - | - | - | - |
| Sergipe Project | - | 237.2 | 237.2 | 237.2 | 237.2 | 237.2 | 237.2 | 237.2 | 237.2 |
| Losses | 48.9 | 48.3 | 36.7 | 27.6 | 19.0 | 13.6 | 10.0 | 8.0 | 6.5 |

Industrial Projects Department
September 1980

ANNEX 5

Starlet for Black Book

Mr. Anthony R. Perram, Chief, IPDD2

December 6, 1978

Geoffrey Evans, IPDD2

BRAZIL - Loan No. 1406-BR
Sergipe Fertilizer Project
Full Supervision Report

1. Please find attached full report of the Supervision Mission which visited Brazil from October 15-25, 1978, to review progress on the above-referenced Project.

2. A draft letter to the Government (Borrower) has not been included at this stage pending receipt of the supplementary report of our gas consultant following his separate visit in mid-November.

Attachment

cc: Messrs. van der Tak (5), Fuchs, Dewey, Jaffe, Walstedt, Sheldrick, Cash, Nayar, Kohli, Soncini, Venkataraman, Segura, Rischard, Loos, Dosik, Lee, Chittleburgh, Gordon, Knotter, Ruisanchez, Glaessner, Mirza, Howlett, Rigo, Mole, Knight
LAC Information Center (F841)
Division File (100)

GEvans:siv

FORM NO. 590
(1–75)

# IBRD AND IDA – SUPERVISION SUMMARY

This summary is
[ ] the initial summary
[x] part of a mission report
[ ] a semi-annual update
[ ] the completion summary

| Regional Office: | Project Name: | Project Code: | Loan [x] Credit [ ] No.: | L/C Amount ($xx.xm): |
|---|---|---|---|---|
| LAC | SERGIPE FERTILIZER PROJECT | 6BRAIC02 | 1406 BR | 64.0 |

| Country: | Borrower/Beneficiary: | Board Date: | Signing Date: | Effective Date: |
|---|---|---|---|---|
| BRAZIL | Petrobras Fertilizantes S.A. | 4/19/1977 | 4/29/1977 | 8/15/1977 |

| Projects Dept./Div. Name: | Org. Code No.: | Projects Officer: | Loan Officer: |
|---|---|---|---|
| IPD/II | 305/20 | Geoffrey Evans | Albert Howlett |

**SECTION 1: SUMMARY PROJECT DESCRIPTION**

The Project is a grass-roots ammonia/urea plant to be built at Laranjeiras, near Aracaju, Sergipe State, consisting of a 907 MTD ammonia unit based on natural gas, a 1,100 MTD urea unit, and all supporting facilities.

**SECTION 2: PERFORMANCE RATING**

| | This Summary | Last Summary |
|---|---|---|
| STATUS: 1 - Problem-free or Minor Problems; 2 - Moderate Problems; 3 - Major Problems | 2 | 2 |
| TREND: 1 - Improving; 2 - Stationary; 3 - Deteriorating | 2 | 2 |
| TYPES OF PROBLEMS: F - Financial; M - Managerial; T - Technical; P - Political; O - Other *(Explain in Section 5)* | P O - - - | O - - - - |

If more than one type of problem, enter most critical factor first.

Designated a "problem project" in most recent SVP review? Y - Yes; N - No [N]

(See Note (2) in Section 5)

**SECTION 3: PROJECT DATA**

| Estimated/Actual: | Project Completion (Mo./Yr.) | Loan/Credit Closing (Mo./Day/Yr.) | Total Project Cost 5/ ($xx.xm) | of which: Foreign 1/ Currency ($xx.xm) | of which: Local Currency ($xx.xm) | Cumulative Disbursements through most recent Quarter ended ( 09/30/78 ) ($xx.xm) |
|---|---|---|---|---|---|---|
| Appraisal Est. | 01,81 | 11,30,81 | 243.1 | 64.3 | 178.8 | 21.0 (Est.) |
| Last Summary ( 08/17/78 ) | 10,81 | 11,30,81 | 243.1 | 64.3 | 178.8 | |
| Current | 09,81 | 11,30,81 | 230.7 | 58.4 | 172.3 | 3.32 2/ (Actual) |

Note - Foreign currency estimate in previous reports included indirect foreign exchange.

**SECTION 4: MISSION SCHEDULE**

| | No. of Staff on Mission | No. of Days in Country | Return to HQ (Mo./Day/Yr.) | Final Report Date (Mo./Day/Yr.) |
|---|---|---|---|---|
| Latest/Present Mission | 1 | 10 | 10,30,78 | 11,28,78 (FS)* |
| Previous Mission | 1 | 23 3/ | 06,06,77 | 06,14,77 ( 04/ )* |

Next Mission Departure (Mo./Yr.) 07,79

Recommended interval between missions (Months) 9

End of period covered by latest progress report (Mo./Day/Yr.) 09,30,78

* *Type of Report: FS = Full Supervision; CS = Combined Full/B-T-O; C = Completion; A = Appraisal; O = Other (explain below)*

**SECTION 5: COMMENTS** *(Explain "other" in Section 2 and clarify, if necessary, data in Sections 3 and 4)*

1/ Made up of imports and ICB items. 2/ Disbursement delay due to non-issuance by Government of import licenses for imported equipment, preventing placement of orders. 3/ Number of days spent on this project. 4/ Partial supervision report only. 5/ Excluding WC and IDC.

**SECTION 6: SUMMARY OF PROJECT STATUS, TREND, AND MAJOR PROBLEMS:**

Generally, progress on the Project has been slow since award of the major engineering design contracts in late 1976, and even though an extended project schedule was anticipated during appraisal, the planned date for mechanical completion is now end March 1981, which will extend the anticipated date for commencement of commercial production by nine months to September 1981. The delays have been primarily due to late registration of foreign engineering contracts by the Central Bank of Brazil (Annex 4A), delays in reaching agreement with CACEX on the imported equipment list (Annex 4C) and an usually burdensome procurement procedure (Annex 4C). As of October 1978, all basic engineering for the Project (performed by Kellogg and Toyo) has been completed and detailed engineering performed by Brazilian firms has been 55% completed for the ammonia and utilities plants and 68% for the urea unit. Both foreign and local procurement are well behind schedule with no firm orders yet having been placed for imported equipment because of delays in obtaining import licenses and only about 10% by value of local suppliers having been ordered due to a late start on detailed engineering. On the site at Laranjeiras, civil works is fairly well advanced with roads, drainage and services works in progress and some buildings nearing completion. However, plant erection is unlikely to commence for at least another year due to late ordering of equipment. As at the end of September 1978, total expenditures and commitments amounted to US$15.85 1/ in foreign exchange and US$36.9 million in

1/ This amount takes into account some letters of intent to purchase foreign equipment issued by PETROFERTIL.

Preparing Officer: G. Evans Initials: Date 12/06/78

local currency, leaving an estimated US$55.0 million in F.E. and US$152.6 million in L.C. to complete the Project, which is slightly below the Appraisal Report estimate (see Annex 4D). As at the end of October 1978, disbursements for the Bank loan totalled only $3.38 million as compared to an anticipated $23 million at the time of appraisal, reflecting the effect of the delays in foreign procurement.

Section 7: Actions Taken or Recommended

(a) Prompt Issuance of Import Licenses (see Annex 4)

There have already been serious delays in project implementation mainly due to the failure to reach agreement with CACEX preventing commencement of procurement. In view of this, it is recommended that the Bank request the Government to instruct CACEX to promptly issue import licenses for all items on the imported item list (which is now believed to have been accepted in principle by CACEX) without further prior item-by-item review and re-examination (see also Annex 8).

(b) Assistance to PETROFERTIL's Procurement Department (see Annex 4)

PETROFERTIL's Procurement Department, which is relatively newly formed, has a huge task to handle procurement of all items for both the Araucaria and Sergipe Projects, and has so far had little experience of preparing, collecting and submitting to the Bank the documentation required for Bank-financed goods. As a result, much of the documentation submitted to date has been deficient. Consequently, it is recommended that the Bank dispatch a consultant familiar with Bank procurement procedures to work with PETROFERTIL for a period of about two months to assist its staff to become fully familiar with these procedures. The proposal has already been accepted in principle by the company.

(c) Finance Plan (see Annex 4)

Although Section 5.07 of the Loan Agreement required PETROFERTIL to arrange within six months of the date of the agreement additional loans as necessary to complete the Project, and Section 3 of the Shareholder's Agreement required PETROBRAS to take shares in the company's capital as necessary to achieve a debt/equity ratio not greater than 60:40, the finance plan for the Project still remains obscure (see Annex 4, paras 14 and 15). It is recommended therefore that PETROFERTIL be requested to finalize all financing arrangements and submit a firm finance plan to the Bank as soon as possible.

(d) Financial Projections for PETROFERTIL and each of its Subsidiaries (see Annex 5)

It is recommended that the Bank request PETROFERTIL to submit five-year financial projections for the company and each of its industrial units as required under Article 5.05 of the Loan Agreement as soon as possible.

(e) Project Management (see Annex 7)

It is believed PETROFERTIL presently has an over-reliance on PETROBRAS (who are only directly responsible for provision of technical services and construction management) for overall management and coordination of the Project.

The Bank should therefore urge PETROFERTIL to promptly appoint a suitably qualified Project Manager to assume this function and as a first step thereafter to prepare a consolidated project schedule to include the activities of all the groups presently participating in the Project.

(f) Staffing and Training (see Annex 7)

It is recommended that the Bank request PETROFERTIL to submit as soon as possible a detailed plan to recruit and train staff for the Project as required under Article 4.05 of the Loan Agreement.

Industrial Projects Department
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ANNEX 1

# BRAZIL - SERGIPE FERTILIZER PROJECT

## LIST OF PERSONS INTERVIEWED

### PETROFERTIL

1. Luis de Magalhaes Botelho - Finance Director
2. Carlos Palmarino Acciolly - Technical Director
3. Nilo Jose Buzzatti - Assistant to Finance Director
4. Ramiro Carlos Guedes de Campos - Assistant to Technical Director
5. Paulo Roberto Souza de Amorim - Chief of Planning
6. Wagner Silva - Procurement Manager
7. Geraldo C. R. de Almeida - Chief of Production
8. Antonio Carlos Rebeiro - Marketing Manager
9. Leopold Barcante - Finance Manager

### PETROBRAS - CONSTRUCADO DE FERTILIZANTES NITROGENADOS (COFEN)

1. Mr. Horacio Martins - Superintendent
2. Jose Eduardo L. Barretto - Project Engineer
3. Mr. Montenegro - Project Engineer
4. Newton Lima de Freitas Guimaraes - Sergipe Site Manager
5. Antonio Luiz Menezes - Deputy Sergipe Site Manager
6. Paulo Freire - Planning Manager Sergipe Site

Industrial Projects Department
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ANNEX 2

# BRAZIL - SERGIPE FERTILIZER PROJECT

## DRAFT PARAGRAPH FOR PRESIDENT'S REPORT

Loan No. 1406 BR - Sergipe Fertilizer Project
Loan of 4/19/1977
Effective Date: 8/15/1977
Closing Date: 11/30/1981

Plant construction is in progress but is running about nine months behind schedule due to procurement delays. Commencement of commercial production is now expected in September 1981. The anticipated cost to complete the Project is presently running about 8% below budget.

Industrial Projects Department
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# BRAZIL - SERGIPE FERTILIZER PROJECT

## SCHEDULE OF BANK LOAN DISBURSEMENTS
($ 000's)

| Calendar Year and Quarter | Disbursement | | Amount Outstanding | | Undisbursed Amount | |
|---|---|---|---|---|---|---|
| **Calendar Year 1978** | | | | | | |
| Actual to 9/30/78 | 3.3 | (21.0)/1 | 3.3 | (21.0)/1 | 60.7 | (43.0)/1 |
| Quarter IV (Estimated) | 3.0 | (8.0) | 6.3 | (29.0) | 57.7 | (35.0) |
| **Calendar Year 1979** | | | | | | |
| Quarter I | 3.0 | (8.0) | 9.3 | (37.0) | 54.7 | (27.0) |
| Qua" II | 3.0 | (8.0) | 12.3 | (45.0) | 51.7 | (19.0) |
| " III | 4.0 | (6.0) | 16.3 | (51.0) | 47.7 | (13.0) |
| " IV) | 5.0 | (4.0) | 21.3 | (55.0) | 42.7 | (9.0) |
| **Calendar Year 1980** | | | | | | |
| Quarter I | 6.0 | (4.0) | 27.3 | (59.0) | 36.7 | (5.0) |
| " II | 8.0 | (3.0) | 35.3 | (62.0) | 28.7 | (2.0) |
| " III | 10.0 | (1.0) | 45.3 | (63.0) | 18.7 | (1.0) |
| " IV | 10.0 | (1.0) | 55.3 | (64.0) | 8.7 | (0.0) |
| **Calendar Year 1981** | | | | | | |
| Quarter I | 5.0 | (-) | 60.3 | (64.0) | 3.7 | (0.0) |
| " II | 2.0 | (-) | 62.3 | (64.0) | 1.7 | (0.0) |
| " III | 1.7 | (-) | 64.0 | (64.0) | 0.0 | (0.0) |
| | 64.0/2 | (64.0) | | | | |

/1 Figures in brackets shown in the above table represent the Appraisal Report estimates.

/2 Assumes loan will be fully disbursed.

Industrial Projects Department
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# BRAZIL - SERGIPE FERTILIZER PROJECT

## EXECUTION OF THE PROJECT

### A. Engineering and Project Schedule

1. In November 1976, PETROFERTIL signed contracts with Pullman Kellogg (USA) for provision of process license, basic engineering design, procurement of critical equipment and technical advisory services relating to the ammonia unit and general offsites facilities, and with the Toyo Engineering Company (Japan) for similar services relating to the urea unit. Subsequently, PETROFERTIL also signed contracts with two domestic engineering firms, Promon Engenharia S.A. to perform detailed engineering and non-critical procurement services for the ammonia and offsites units under the supervision of Kellogg, and Montreal Engenharia S.A.[1/] to perform similar services for the urea unit under the supervision of Toyo. Neither foreign contractor was able to commence work, however, until its contract was registered with the Banco de Brasil, which in turn required the prior approval of the Secretary of Mines and Energy and the I.N.P.I. ("Industrial Property Institute), the latter being now responsible to ensure that no contracts are approved involving payment of foreign license fees unless the licensor holds patents registered in Brazil. The Kellogg contract received all necessary approvals and became effective on March 16, 1977. The Toyo contract, however, even though it included license fees as had been previously approved for PETROFERTIL's Camacari project, was held up by the I.N.P.I., who ruled that Toyo's urea patents had not yet been approved in Brazil. Toyo therefore did not start work on the Project until July 27, 1977 (eight and a half months after contract signing) and then only under a special arrangement with PETROFERTIL. The Toyo patent was not approved for registration until October 12, 1977, thus opening the way for formal registration by the Banco de Brasil. (It may be noted here that the IBRD agreed at the time of appraisal to finance the Kellogg and Toyo contracts without any competitive bidding in order to expedite implementation of the Project.)

2. The long delays in registration of these two contracts, by delaying the start of basic engineering design (and by delaying procurement, as will be seen in Annex 4C) have significantly extended the completion time of the Project. As of October 1978, all basic engineering design for the Project had been completed (by Toyo in January 1978 and by Kellogg in March 1978). Detailed engineering for the ammonia and offsites units was 40% complete and for the urea unit 63% complete. Overall, engineering design was 55% complete for ammonia and offsites and 68% for urea, indicating about a nine-month delay compared to the appraisal estimate. As receipt of vendor drawings will be delayed because of late ordering of equipment, however, it is likely that completion of detailed engineering will be further delayed until at least September/October 1979, representing a one-year delay in the schedule indicated in the Appraisal Report. As this will in turn delay site construction

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1/ "Montreal" has now been absorbed by the International Morrison Knudsen Corporation and has been renamed "Companhia Internacional de Engenharia" (Internacional).

work, it is believed little, if any, of this lost time will be made up and end March 1981 will now represent the most optimistic date for mechanical completion of the Project.

3. The design of the water supply pipeline from the Sao Francisco River to the plant site, which is now outside the financial scope of the Project,[1/] is being undertaken by a Brazilian firm, "GEOTECNICA," and was 25% complete as of October. The design of the gas supply pipeline from Carmopolis to Aracaju, which is being undertaken by PETROBRAS, is already 95% complete, and a construction contract is expected to be awarded soon with construction scheduled for completion by May 1980. Engineering of the gas/liquids separation plant at Aracaju is similarly well advanced, and construction, which is already underway, is expected to be complete by June 1980. The Bank's gas consultant is visiting PETROBRAS in November to further review engineering of the gas transmission and treatment facilities as well as updating gas reserves estimates and examining gas production programs, gas production facilities and arrangements for dedication of gas to the Project.

B. Site Construction

4. Management of site construction is being undertaken on behalf of PETROFERTIL by PETROBRAS through a division of its Engineering Services Department referred to as COFEN,[2/] which is additionally supervising the engineering, and coordinating the entire Project from its Rio offices. The site manager, Mr. Newton Lima de Freitas Guimaraes, who is responsible to COFEN's General Manager in Rio (Mr. Horacio Martin ) is a competent and experienced engineer/manager, having been previously site manager for PETROFERTIL's ammonia/urea complex at Camacari. The site organization is shown in figure 1 and is based on PETROBRAS standard site management structure for large petrochemical plants. It includes four services departments (Planning, Administration, Materials Control and Finance) and three construction supervision groups with a total strength of 195 staff to handle both the fertilizer project at Laranjeiras and the gas/liquids separation plant at Aracaju, about 15 km distant. Considerable authority is vested in the site manager, who is extended full autonomy in the control of the works, inclusive of award of all but the most major contracts. Present staff strength is 87, as shown in figure 1, and is adequate for the present stage of construction which is confined to civil works. Later, when erection work begins, it is planned to have the assistance of about seven expatriates from Kellogg and Toyo to assist with erection planning and technical supervision.

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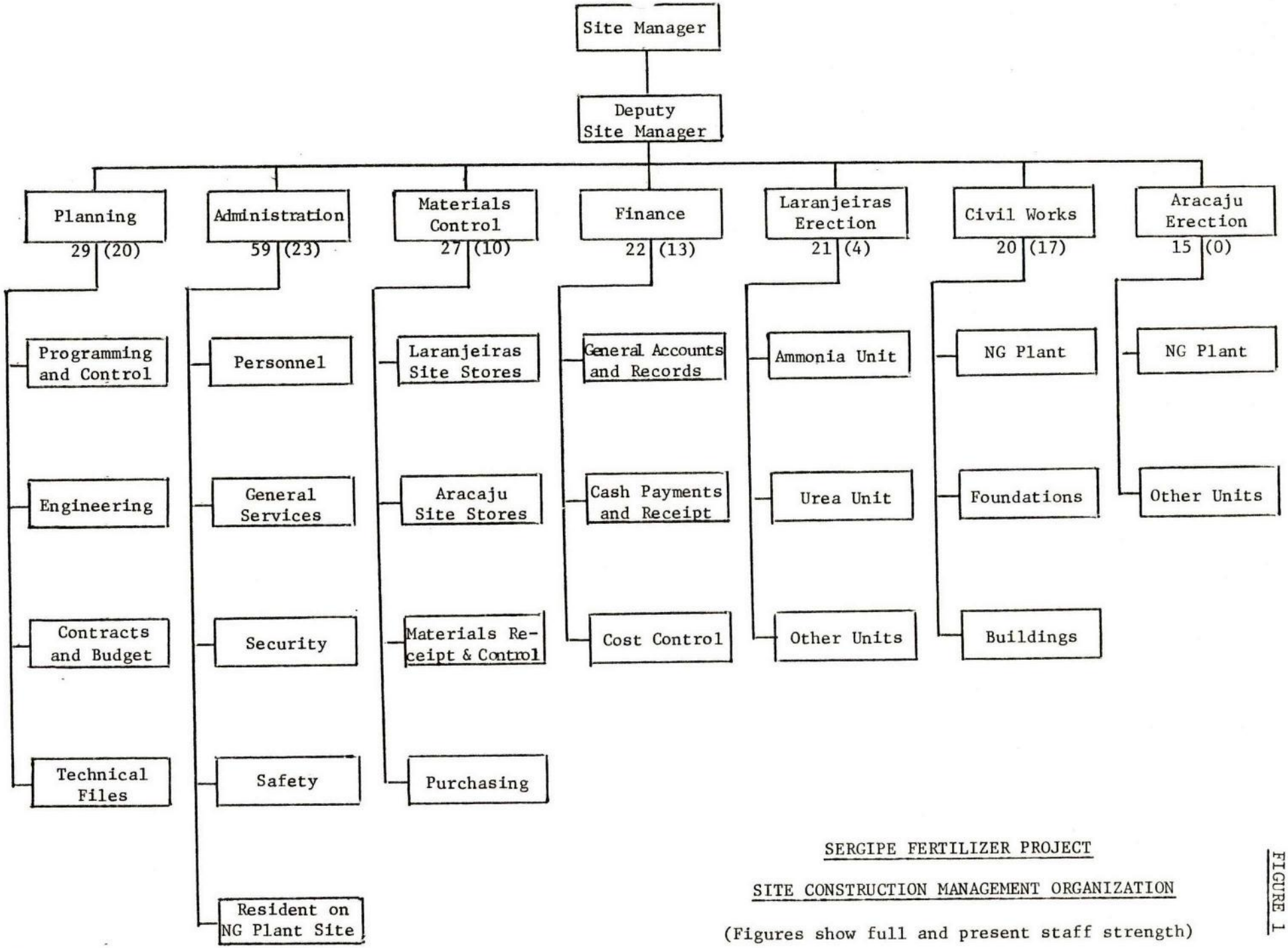
1/ PETROBRAS will now bear PETROFERTIL's share of the financing of this pipeline.

2/ Construcao de Fertilizantes Nitrogenados. COFEN is currently managing four projects, Sergipe and Araucaria, which are being financed by the Bank, the North Rio Ammonia Urea Plant being financed by the IDB and the Aracaju Gas/Liquids Project mentioned in para A. 3.




SERGIPE FERTILIZER PROJECT

SITE CONSTRUCTION MANAGEMENT ORGANIZATION

(Figures show full and present staff strength)

FIGURE 1

Industrial Projects Department
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5. As of October, all earth moving, levelling and grading work on the site had been completed with roads and drainage construction in progress and expected to be complete by January 1979. Construction of plant buildings was in progress with the guardhouse, medical center and general services buildings being complete, the administration block (65% complete), canteen (25%), three maintenance shops (57%) and two general warehouses (75%). A contract for detailed design of plant foundations and urea prilling tower had previously been awarded to a Brazilian civil engineering consulting firm (GEOTECNICA), who had specified piling of foundations for the prilling tower, and some of the plant units. Construction of the prilling tower foundation had been completed in October and slip forming of the tower itself was about to begin under a contract awarded to a major Brazilian contractor (TENENGE). Construction of foundations and piling for the ammonia and urea units had progressed to the stage in October where it represented 10% and 7% completion of all civil works for those units, respectively. Amongst the services facilities, two service water concrete reservoirs with a total storage capacity of 23,000 cubic meters were 78% completed and pad foundations for fuel oil and diesel oil storage fully complete. The liquid ammonia storage tank foundations were about to be started.

6. While reasonable progress is presently being made on construction of civil works on the site, it is clear that further progress will be severely hindered due to the delay in completion of detailed design of foundations and structures. Further, it is unlikely that any significant erection work will begin for about one year due to late ordering of equipment. In an endeavor to recover as much of this lost time as possible, the site management is scheduling a total plant construction time of 20 months to meet the newly targeted mechanical completion date of March 1981. This is, however, a tight schedule and will be difficult to meet.

C. Procurement

7. Procurement delays especially in the placement of orders for foreign equipment have been the major cause of slippage in the overall project schedule. As at October 1978, no firm orders had yet been placed for foreign equipment or materials, although letters of intent to a total value of US$9.3 million had been issued during September/October for the critical items below:

| Item | Supplier | Price | US$ Equivalent |
|---|---|---|---|
| $CO_2$ Compressor | KOBE (Japan) | Y 180,813,000 | $ 977,000 |
| CO2 Booster Compressor | KOBE/SUMITOMO | Y 88,332,000 | $ 477,000 |
| Feed Gas Compressor | Demag (FRG) | Dm 880,036 | $ 463,000 |
| Air Compressor/Turbine | Demag (FRG) | Dm 2,321,215 | $1,221,000 |
| | AEG (FRG) | Dm 1,169,694 | $ 616,000 |
| Syngas Compressor/Turbine | N. PIGNONE (Italy) | US$ 2,163,832 /1 | $2,163,832 |
| High Pressure Decomposer | Mitsui (Japan) | Y 31,772,000 | $ 171,000 |
| Recycle Solution Pumps | EBARA (Japan) | Y 116,346,000 | $ 629,000 |
| Reformer Furnace Internals | Heat Research (USA) | US$ 2,232,000 | $2,232,000 |
| Portal Reclaimer Components | ARENCO (FRG) | Dm 307,950 | $ 162,000 |
| Transfert Line | I.H.I. (Japan) | Y 19,221,000 | $ 103,000 |
| Alloy Steel Plate | E.U.D. (FRG) | Dm 159,432 | $ 84,000 |
| Spray Nozzles | Mitsui (Japan) | Y 890,000 | $ 5,000 |
| | TOTAL | | $9,303,832 |

/1 Bid in US$.

Additionally, letters of intent for a further US$1.35 million covering ammonia pumps, urea reactor and potassium carbonate solution pumps were ready for issuance. There have also been delays in placing orders for local equipment and supplies with only about 9% of the total by value having been ordered by the end of September 1978. These long delays in placing orders are attributable to delays in commencing engineering design (para A.1-2), failure to reach agreement with CACEX on the local reserve equipment list (para A. 8) and an extraordinarily complicated and cumbersome procurement procedure (para A. 9). Figure 2 shows the sequence of events over the 23-month period between November 1976 when the foreign engineering contracts were signed and September/October 1978 when the first letters of intent for foreign equipment orders were placed. This diagram indicates the two consecutive delay periods, the first being caused by the late registration of foreign engineering contracts which resulted in the passage of 12 months before a consolidated registered vendor list was submitted to the Bank, and the second by the cumbersome project procurement procedures which absorbed a further 9 months[1/] for selection of vendors from the date of issuance of bid invitations. The chart further shows that even after the passage of this 23-month period, only letters of intent could be issued to foreign suppliers because agreement had not yet been reached with CACEX[1/] on the equipment reserve list.

8. During Loan Negotiations for the Project in Washington in February 1977, the project authorities submitted to the Bank a draft equipment reserve list based on a 60/40 split between imported and local supply as previously agreed between the Bank and the Ministry of Finance. They anticipated at that time that in view of this basic agreement, approval of this list by CACEX

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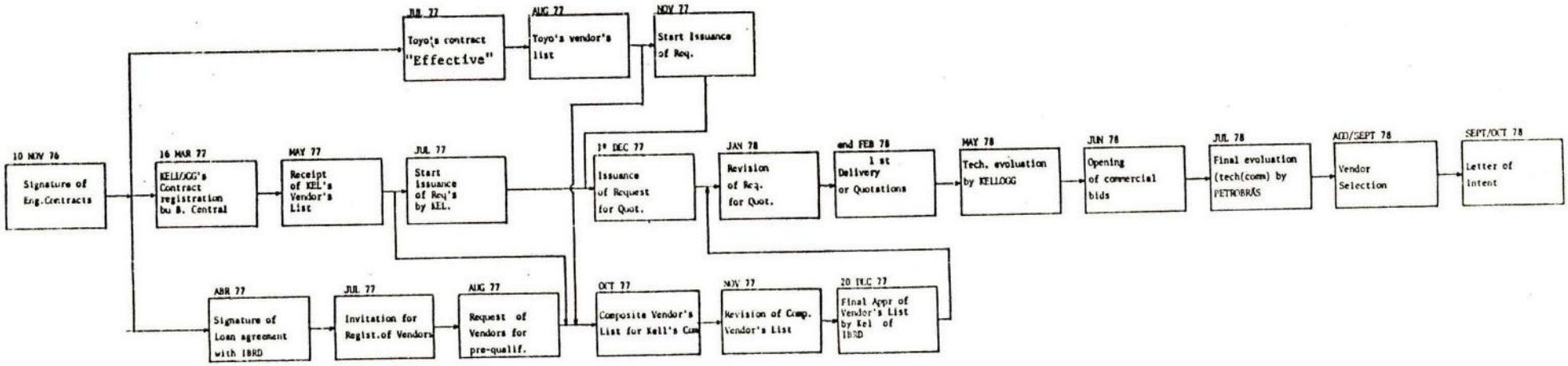
1/ This nine-month period included only two months for bid preparation.

2/ CACEX is a branch of the Banco de Brasil which administers all import (and export) licensing. It operates under powers bestowed upon it by the C.P.A. (Customs/Politics Council) pursuant to Brazilian Decree No. 37 and is presided over by the Ministry of Finance. Its director is Mr. Benedito Moreira, and the manager of the import licensing division is Mr. Salek. Under CACEX's normal procedure, a plant builder wishing to import a range of equipment must first draw up a list of all such items and seek the prior agreement of ABINEE (The Brazilian Electrical Equipment Manufacturers Association) and SIMESP (The Brazilian Association of Mechanical Equipment Manufacturers) that the listed items cannot be produced in Brazil. The final agreed list as signed by both associations and containing item by item specifications and prices may then be submitted to CACEX for its blanket approval as a basis for subsequent applications for import license on an item-by-item basis. To make such an application, the importer must first obtain a proforma invoice for the goods from the selected vendor and submit this together with a certificate of approval from the Ministry of Mines and Energy (who exercise budget control over each corporation) to CACEX, who will then check the price and specification of the goods against the orginally agreed list before granting an import license. Normally, it takes four to eight months to obtain CACEX blanket approval of the full equipment list and a further two to three months for the granting of each import license from the date of application. However, in the latter case, this period may be extended up to one year if the specification of the item on the proforma invoice is at variance with that on the originally agreed list or the invoice price is significantly above the original estimate. Again, long delays are sometimes experienced in obtaining the proforma invoice from foreign suppliers made out in accordance with CACEX standard PGI format, especially when such suppliers do not have local representation.

# SERGIPE FERTILIZER PROJECT - BRAZIL




SERGIPE FERTILIZER PROJECT

ACTUAL SCHEDULE OF EVENTS
LEADING TO ISSUANCE OF
FIRST LETTERS OF INTENT
TO PURCHASE IMPORTED
EQUIPMENT ITEMS

FIGURE 2

Industrial Projects Department
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as a prerequisite for the granting of import licenses would be duly received. However, as of October 1978, CACEX's formal approval had not yet been received and accordingly no applications for the granting of individual import licenses had yet been submitted, and in turn no firm foreign orders placed. A brief history of the relevant events over this period is as follows: Following further detailed review of the draft equipment list by Kellogg and Toyo, PETROFERTIL, pursuant to a previous telex from the Ministry of Finance to both CACEX and PETROFERTIL reflecting the basic agreement with the Bank, submitted the proposed list showing a 60/40 split to CACEX in September 1977. In December 1977, CACEX responded that while it accepted the basic 60/40 split obligation, the list per se could not be accepted as it had not been agreed with the Brazilian Manufacturers Associations. From December 1977 until April 1978, PETROFERTIL contemplated whether the agreement between the Government and the Bank as accepted by CACEX should be an adequate basis for the granting of import licenses or alternatively whether the normal procedure of involving the local manufacturers associations should be followed. PETROFERTIL finally, however, opted for the latter and submitted the list to the two national associations through CACEX in April this year. As of mid-October 1978, the list, which has been through several revisions[1/] since being originally agreed by the Bank, has now been signed by the two national associations and PETROFERTIL is awaiting confirmation from CACEX of its own agreement. The present list exhibits the following features:

| ICB Items | US$ | % |
|---|---|---|
| Imported Equipment[/a] | 20,552,890 | 22.6 |
| Imported Materials[/a] | 3,123,989 | 3.4 |
| ICB Items[/b] | 12,684,945 | 14.0 |
| Subtotal | 36,361,824 | 40.0 |
| Local Reserve | | |
| Subtotal | 54,541,907 | 60.0 |
| Total Equipment and Materials | 90,903,731 | 100.0 |

/a Not manufactured in Brazil.

/b With Brazilian participation.

It is clear from the provisionally agreed list that many items originally planned for importation have now been shifted to local reserve. But this has been compensated to the extent of retaining the 60/40 split import by inclusion of imported raw materials for Brazilian fabricators under the import list and a switching of the urea reactor from local reserve to the import list following the insistence of Toyo. Among the items switched from the imported supply to local

1/ Without reference to the Bank.

reserve are the ammonia unit primary waste heat boiler and steam drum which the Bank had previously accepted as technically critical items at the request of PETROFERTIL. While the new list clearly reflects the desired objectives of Brazilian equipment manufacturers far more than those of the Bank, PETROFERTIL or its engineering consultants, it may represent the best compromise that can be reached at this stage of the Project.

9. Procurement of all equipment and materials for the Project is being undertaken by PETROFERTIL's purchasing department with the assistance of Kellogg, Toyo, COFEN, PROMON and INTERNATIONAL. The extraordinarily complex procedures necessary to coordinate these groups and to comply with all required regulations are best seen by reference to Figure 3, representing the procedures followed for Bank-financed imported items. Here it is seen that from the time of identification of an item to be purchased, there are 17 consecutive steps requiring transfer of documentation between different departments or organizations for action, study or approval before a letter of intent is finally issued to the successful vendor. Further complications (which is not shown on the diagram) also arises from the steps additionally necessary to obtain an import license for the item as required before a firm purchase order can be issued (see footnote 2, page 4, Annex 4). It may be worth noting that under normal circumstances where there would be one engineering firm and a fully authorized representative of the owner working in the engineering firm's offices, some 13 of these steps could be eliminated. The procedures followed for procurement of domestic supplies are virtually the same except that no public bid opening or Bank approvals are required and normally a maximum of four or five firms are invited to bid. PETROFERTIL's intention to itself import certain raw materials for supply to local fabricators on whom it places orders for equipment will combine the three major tasks of foreign procurement, import licensing and local procurement into one huge procurement operation involving a mammoth coordination task. While therefore serious procurement delays have already been suffered, the prospects of further such delays throughout the course of the Project may be anticipated.

10. There have also been delays in placing orders on local suppliers for certain major equipment items due to the insistence of domestic manufacturers associations and CACEX that these items be manufactured in Brazil even though the domestic manufacturers' capabilities were unproven. As a result, it was decided by PETROFERTIL to bring an expert team from Kellogg to Brazil in March 1978 to survey local manufacturers' capabilities before selecting those firms to be invited to bid and consequently such invitations were not issued until around the middle of this year. Again, there have been delays in finalizing the order on the domestic firm CONFAB for manufacture of the ammonia converter, and as at October 1978, this matter remained unresolved. This is a long delivery item, and its late delivery will further extend the project completion time.1/

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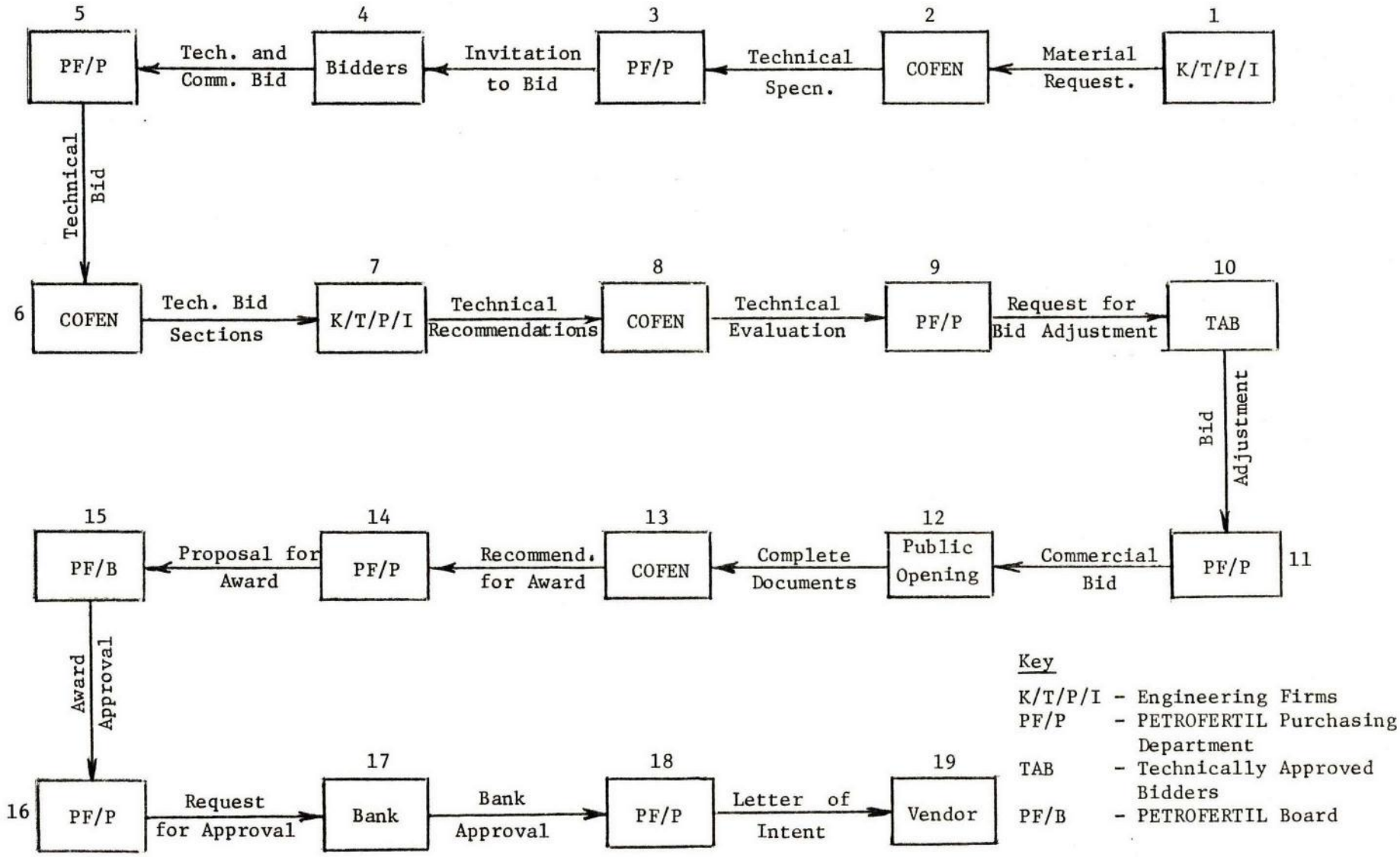
1/ In February 1977, the Bank agreed to CONFAB bidding the ammonia converter subject to the conclusion of a satisfactory collaboration agreement with Struthers Wells (USA) and the overall approval of Kellogg, which was ultimately given in March 1978. The invitation to bid had been issued in this case in January this year, and CONFAB was selected as the supplier in June. However, following a vendor coordination meeting with Kellogg held in September to plan commencement of the work, CONFAB requested a price increase and negotiations are still in progress.

SERGIPE FERTILIZER PROJECT

SCHEMATIC PROCUREMENT PROCEDURE
(Major Item)




Key

K/T/P/I - Engineering Firms
PF/P - PETROFERTIL Purchasing Department
TAB - Technically Approved Bidders
PF/B - PETROFERTIL Board

FIGURE 3

11. Even with the above delays, which are almost entirely outside of its control, PETROFERTIL's purchasing department is handling its procurement task creditably in spite of a serious understaffing problem, which has to some extent caused priority to be given to the Araucaria Project procurement, which is proceeding concurrently. It is implementing sound systems for expediting and for inspection which for national supply will be undertaken by PETROFERTIL's own staff,[1/] although contracts with inspection and expediting firms may also be awarded. Insurance of purchased equipment is arranged through PETROBRAS open policy with the Brazilian Government Reinsurance Agency which covers the equipment up till 60 days after receipt. The heavy work load on PETROFERTIL's purchasing department, however, is preventing it devoting adequate attention to requirements for Bank-financed goods and the flow of necessary documentation to the Bank, particularly detailed bid evaluation has been inadequate. It is recommended therefore that the Bank dispatch a consultant procurement expert to work with PETROFERTIL for about two to three months to provide assistance and guidance in this area.

D. Cost to Complete the Project

12. The estimated cost to complete the Project is $260.3 million, including $70.8 million in foreign exchange,[2/] which is slightly below the appraisal estimate of $283.4 million. The current total project cost estimate expressed in September 1978 prices is itemized in the following table with the corresponding figures contained in the Appraisal Report of April 1977 expressed in January 1977 prices set out alongside in brackets for comparison. The present estimate is based on an estimate prepared by COFEN in August 1978, which in turn was based on a definitive estimates prepared by Kellogg and Toyo towards the end of 1977. The new estimate shows a significant reduction in infrastructure costs which is due mainly to PETROBRAS now assuming PETROFERTIL's share of the financing for the water supply pipeline and rail-link, each of which will also serve PETROBRAS' own facilities. There have also been reductions in the amounts allowed for equipment and materials following Kellogg and Toyo's definitive estimates at the end of 1977 and in "Administrative Support" costs mainly following a negotiated reduction in the fees charged to PETROFERTIL by COFEN as a result of PETROFERTIL's enlarged procurement role and COFEN's Laranjeiras site services being also used for PETROBRAS gas/liquids plant at Aracaju. The estimated cost of civil works has, however, been substantially increased following a new study of foundation, piling and concrete structure costs which was made shortly after appraisal on the basis of a comparison of costs of the Araucaria Project. Overall, the allowance for price escalation has been reduced for the reasons given in footnote 1 to the table, but the contingency provision has been increased by PETROFERTIL. The interest during construction on the Bank loan has been reduced to reflect the delay

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1/ Kellogg and Toyo are handling expediting and inspection of imported equipment.

2/ The amount of $70.84 million includes $58.46 million in ICB items eligible for financing from the Bank loan and $12.38 million in interest payable on this amount during the construction period.

(In millions US dollars)

| | | ICB | | Local Reserve | | Total | |
|---|---|---|---|---|---|---|---|
| 1. | Site Preparation | - | (-) | 4.77 | (5.57) | 4.77 | (5.57) |
| 2. | Infrastructure | - | (-) | 0.08 | (3.61) | 0.08 | (3.61) |
| 3. | Civil Works | - | (-) | 21.84 | (13.66) | 21.84 | (13.66) |
| 4. | Equipment and Materials | 37.00 | (40.61) | 55.28 | (60.92) | 92.28 | (101.53) |
| 5. | Freight and Insurance | 3.70 | (5.16) | 2.76 | (3.05) | 6.46 | (8.21) |
| 6. | Plant Erection | - | (-) | 25.01 | (27.83) | 25.01 | (27.83) |
| 7. | Engineering Services | 8.64 | (9.10) | 11.35 | (10.92) | 19.99 | (20.02) |
| 8. | Administrative Support | - | (-) | 9.13 | (13.49) | 9.13 | (13.49) |
| 9. | Preoperational Expenses | - | (-) | 4.52 | (2.89) | 4.52 | (2.89) |
| 10. | Contingencies | 4.93 | (4.58) | 18.70 | (12.54) | 23.63 | (17.12) |
| 11. | Price Escalation | 4.19 | (4.88) | 18.84/1 | (24.31) | 23.03 | (29.19) |
| | Total Project Cost | 58.46 | (64.33) | 172.28 | (178.79) | 230.74 | (243.12) |
| 12. | Interest During Construction/2 | 12.38 | (17.59) | 6.26 | (7.76) | 18.64 | (25.35) |
| 13. | Working Capital | - | (-) | 10.91 | (14.95) | 10.91 | (14.95) |
| | Total | 70.84 | (81.92) | 189.45 | (201.50) | 260.29 | (283.42) |

/1 As a result of indexation, PETROFERTIL does not provide any price escalation on the local cost. Accordingly, the amount shown is the original appraisal estimate adjusted for the escalation already incurred from the January 1977 prices of the appraisal estimate to the September 1978 prices of the current estimate, the nine-month delay in the project completion date, and the new total project cost (excluding escalation).

/2 Original appraisal estimate adjusted for new total project cost and construction period, and present disbursements.

in disbursement arising from late placement of foreign orders which will result in a bunching of Bank loan disbursements towards the end of construction period with a commensurate reduction in interest due.[1] Another new cost estimate will be made by COFEN and PETROFERTIL in March 1979 based on actual costs incurred to that time.

E. Disbursements

13. Progress of expenditure and commitments against the Bank loan and the total project funds up to September 30, 1978, is as set out below:

(Millions of US dollars)

| | Bank Loan | Total Project |
|---|---|---|
| Expenditure | 4.1/a | 11.4 |
| Unexpended Commitments | 4.0/b | 34.1 |
| Total Commitments | 8.1 | 45.5 |
| Estimated Cost to Finish | 50.4 | 214.8 |
| Total Estimated Funds Use | 58.5/c | 260.3 |

/a Expenditures shown are a little higher than actual disbursements with the difference representing disbursement applications in the course of preparation, transit and processing. Actual disbursements as at September 30 were $3.3 million.

/b Not including future interest payments or letters of intent to purchase equipment already issued.

/c Slightly under the loan amount of $64 million.

14. At the time of loan approval, the full financing arrangements for the Project had still not been completed. Consequently, under Article 5.07 of the loan agreement, PETROFERTIL was required to obtain a local currency loan equivalent to not less than $71 million from the BNDE[2] (or any other source) with a repayment period of 15 years, including 4 1/2 years grace, and within 6 months after the date of the agreement (4/29/77) untied foreign credit as required to complete the Project, then estimated at $25 million. Although it has not yet completed all formalities, PETROFERTIL has now made appropriate arrangements to secure these funds. On the 29 July 1977, it signed an agreement with BNDE[3] for 2,351,000 ORTN[4] equivalent to about

1/ Kellogg and Toyo are handling expediting and inspection of imported equipment.

2/ Banco Nacional do Desenvolvimento Economico.

3/ Available in Project File.

4/ Obrigacoes Reajustaveis do Tesouro Nacional--A monetary unit of the Central Bank which has constant real value.

US$35.5 million or half the stipulated local currency requirement. The balance will be supplied by FINAME,[1] a special branch of BNDE which finances domestically manufactured equipment. This agency, however, only enters into loan agreements on a case-by-case basis, and consequently, there will be loan agreements with PETROFERTIL to cover the purchase of each piece of equipment. Although this would seem to be an extremely cumbersome arrangement, it is unlikely that it will cause any delays in the Project. To secure the balance of the foreign loan funds required, PETROFERTIL has made arrangements for an untied foreign exchange loan of $25 million with the Morgan Guarantee Trust Company of New York, and the loan agreement[2] is expected to be signed shortly.

15. For the equity finance portion, PETROFERTIL has planned that SUDENE[3] should take up about 30% of the equity in the Project through the agency of FINOR.[4] However, FINOR is presently in a weak financial situation having more demands for funds than available resources and no arrangements have so far been completed. PETROFERTIL is still negotiating with FINOR, however, but consistent with the relevant provisions of the loan agreement will inform the Bank before entering into any binding commitment. The financing arrangements consistent with the current capital estimate are expected therefore to be as below:

| | US$ Million |
|---|---|
| Equity | |
| PETROBRAS/a | 72.0 |
| FINOR | 28.0 |
| Debt | |
| World Bank | 64.0 |
| Morgan Guarantee | 25.0 |
| BNDE | 35.5 |
| FINAME | 35.5/b |
| Total Debt | 160.0 |
| Total Financing Available | $260.0 |

/a The actual level of PETROBRAS equity contribution will be as necessary to complete the Project and to maintain a debt/equity ratio of not more than 60/40 as provided in Section 2(a) of the Shareholders Agreement. PETROBRAS may therefore also provide some loan funds.

/b The actual FINAME loan will be in accordance with local equipment financing requirements.

1/ Agencia de Financiamento Industrial.

2/ The draft agreement is available in the Project File.

3/ Superintendencia do Desenvolvimento do Nordeste (North East Development Authority). A regional development agency established by the Federal Government under Decree No. 3692/59.

4/ Fundo de Desenvolvimento do Nordeste (North East Development Fund).

# BRAZIL - SERGIPE FERTILIZER PROJECT

## COMPANY OPERATIONS AND FINANCIAL ANALYSIS

### A. Existing Company Operations

1. PETROFERTIL currently has two subsidiaries operating fertilizer plants, ULTRAFERTIL[1/] and NITROFERTIL, and three further plants in the design or construction stage, "Sergipe" (the subject of this report) and "Araucaria," both of which are being financed by the Bank, and "North Rio," being financed by the I.D.B. Additionally, PETROFERTIL has a 30% equity holding in GOIASFERTIL, a company formed to develop rock phosphate and other minerals in the state of Goias, a 20% holding in PHOSFERTIL, a company formed to explore similar deposits in Minas Gerais, and intends to take up 30% equity in a new company, CRN,[2/] formed to establish a coal-based ammonia project in Rio Grande do Sul, and is about to purchase all government-owned shares and a substantial new share issue in I.C.C., [3/] a company currently building a sulfuric acid/phosphoric acid complex. (See also Araucaria Supervision Report, 7/28/78.) PETROFERTIL has informed the Bank of all these investment plans as required under Section 4.04 of the Loan Agreement for the Sergipe Project.

2. In 1977, PETROFERTIL's total production of solid fertilizers was 628,900 tons up from 428,100 tons in the previous year. The projected output for 1978 shows a further increase to 770,400,tons, mainly attributable to the achievement of full production of NITROFERTIL's new ammonia/urea plant at Camacari. Further substantial increases will occur in 1982 and thereafter following the commissioning of the new projects at Laranjeiras (Sergipe), Araucaria and North Rio. The installed capacity and outputs from PETROFERTIL's existing wholly owned manufacturing units over the years 1976 to 1978 are shown in the table below:

(Figures in '000 tons)

| Finished Product | Production | | | Installed Capacity (1978) |
|---|---|---|---|---|
| | 1976 | 1977 | 1978 (Estimated) | |
| Ammonium Nitrate | 144,020 | 215,427 | 241,204 | 227,000 |
| D.A.P. | 218,570 | 261,231 | 266,640 | n.a. |
| M.A.P. | 10,544 | - | - | - |
| CAN | - | 99,970 | 120,229 | 148,500 |
| Nitric Acid (100%) | - | 13,945 | 23,600 | n.a. |
| Sulfur | - | 6,062 | 10,080 | 13,500 |
| Liquid Ammonia | 17,500 | 13,700 | 73,300 | 162,000 |
| Urea (Technical Grade) | 30,300 | 25,676 | 53,299 | 346,000 |
| Urea (Fert. Grade) | 54,984 | 52,260 | 142,249 | |

1/ ULTRAFERTIL absorbed the operations of FAFER in January 1977 (refer Annex 2 of Appraisal Report).

2/ Companhia Riograndense di Nitrogenados.

3/ Industria Carboquimica Catarinense S.A.

B. Operations of ULTRAFERTIL

3. Pursuant to the requirements of Article 4.04 of the Loan Agreement, PETROFERTIL furnished in August 1977 a report on the financial condition of its subsidiary ULTRAFERTIL S.A.1/ which up till the time of appraisal had been financially weak and operating at poor profitability. The report states that the acquisition of FAFER has significantly improved the financial structure of ULTRAFERTIL by increasing its equity capital in relation to debt financing and adding some Cr$95 million to working capital. Additionally, due to the close proximity of the two works (5 km) and the complementary nature of their marketing activities, a number of operating economies have been possible, which are producing improved project performance. As a result, profit increased to US$10.97 million for the year ending December 31, 1977, compared with US$3.73 million for the preceding year representing an increase in return from 2.4% to 5.6% or the total funds employed or from 9.1% to 14.1% or shareholder's funds. Some part of this improved profitability, however, may be due to the attractive prices the company receives for its products on the domestic market which in some cases are well above the prices for imported material. This can be seen in the table below, which shows a comparison of prices prevailing at the beginning of 1978:

Cr$/Ton

| | Works Realization Price | Imports (fob) | Imports (CIF) | CIF/Imports Including Duties Port Charges and Expenses |
|---|---|---|---|---|
| Liquid Ammonia | 3,308 | 1,877 | 2,212 | 2,365 |
| CAN | 2,595 | 2,310 | 2,860 | 3,110 |
| Ammonium Nitrate | 3,279 | - | - | - |
| DAP | 4,244 | 2,549 | 2,856 | 3,077 |

The company is vigorously pursuing technical developments aimed at rationalizing and streamlining its works operations and projects further steady improvement in profitability over the six-year period, 1978-1983. Tables 1 and 2 show the audited balance sheet as at 12/31/77 and income statement for the year ending 12/31/77, respectively. Tables 3 and 4 show the latest six-year projected balance sheets and income statements for the period 12/31/78-12/31/83.2/ In 1977, some 97% of the net income of PETROFERTIL from its consolidated operations was contributed by ULTRAFERTIL, and this high share is not expected to fall significantly until PETROFERTIL's new projects come into operation.

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1/ Industria e Comercio de Fertilizantes S.A.

2/ These are somewhat more conservative than those contained in the August 1977 report.

TABLE 1

BRAZIL - SERGIPE FERTILIZER PROJECT

ULTRAFERTIL - BALANCE SHEET AS AT 12/31/77

| | US$ (000) |
|---|---|
| **Assets** | |
| Current | |
| Cash | 2,464 |
| Short-Term Investments | 14,034 |
| Accounts Receivable | 66,717 |
| Inventories | 46,776 |
| Compulsory Deposits | 1,189 |
| Prepaid Expenses | 5,386 |
| Total Current Assets | 136,566 |
| Compulsory Loans and Deposits | 4,878 |
| Investments | 1,461 |
| Capital Assets | 48,652 |
| Pre-Operating Expenses | 4,595 |
| | 196,152 |
| **Liabilities and Shareholders' Equity** | |
| Current | |
| Short-Term Loans | 62,052 |
| Trade Accounts Payable | 6,560 |
| Accrued Taxes | 7,696 |
| Loans of Materials | 1,373 |
| Deferred Fertilizer Sales | 1,680 |
| Proposed Dividends | 2,636 |
| Employees' Participation | 1,132 |
| Others | 4,996 |
| Total Current Liabilities | 88,125 |
| Long-Term Debt | 30,296 |
| Shareholders' Equity | |
| Capital Stock | 76,356 |
| Special Reserve | |
| Legal Reserve | 631 |
| Reserve for Contingencies | 1,246 |
| Other Reserves | |
| Accumulated Profit (Deficit) | ( 502) |
| | 77,731 |
| | 196,152 |

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TABLE 2

## BRAZIL - SERGIPE FERTILIZER PROJECT

## ULTRAFERTIL - INCOME AND EXPENDITURE STATEMENT FOR YEAR ENDING 12/31/77

| | US$ (000) |
|---|---|
| Net Sales | 237,380 |
| Cost of Sales | 165,296 |
| Gross Profit | 72,084 |
| Selling Expense | 20,738 |
| Financial Expense | 26,373 |
| Inflationary Effect on Net Monetary Liabilities | |
| General and Administrative Expenses | 10,416 |
| Amortization of Pre-Operating Expenses | 3,581 |
| Other Income | ( 1,917) |
| Employees Participation | 1,132 |
| | 60,323 |
| Income before Taxes, Extraordinary Item and Gain or Loss on Translation | 11,761 |
| Income Tax | 3,693 |
| Income before Extraordinary Item and Translation Difference | 8,068 |
| Extraordinary Item | |
| Reduction of Income Tax Arising from Utilization of Prior Year Tax Losses Brought Forward | 8,068 |
| Gain (Loss) on Translation | 2,903 |
| Net Income | 10,971 |
| Appropriation to Legal Reserve | 631 |
| Appropriation to Reserve for Contingencies | 1,246 |
| Dividends Paid out of Profit - Year Ended December 31, 1976 | 200 |
| Dividends Proposed out of Profit - Year Ended December 31, 1977 | 2,637 |
| | 6,257 |
| Income (Deficit) at Beginning of Year | ( 6,759) |
| Income (Deficit) at End of Year | ( 502) |

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BRAZIL - SERGIPE FERTILIZER PROJECT

SIX-YEAR PROJECTED BALANCE SHEETS ULTRAFERTIL AS AT 12/31/79 THROUGH 12/31/83
(Figures in US$ '000)

| | 1978/2 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| Total Current Assets | 119,306 | 120,930 | 121,779 | 124,786 | 139,103 | 136,519 |
| Cash | 1,771 | 1,771 | 1,771 | 1,771 | 1,771 | 1,771 |
| Other Current Assets | 117,535 | 119,159 | 120,008 | 123,015 | 137,332 | 134,748 |
| Long-Term Assets/1 | 5,893 | 7,630 | 9,483 | 11,254 | 13,083 | 14,927 |
| Permanent Assets | 67,759 | 80,971 | 103,936 | 127,756 | 146,159 | 166,260 |
| Gross Fixed Assets | 149,064 | 179,247 | 207,827 | 236,089 | 262,075 | 283,428 |
| Investment | 2,805 | 4,640 | 7,328 | 10,360 | 13,774 | 17,519 |
| Depreciation (Accumulated) | (84,110) | (102,916) | (111,219) | (118,693) | (126,690) | (134,687) |
| Dividends (Accumulated to be Paid) | - | - | - | - | - | - |
| Cash Surplus | 1,802 | 959 | 182 | 226 | 14 | 677 |
| TOTAL ASSETS | 194,760 | 210,490 | 235,380 | 264,022 | 301,359 | 318,383 |
| Shareholders Funds | 90,610 | 99,205 | 122,031 | 144,181 | 160,992 | 172,385 |
| Stock Capital | 61,687 | 67,589 | 86,473 | 104,177 | 115,980 | 121,882 |
| Reserves | 28,923 | 31,616 | 35,558 | 40,004 | 45,012 | 50,503 |
| Taxes Exemption | - | - | - | - | - | - |
| Retained Earnings | - | - | - | - | - | - |
| Current Liabilities | 71,119 | 90,517 | 98,995 | 93,604 | 95,753 | 93,245 |
| Short-Term Loans | 25,583 | 40,443 | 40,443 | 33,505 | 33,815 | 30,629 |
| Dividends | 12,120 | 16,278 | 23,829 | 26,882 | 30,272 | 33,198 |
| Accounts Payable (Raw Materials) | 8,924 | 9,265 | 9,413 | 9,561 | 9,895 | 10,072 |
| Other Accounts Payable | 24,492 | 24,531 | 25,310 | 23.656 | 21,771 | 19,346 |
| Long-Term Debt | 33,031 | 20,768 | 14,354 | 26,237 | 44,614 | 52,753 |
| Bank Loans | 33,031 | 20,768 | 14,354 | 26,237 | 44,614 | 52,753 |
| TOTAL LIABILITIES | 194,760 | 210,490 | 235,380 | 264,022 | 301,359 | 318,383 |

/1 These are deposits on utilities connections, import license deposits, etc.

/2 Expected as at 12/31/78.

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TABLE 3

TABLE 4

BRAZIL - SERGIPE FERTILIZER PROJECT

SIX-YEAR PROJECTED INCOME AND EXPENDITURE STATEMENTS ULTRAFERTIL 1979-1983
(Figures in US$ '000)

| | 1978/2 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| Sales | 240,291 | 267,314 | 283,898 | 301,610 | 333,251 | 360,575 |
| Industrialized Products Taxes (IPI) | 698 | 796 | 844 | 892 | 918 | 956 |
| Net Sales | 239,593 | 266,518 | 283,054 | 300,718 | 332,333 | 359,619 |
| Cost of Goods Sold | 171,392 | 189,594 | 191,112 | 202,094 | 225,166 | 243,271 |
| Operating Expenses | 49,975 | 52,447 | 56,109 | 58,200 | 61,646 | 66,426 |
| Operating Profit | 18,226 | 24,477 | 35,833 | 40,424 | 45,521 | 49,922 |
| Open-Market Receipts | - | - | - | - | - | - |
| Net Profit Before Taxes | 18,226 | 24,477 | 35,833 | 40,424 | 45,521 | 49,922 |
| Income Taxes | 4,101 | 5,507 | 8,062 | 9,095 | 10,242 | 11,232 |
| Net Profit After Taxes | 14,125 | 18,970 | 27,771 | 31,329 | 35,279 | 38,690 |
| Earnings Distribution | | | | | | |
| Dividends/1 | 12,120 | 16,277 | 23,829 | 26,882 | 30,272 | 33,198 |
| Reserves | 638 | 857 | 1,254 | 1,415 | 1,593 | 1,748 |
| Investments in SUDENE Area (Incentives) | 1,367 | 1,836 | 2,688 | 3,032 | 3,414 | 3,744 |
| Surplus During Year | - | - | - | - | - | - |

/1 Paid to PETROBRAS.

/2 Estimated for the year ending 12/31/78.

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C. PETROFERTIL's Current Financial Position

4. The actual consolidated balance sheet for PETROFERTIL as at December 31, 1977, is shown in Table 5.1/ The long-term debt to equity ratio is 38/62, and the total debt to equity ratio is 51/49, both of which are satisfactory. The current ratio is 1.29, which is above the minimum ratio of 1.2 to be maintained after completion of the Sergipe Project as stipulated under Clause 5.02(b) of the Loan Agreement. The actual consolidated income and expenditure statement for PETROFERTIL for the year ending December 31, 1977, is shown in Table 6. Here it is seen that PETROFERTIL's profitability being dependent almost entirely on ULTRAFERTIL's operation pending start-up of its new projects was extremely low with profit to sales ratio being 5.5%, profit to total funds employed being 3.1%, and profit to shareholder's funds being 7.8%.

D. PETROFERTIL's Financial Projections

5. Article 5.05 of the Loan Agreement stipulates that every year, starting on July 1, 1977, PETROFERTIL shall furnish to the Bank, its financial projections for the following five years, on a consolidated basis, and separately for each of its industrial units. PETROFERTIL has so far failed to comply with this covenant but by October 1978 had prepared preliminary such projections2/ for each of the years 1978 through 1983 for NITROFERTIL, ULTRAFERTIL, PETROFERTIL itself (the holding company), and on a consolidated basis. These will be forwarded to the Bank as soon as they are approved by PETROFERTIL's management. Table 7 shows the preliminary projected balance sheets and Table 8 the preliminary projected income statements, both on a consolidated basis for the years 1978 through 1983. At the end of 1981, after completion of the Sergipe Project, the long-term debt to equity ratio would be 42/58, which is well below the maximum allowable of 60/40, and this would remain relatively steady, but falling still further to 39/61 by 1983. Similarly, the current ratio at end of 1981 would be 2.0, which would be well above the minimum of 1.5 necessary to permit payment of dividends, and it would rise still further to 2.5 by 1983.

6. The projected income and expenditure statements indicate a steady increase in sales value as NITROFERTIL II, Araucaria, Sergipe and finally North Rio come on stream and build up production. Profits build up rapidly until 1980 due to projected improved performance of ULTRAFERTIL and an increased utilization of NITROFERTIL II, but then suffer setbacks in 1981 and 1982 due to losses being sustained in the first year's operations of each

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1/ This statement as also that shown in Table 6 have been taken from the report of the auditors (Arthur Anderson and Company, Rio de Janeiro, Brazil).

2/ These projections as presently prepared and presented in part in this report do not allow for the slippage in completion of the Sergipe Project. They assume mechanical completion of Araucaria by December 1979, Sergipe by December 1980 and North Rio by June 1982.

BRAZIL - SERGIPE FERTILIZER PROJECT

PETROFERTIL - CONSOLIDATED BALANCE SHEET AS AT DECEMBER 31, 1977

(Expressed in thousands of cruseiros - MCr$)

(Note - Use US$1 = Cr$16.0 for comparison with other tables)

## ASSETS

| | Consolidated Balance |
|---|---|
| CURRENT ASSETS: | |
| Cash and Treasury Bonds | MCr$ 565,953 |
| Accounts Receivable | |
| Customers | MCr$1,090,598 |
| Less: Notes Discounted | (13,563) |
| Reserve for Bad Debts | (33,545) |
| | MCr$1,043,490 |
| Subsidiaries and affiliates (PETROBRAS Group) | 4,089 |
| Advances to Suppliers and Contractors | 93,342 |
| Other Receivables | 54,404 |
| | MCr$1,195,325 |
| Inventories, at Average Cost | 743,998 |
| Compulsory Deposits for Importation | 19,731 |
| Special Deposits - ICM Exemption | 8,867 |
| Prepaid Expenses | 89,204 |
| Other Current Assets | 1,868 |
| Total Current Assets | MCr$2,624,976 |
| NONCURRENT ASSETS: | |
| Advances to Suppliers and Contractors | MCr$ 75,146 |
| Compulsory Deposits and Readjustable Bonds - ELECTROBRAS | 57,776 |
| Compulsory Deposits on Fuel Oil Acquisition | 12,815 |
| Judicial Deposits | 2,263 |
| Other Noncurrent Assets | 2,692 |
| Investments, at Cost (Subsidiary Companies and Other) | 69,044 |
| Total Noncurrent Assets | MCr$ 220,006 |
| PROPERTY, PLANT AND EQUIPMENT, Net | MCr$3,270,770 |
| DEFERRED CHARGES, Net | MCr$ 380,304 |
| MONETARY RESTATEMENT AND EXCHANGE VARIATION ON FIXED ASSETS LOANS | MCr$ 121,707 |
| Total Assets | MCr$6,617,733 |

## LIABILITIES AND STOCKHOLDERS' EQUITY

| | Consolidated Balance |
|---|---|
| CURRENT LIABILITIES: | |
| Loans Payable | MCr$1,144,874 |
| Suppliers and Contractors | 232,470 |
| Subsidiares and Affiliates (PETROBRAS Group) | 259,398 |
| Taxes and Social Contributions | 72,903 |
| Product Exchange | 22,047 |
| Sales for Future Deliverance | 26,960 |
| Dividends Declared | 42,304 |
| Accrued Bonuses to Employees | 25,526 |
| Income Tax Payable | 69,647 |
| Other Current Liabilities | 130,927 |
| Total Current Liabilities | MCr$2,027,056 |
| LONG-TERM DEBT: | |
| Loans Payable | MCr$1,515,351 |
| Credit for Future Capital increase - (Petroleo Brasileiro S. A. - PETROBRAS) | 110,000 |
| Total Long-Term Debt | MCr$1,625,351 |
| MINORITY INTEREST | MCr$ 351,306 |
| STOCKHOLDERS' EQUITY: | |
| Capital Stock - Authorized and Subscribed | MCr$2,641,840 |
| Less: Unpaid | (441,853) |
| Subscribed and Fully Paid | MCr$2,199,987 |
| Capital Reserves | 283,541 |
| Statutory Reserves | 48,952 |
| Retained Earnings | 122,405 |
| Less: Minority Interest on Reserves and Retained Earnings | (40,865) |
| Total Stockholders' Equity | MCr$2,614,020 |
| Total Liabilities and Stockholders' Equity | MCr$6,617,733 |

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TABLE 5

TABLE 6

BRAZIL - SERGIPE FERTILIZER PROJECT

PETROFERTIL - CONSOLIDATED INCOME AND EXPENDITURE

STATEMENT FOR YEAR ENDING 12/31/77
(Expressed in thousands of cruzeiros - MCr$)
(Note - Use US$1 = Cr$16.0 for comparison with other tables)

| | |
|---|---|
| SALES | MCr$3,732,096 |
| LESS: Sales Taxes | (13,657) |
| Net Sales | MCr$3,718,439 |
| COST OF SALES | (2,501,653) |
| Gross Profit | MCr$1,216,786 |
| OPERATING EXPENSES: | |
| Sales Expenses | MCr$ (316,243) |
| Financial Expenses, Net | (328,370) |
| Provision for Maintenance of Working Capital | - |
| Directors' Fees | (6,490) |
| Administrative Expenses | (256,918) |
| Taxes, Other than Income Tax | (3,602) |
| Amortization of Preoperational Expenses | (18,781) |
| Other | (24,094) |
| Total Operating Expenses | MCr$ (954,498) |
| OPERATIONAL PROFIT (LOSS) | MCr$ 262,288 |
| NONOPERATING INCOME AND EXPENSE: | |
| Financial Income | MCr$ - |
| Gain (Loss) on Fixed Assets Sales | 5,765 |
| Other | 9,112 |
| Total Nonoperating Income and Expense | MCr$ 14,877 |
| PROVISION FOR MAINTENANCE OF WORKING CAPITAL | MCr$ 23,109 |
| PROVISION FOR BONUSES TO EMPLOYEES | MCr$ (25,526) |
| NET PROFIT BEFORE INCOME TAX | MCr$ 274,748 |
| PROVISION FOR INCOME TAX | (69,647) |
| NET PROFIT FOR THE YEAR | MCr$ 205,101 |

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BRAZIL - SERGIPE FERTILIZER PROJECT

SIX-YEAR PROJECTED BALANCE SHEETS PETROFERTIL AS AT 12/31/79 THROUGH 12/31/83
(Figures in US$ '000)

| | 1978/2 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| Total Current Assets | 124,558 | 126,623 | 127,848 | 142,750 | 168,004 | 172,498 |
| Cash | 3,751 | 3,751 | 3,751 | 4,581 | 4,788 | 5,865 |
| Other Current Assets | 120,807 | 122,872 | 124,097 | 138,169 | 163,216 | 166,633 |
| Long-Term Assets/1 | 7,401 | 9,138 | 10,991 | 12,762 | 14,591 | 16,435 |
| Permanent Assets | 437,481 | 757,123 | 986,078 | 977,206 | 879,721 | 773,684 |
| Gross Fixed Assets | 528,600 | 884,895 | 1,161,264 | 1,257,710 | 1,284,920 | 1,307,000 |
| Investment | 8,201 | 15,155 | 10,711 | 5,060 | 732 | (3,493) |
| Depreciation (Accumulated) | (96,551) | (127,368) | (146,949) | (209,189) | (286,550) | (363,936) |
| Dividends (Accumulated to be Paid) | (2,769) | (15,559) | (38,948) | (76,375) | (119,381) | (165,887) |
| Cash Surplus | 37,529 | 57,287 | 91,376 | 108,367 | 138,155 | 215,872 |
| TOTAL ASSETS | 606,969 | 950,171 | 1,216,293 | 1,241,085 | 1,200,471 | 1,178,489 |
| Shareholders Funds | 300,665 | 468,500 | 606,486 | 637,697 | 641,315 | 677,431 |
| Stock Capital | 267,624 | 427,380 | 555,676 | 608,263 | 623,879 | 633,539 |
| Reserves | 29,698 | 32,877 | 37,646 | 42,941 | 48,803 | 56,239 |
| Taxes Exemption | 302 | 3,208 | 6,135 | 7,274 | 7,324 | 7,663 |
| Retained Earnings | 3,041 | 5,035 | 7,029 | (20,781) | (38,691) | (20,010) |
| Current Liabilities | 68,464 | 77,323 | 78,251 | 71,502 | 72,057 | 68,878 |
| Short-Term Loans | 26,377 | 40,443 | 40,443 | 33,505 | 33,815 | 30,629 |
| Dividends | 134 | 134 | 134 | - | - | 1,259 |
| Accounts Payable (Raw Materials) | 11,875 | 12,215 | 12,364 | 14,341 | 16,471 | 17,644 |
| Other Accounts Payable | 30,078 | 24,531 | 25,310 | 23,656 | 21,771 | 19,346 |
| Long-Term Debt | 237,840 | 404,348 | 531,556 | 462,285 | 487,099 | 432,180 |
| Bank Loans | 237,840 | 404,348 | 531,556 | 462,285 | 487,099 | 432,180 |
| TOTAL LIABILITIES | 606,969 | 950,171 | 1,216,293 | 1,241,085 | 1,200,471 | 1,178,489 |

/1 These are deposits on utilities connections, import license deposits, etc.

/2 Expected as at 12/31/78.

TABLE 7

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TABLE 8

BRAZIL - SERGIPE FERTILIZER PROJECT

SIX-YEAR PROJECTED INCOME AND EXPENDITURE STATEMENTS PETROFERTIL 1979-1983
(Figures in US$ '000)

| | 1978/2 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| Sales | 286,237 | 353,662 | 381,433 | 406,282 | 436,143 | 463,467 |
| Industrialized Products Taxes (IPI) | 1,088 | 1,359 | 1,407 | 1,290 | 1,152 | 1,190 |
| Net Sales | 285,149 | 352,303 | 380,026 | 404,992 | 434,991 | 462,277 |
| Cost of Goods Sold | 198,883 | 234,560 | 238,086 | 253,547 | 276,451 | 294,556 |
| Operating Expenses | 73,832 | 89,372 | 92,458 | 93,574 | 95,407 | 99,056 |
| Operating Profit | 12,434 | 28,371 | 49,482 | 57,871 | 63,133 | 68,665 |
| Open-Market Receipts | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| Net Profit Before Taxes | 22,434 | 38,371 | 59,482 | 67,871 | 73,133 | 78,665 |
| Income Taxes | 5,364 | 9,675 | 15,157 | 17,329 | 18,526 | 19,855 |
| Net Profit After Taxes | 17,070 | 28,696 | 44,325 | 50,542 | 54,607 | 58,810 |
| Net Profit from the Projects (Araucaria, Laranjeiras, Norte Fluminense) | - | - | - | (30,050) | (20,150) | 18,750 |
| Earnings Distribution | | | | | | |
| Dividends/1 | 12,924 | 23,523 | 37,561 | 43,006 | 46,506 | 51,443 |
| Reserves | 785 | 1,343 | 2,082 | 2,264 | 2,447 | 3,692 |
| Investments in SUDENE Area (Incentives) | 1,367 | 1,836 | 2,688 | 3,032 | 3,414 | 3,744 |
| Surplus During Year | 1,994 | 1,994 | 1,994 | (27,810) | (17,910) | 18,681 |

/1 Paid to PETROBRAS.

/2 Estimated for the year ending 12/31/78.

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of the three subsequent projects (Araucaria, Sergipe and North Rio), and it is not until 1983 that the combined operation of these three projects yield a net profit to PETROFERTIL and renew its profit growth. The trend in profitability and returns over these years in terms of three different ratios are shown in the table below, which clearly illustrates the very heavy burden of the new capital investments. Beyond 1983, with favorable market conditions PETROFERTIL should continue to strengthen its position.

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|
| Profit/Sales % | 6.0 | 8.1 | 11.6 | 5.0 | 7.9 | 16.7 |
| Return on Equity % | 5.7 | 6.1 | 7.3 | 3.2 | 5.4 | 11.4 |
| Return on Total Funds % | 2.8 | 3.0 | 3.6 | 1.7 | 2.9 | 6.6 |

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## FERTILIZER DEMAND/SUPPLY BALANCE

### A. Present Consumption of Nutrients

1. Actual and estimated consumptions of each nutrient in Brazil from 1975 to 1978 are given in the table below:

('000 MT)

| Year | N | $P_2O_5$ | $K_2O$ | Total |
|---|---|---|---|---|
| 1975/1 | 379 | 989 | 507 | 1,875 |
| 1976/1 | 498 | 1,229 | 801 | 2,528 |
| 1977/2 | 650 | 1,477 | 817 | 2,944 |
| 1978/2 | 730 | 1,674 | 937 | 3,341 |

/1 Actual.

/2 Estimated.

Annual growth rates over this period fluctuated rather widely year to year but averaged 25% for nitrogen, 19% for $P_2O_5$ and 22% for potash, which is significantly above the corresponding rates estimated in the appraisal report of 13%, 10% and 11%, respectively.

2. Distribution of demand for nutrients over the major geographical regions for the years 1977 and 1978 expressed as a percentage of total demand are shown in the table below:

| | 1977 | | | 1978 | | |
|---|---|---|---|---|---|---|
| | N | P | K | N | P | K |
| North | 0.3 | 0.3 | 0.4 | 0.3 | 0.3 | 0.5 |
| North East | 10.4 | 6.3 | 8.9 | 9.9 | 5.8 | 8.5 |
| Alagoas | 3.1 | 2.0 | 3.3 | 3.1 | 1.9 | 3.1 |
| Bahia | 3.0 | 2.0 | 2.1 | 2.8 | 1.7 | 1.9 |
| Pernambuco | 3.2 | 1.5 | 2.8 | 2.9 | 1.4 | 2.5 |
| Other N. E. States | 1.1 | 0.8 | 0.7 | 1.1 | 0.8 | 1.0 |
| West | 4.2 | 8.9 | 6.7 | 4.1 | 8.5 | 6.3 |
| South East | 54.6 | 31.2 | 49.6 | 55.0 | 32.0 | 48.3 |
| South | 30.5 | 53.3 | 34.4 | 30.7 | 53.4 | 35.9 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

It can be seen from this table that the share of total fertilizer consumption taken by the North East region (which will be served by the Sergipe Project) declined between 1977 and 1978. However, there was still a positive growth rate for the region as shown below:

('000 tons)

| | 1977 | 1978 | Growth Rate % |
|---|---|---|---|
| N | 67,600 | 72,300 | 7.0 |
| P | 93,000 | 97,100 | 4.4 |
| K | 72,700 | 79,600 | 9.5 |
| Total | 233,300 | 249,000 | 6.7 |

B. Projected Nutrient Consumption

2. The Institute of Agricultural Economics in the state of Sao Paulo (IEA) is currently conducting a study on Brazil's future fertilizer requirements under a contract jointly awarded by PETROFERTIL and the Government. The results of this study are expected at the end of 1978. National fertilizer demand projections available at this time are limited to those prepared by BNDE up to 1980, and those prepared beyond 1980 by PETROFERTIL on the basis of past consumption trends and current agricultural developments.1/ These are as shown below compared to those contained in the Appraisal Report.

('000 ton nutrient)

| | | BNDE | PF | Bank |
|---|---|---|---|---|
| 1979 | N | - | 650/a | - |
| | $P_2O_5$ | - | 1,850 | - |
| | $K_2O$ | - | 950 | - |
| | Total | 3,551 | 3,350/a | - |
| 1980 | N | - | 800 | 800 |
| | $P_2O_5$ | - | 2,050 | 1,680 |
| | $K_2O$ | - | 1,000 | 1,000 |
| | Total | 3,956 | 3,850 | 3,480 |
| 1982 | N | - | 1,000 | 1,000 |
| | $P_2O_5$ | - | 2,400 | 1,990 |
| | $K_2O$ | - | 1,250 | 1,200 |
| | Total | - | 4,650 | 4,190 |
| 1985 | N | - | 1,512 | 1,400 |
| | $P_2O_5$ | - | 3,068 | 2,580 |
| | $K_2O$ | - | 1,815 | 1,700 |
| | Total | - | 6,395 | 5,680 |

/a Projected consumptions in 1979 are inconsistent with estimated consumption for 1978 because they are taken from the trend line.

1/ Projections of the PNFCA (National Fertilizer Program) available to the mission prepared in 1973/74 are now considered to be unreliable.

3. Up till the present time, PETROFERTIL's market evaluation and analyses department which was formed to carry out a work program along the lines outlined in paragraph 3.23 of the Appraisal Report and paragraph 55 of the President's Report has not undertaken a study of future fertilizer requirements of the North East region.

C. Future Supply/Demand Balance

4. Projections prepared by PETROFERTIL's Planning Department show that while only about one-third of Brazil's current nitrogen requirements are being met by domestic production, the gap will be substantially closed by 1982 as the new projects come on stream. Unless further projects are approved, however, significant shortages will again appear by 1985. Domestic phosphate production, however, presently only supplies some 20% of the domestic market and will continue to lag far behind demand. It is projected to only reach a little over 50% between 1981 and 1983 when presently planned projects achieve full output. By 1985, unless further projects are approved, the shortfall in domestic production will widen to 60%.

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ANNEX 7

# BRAZIL - SERGIPE FERTILIZER PROJECT

## ORGANIZATION, MANAGEMENT AND PERFORMANCE OF THE BORROWER

### A. Organization of the Company

1. The organization of PETROFERTIL has closely followed the original scheme proposed by the management as illustrated in Chart 1, Annex 2 of the Appraisal Report. The only changes are the addition of GOIASFERTIL (see Annex 5), which is now under construction, to the "Operating Plants and Subsidiaries," and the elimination of FAFER, which has been absorbed by ULTRAFERTIL. Additionally, the operating units at Camacari previously named PETROFERTIL have been renamed NITROFERTIL. Within the corporate management structure, the company is contemplating adding a Project Management Department to its existing three major operational departments, namely, Finance, Industrial and Administrative. It is expected this new department would coordinate the management of each of the major ongoing projects in the same way that the Industrial Department coordinates the operations of the manufacturing units. It is believed that such a department is now urgently needed, and the company can no longer continue to rely solely on PETROBRAS Engineering Department to assume this responsibility on its behalf. The company should therefore form such a department and appoint a suitably qualified General Project Manager for the Sergipe Project as soon as possible.

2. Amongst PETROFERTIL's staff departments (Marketing, Legal, Procurement and Planning), the management has apparently recognized the importance of ensuring that the rapid growth of the company over the next few years be planned and achieved in an orderly and controlled fashion. Accordingly, its Planning Department has been organized into five divisions as below:

| Division | Staff | Function |
|---|---|---|
| Market | 1 Senior Economist<br>3 Economists | Evaluation and analysis of fertilizer market. Forecasting future demand. |
| Budget | 6 Professionals<br>3 Assistants | Cost control.<br>Capital budget. |
| Economic Planning | 5 Economists | Evaluation of new projects. Re-evaluation of old projects. |
| Systems | 6 Professionals<br>4 Others | Computer studies and activities. |
| Organization and Methods | (n.a.) | Work optimization. |

The Chif of Planning, who is directly responsible to PETROFERTIL's Vice President, is Mr. Paulo Roberto Souza de Amorim, a competent professional

who is going about the task of organizing the Planning Department, and developing its procedures and work programs with commendable zeal. Because of the wide diversity of activities encompassed by the department, however, outside specialist assistance from time to time may be useful and necessary.1/ In Mr. Amorim's particular case, it is believed he may derive considerable benefit from a course at the EDI when a suitable range of topics is scheduled.

B. Project Management and Organization

3. PETROBRAS fertilizer project implementation unit (COFEN), within PETROBRAS Engineering Services Department (SEGEN)2/ is supervising project execution on behalf of PETROFERTIL. It has appointed supervisors for each of the three fertilizer projects it is handling, each of whom essentially supervises and coordinates the work of the engineering design contractors, drawing upon the technical divisions of SEGEN as required. As explained in Annex 4, plant construction is also managed by COFEN with the site manager being directly responsible to COFEN's Superintendent, who effectively therefore controls the design and construction of all three projects. As also explained in Annex 4, however, procurement is the responsibility of PETROFERTIL's Procurement Department, which receives only technical advisory services from COFEN. Finally, preparations for project start-up are handled by PETROFERTIL's Industrial Department as part of its overall responsibilities for coordination of manufacturing activities. It is clear therefore that there is currently no entity vested with overall responsibility for coordinating all project activities and this omission is believed to be adversely affecting the progress of the Project. This may be illustrated by the fact that at this stage there is no consolidated project schedule bringing together all the activities and work programs of the above groups into one coordinated plan. Each of these groups is presently working to a schedule prepared to cover its own activities only without sufficient regard to other project activities. The need for prompt preparation of such a consolidated schedule and for early appointment of a single project manager to coordinate the overall Sergipe Project as recommended in para 1 is therefore emphasized here.

C. Project Staffing and Training

4. Under Article 4.05 of the Loan Agreement, PETROFERTIL was required by March 31, 1978, to furnish to the Bank a detailed plan, satisfactory to the Bank, to recruit and train the staff required to operate the facilities included in the Project, and thereafter to carry out this plan. While PETROFERTIL has not yet fulfilled this requirement, it has already prepared a very detailed report covering the staffing of the Project when in operation

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1/ PETROFERTIL's management is currently considering splitting the department into two.

2/ Servicio de Engenharia.

and a schedule for staff pretraining. The mission requested that this report be forwarded to the Bank as soon as possible.

5. PETROFERTIL's staffing plan provides for a full complement of 384 personnel, exactly as per the Appraisal Report estimate. Functional groupings will be as below:

| | |
|---|---|
| General Management | 6 |
| Industrial Safety | 5 |
| | 11 |
| Operating Division | |
| Management | 3 |
| Shift Supervisors | 4 |
| Ammonia Unit | 37 |
| Urea Unit | 34 |
| Utilities | 21 |
| | 99 |
| Technical Division | |
| Management | 2 |
| Records | 3 |
| Laboratory | 22 |
| Process Engineering | 9 |
| Equipment Inspection | 6 |
| | 42 |
| Maintenance Division | |
| Management | 2 |
| Planning and Coordination | 6 |
| Electrical | 11 |
| Instrumentation | 10 |
| Mechanical | 25 |
| Vessels/Piping | 26 |
| Miscellaneous Trades | 16 |
| | 96 |
| Administrative | |
| Management | 4 |
| Security | 20 |
| General Office | 5 |
| Personnel | 6 |
| Medical/Social | 4 |
| Training | 3 |
| General Services | 11 |
| | 53 |
| Finance | 20 |

| | |
|---|---|
| Commercial | |
| Management | 2 |
| Sales | 7 |
| Dispatch | 35 |
| | 44 |
| Purchasing | 19 |
| TOTAL | 384 |

PETROFERTIL sees no difficulty in recruiting these staff, some of whom will be employed locally and the remainder, particularly in the professional and skilled categories, drawn from PETROBRAS or other sources.

6. PETROFERTIL has prepared a very detailed scheme for training plant operators and maintenance staff prior to plant start-up. PETROBRAS has continuous training programs for its own staff, and these programs will be utilized by PETROFERTIL. Under this arrangement PETROBRAS schedules such training courses for PETROFERTIL's staff as soon as it is notified by PETROFERTIL of its requirements. The complete training program for plant operators which is followed by PETROBRAS and which will also be adopted by PETROFERTIL covers a 15-month period and accordingly PETROFERTIL intends to contract with 42 new personnel in January 1979 and commence their training in two groups shortly thereafter. The company does not propose to offer special training courses to finance and accounts staff, which it feels will have adequate experience to handle their tasks. A detailed examination of the full training program will be made on receipt of PETROFERTIL's aforementioned Recruitment and Training Plan Report.

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ANNEX 8

# BRAZIL - SERGIPE FERTILIZER PROJECT

## COMPLIANCE WITH COVENANTS

1. All covenants under the agreements[1/] are currently being complied with except the following:

(a) PETROFERTIL has not yet submitted five-year financial projections for the company and each of its industrial units separately, which under Article 5.05 of the Loan Agreement were to be furnished each year commencing from July 1, 1977.

(b) PETROFERTIL has not yet submitted a detailed plan to recruit and train staff for the Project, which under Article 4.05 of the Loan Agreement was due on March 31, 1978.

(c) PETROFERTIL would not seem to have fully complied with the provision of Article 5.07 of the Loan Agreement requiring it to obtain a loan of not less than $71 million for the BNDE.

(d) The delay in issuing import licenses by CACEX for goods required for the Project has been a major factor in the slippage in the project schedule to date. The Government may not therefore have actively complied with the provisions of Section 3.01 of the Guarantee Agreement requiring it to take all reasonable action to ensure the prompt issuance of such permits as necessary for carrying out the Project.

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1/ Compliance with covenants relating to the supply of gas to the Project, particularly that requiring PETROBRAS to dedicate 3.1 billion $NM^3$ of gas for the exclusive use of the Project (covered by Article 4C of the Shareholder's Agreement), will be determined following review of the gas consultant's report (see Annex 4, para 3).

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Report No. 1414a-BR

# Brazil: Appraisal of the Sergipe Nitrogen Fertilizer Project

April 6, 1977

Industrial Projects Department



FOR OFFICIAL USE ONLY

**Document of the World Bank**

## CURRENCY EQUIVALENTS

Except where otherwise indicated, all figures are quoted in Brazilian Cruzeiros (Cr$) and US$ (Exchange Rate as of December 31, 1976):

| | |
|---|---|
| Cr$1.0 | = US$0.0809 |
| Cr$12.35 | = US$1.00 |
| Cr$1,000,000 | = US$80,972 |

(Exchange Rate as of 3/9/77
Cr$12.98 = US$1.00)

## WEIGHTS AND MEASURES

All weights and measures are in metric units except as noted:

| | |
|---|---|
| 1 Metric Ton (t) | = 1,000 Kilograms (kg) |
| 1 Metric Ton (t) | = 2,204 Pounds |
| 1 Kilometer (km) | = 0.62 Miles |
| 1 Hectare (ha) | = 2.47 Acres |
| 1 Cubic Meter ($NM^3$) | = 6.19 Barrels |

## PRINCIPAL ABBREVIATIONS AND ACRONYMS USED

| | |
|---|---|
| ANDA | Associacao Nacional para Diffusao Adubos |
| BNDE | Banco Nacional do Desenvolvimento Economico |
| COFEN | Construcao de Fertilizantes Nitrogenados |
| DAP | Diammonium Phosphate |
| Fafer | Fabrica de Fertilizantes S.A. |
| FERTILIZANTES | Petrobras Fertilizantes S.A., the Company |
| K | Potassium |
| $K_2O$ | Potassium Oxide Equivalent Content in Fertilizers |
| MAP | Monoammonium Phosphate |
| MSCF | 1,000 Standard Cubic Feet |
| N | Nitrogen |
| NFP | National Fertilizer Program |
| P | Phosphorous |
| PETROBRAS | Petroleo Brasileiro S.A. |
| Petrofertil | Petrobras Quimica Fertilizantes S.A. |
| PETROQUISA | Petrobras Quimica S.A. |
| $P_2O_5$ | Phosphorous Pentoxide Equivalent Content in Fertilizers |
| RFFSA | Rede Ferroviaria Federal S.A. |
| TPD | Tons (Metric) Per Day |
| TPY | Tons (Metric) Per Year |
| Ultrafertil | Industria e Commercio de Fertilizantes S.A. |

## Brazilian Fiscal Year

January 1 - December 31

BRAZIL

# APPRAISAL OF THE SERGIPE NITROGEN FERTILIZER PROJECT



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This report has been prepared by Messrs. Geoffrey Evans, Kurt Loos and Neithard Petry of the Industrial Projects Department.

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# BRAZIL

## APPRAISAL OF THE SERGIPE NITROGEN FERTILIZER PROJECT

## SUMMARY AND CONCLUSIONS

i. This report appraises a project to produce nitrogen fertilizers with a capacity of 907 tons per day of ammonia and 1,100 tons per day of urea. The gas-based plant will be built in Northeast Brazil on a new site at Laranjeiras, about 20 km northwest of Aracaju in the state of Sergipe not far from the Atlantic ocean. The plant is expected to come on stream by the beginning of 1981 and will increase Brazil's nitrogen capacity by about one-fourth. The output from the plant will be primarily for the Northeastern market and will be handled as at present by the private sector, primarily existing bulkblending and mixing companies. The project is expected to require financing of US$283 million equivalent, including US$102 million in foreign exchange of which the proposed Bank loan would finance U$64 million.

ii. The project is sponsored by Petrobras Fertilizantes S.A. (FERTILIZANTES), a wholly owned subsidiary of Petroleo Brasileiro S.A. (PETROBRAS). FERTILIZANTES was established in early 1976 with the objective of consolidating PETROBRAS' existing and future fertilizer interests. Control over PETROBRAS' three existing fertilizer companies has been transferred to FERTILIZANTES at the beginning of 1977. PETROBRAS is deeply involved in the production and distribution of nitrogen fertilizers and holds a virtual monopoly of ammonia and urea production in Brazil. Recent participation of the private sector in the production of new nitrogen fertilizer capacity did not occur (as hoped for) and cannot be expected at this time because of the very high capital requirements of new, large-scale plants, particularly when compared to the low capitalization of the existing private fertilizer industry in Brazil and the Government control of feedstock and fertilizer prices. However, PETROBRAS intends to offer shares of FERTILIZANTES to the private sector at a later stage.

iii. The proposed loan would be the second Bank loan to FERTILIZANTES and the Brazilian fertilizer sector. The first loan (US$50 million) was made in May 1976 for the Araucaria ammonia/urea project, which is in the early stages of implementation and is proceeding satisfactorily. Another project (Valefertil) in this sector, though for phosphatic fertilizers and with different project sponsors, is scheduled for consideration by the Bank's Executive Directors at about the same time as this project.

iv. Brazil's agricultural sector is characterized by extensive agricultural practices and the country's rising output has resulted mainly from expansions of cultivated area. Although it is expected that the area under cultivation will continue to expand, agricultural growth will have to depend increasingly on raising the productivity of existing land. Growth of fertilizer consumption has been rapid but also erratic. Up to 1966 there was little growth reflecting the Government's neglect of the agricultural and fertilizer sector. Stimulating measures introduced in the mid-sixties

brought six years of very rapid growth with annual increments averaging 35% through 1972. Over the following three years (1973-75), fertilizer consumption grew modestly, primarily as a result of the sharp rise in international prices and the scarcity of fertilizer in the world market. For 1976 a significant recovery in fertilizer consumption occurred and total nutrient consumption is estimated to have reached 2.3 million tons. Phosphatic fertilizers account for nearly 50% of total nutrient consumption which is agronomically justified on account of Brazilian soil characteristics and cropping patterns. It is estimated that four crops (sugar, coffee, soybeans and wheat) account for over half of total fertilizer consumption.

v. On the supply side, domestic fertilizer production accounts for only about 40% of consumption. The low level of domestic production has been due to Brazil's lack or knowledge of easily exploitable fertilizer raw materials, the rapidly rising capital requirements for the manufacture of chemical fertilizers and the absence of specific Government policies for the development of the fertilizer sector. As a consequence, the local fertilizer industry has concentrated on importing, mixing, blending and distribution while only a few companies have their own small-scale production facilities. To overcome the country's dependency on imports, the Government has embarked on a National Fertilizer Program establishing a target of self-sufficiency in nitrogenous and phosphatic fertilizers by 1980 which includes a program for large, basic production facilities of which the Araucaria, Sergipe and Valefertil projects form part. Production costs of local fertilizers have generally been higher than the cost of imports and the Government established an import quota system, which is regularly revised, to ensure that all domestic production is used. As the new, large-scale, efficient fertilizer plants enter into production, costs of domestic fertilizers are expected to move, in the longer run, in line with long-term international prices, thereby obviating the need for the import quota system. Concerned about the impact of the high international fertilizer prices during 1973-75 on its plans for increasing agricultural output, the Government introduced a price subsidy to farmers in early 1975 which resulted in a significant recovery in consumption during 1976. However, with the rapid decline of these prices during 1975 and 1976, the purchasing power of agricultural products relative to fertilizer improved again and the subsidy was eliminated in late December 1976. Removal of the subsidy is not expected to affect demand beyond the first months in 1977 since the relationship between agricultural product and fertilizer prices is still favorable and is expected to remain so in the future.

vi. In the absence of detailed historical data for the fertilizer sector by region and crop, projections of future demand in Brazil are risky. Assuming an average annual growth rate of about 11%, which compares to one of 22% over the last ten years, total nutrient consumption can be expected to reach a level of 3.4 and 5.7 million nutrient tons by 1980 and 1985, respectively. The projected demand/supply balances indicate that the goal of self-sufficiency can probably be met in the early 1980s for nitrogen and phosphates; the domestic supply of potash is considerably more uncertain and supply will probably continue through imports for some time in the future.

vii. The location of the plant will be just south of the main fertilizer market of the Northeast, and it will be close to the onshore and offshore oil and gas fields from which natural gas, the principal raw material for the project, will be supplied. Reserves are adequate to allow for 15 years of operation of the project. PETROBRAS already operates some oil and gas transmission pipelines in this area, but will, outside the project, construct a gas gathering and conservation scheme which will reduce gas losses and boost supplies to users.

viii. The project is based on modern, commercially proven technology, and will be implemented for FERTILIZANTES by PETROBRAS' fertilizer project implementation unit supported by PETROBRAS' engineering department. Engineering contracts, acceptable to the Bank, with Pullman Kellogg (US) and Toyo Engineering Company (Japan) have already been signed, and these companies will provide process licenses, basic engineering, procurement assistance, and technical advisory services relating to the ammonia unit and general site facilities, and the urea unit, respectively. Detailed engineering will be undertaken by two Brazilian engineering firms under the direct supervision of Kellogg and Toyo. In agreement with the Government's and PETROBRAS' policy to support and develop Brazilian industry, 60% of the equipment and materials required by the project are to be procured locally, which is estimated, because of the higher Brazilian costs, to increase the total equipment and material costs by about 11% and the total financing requirements by about 5%. The remaining 40% will be procured in accordance with the Bank guidelines and will be financed by the proposed Bank loan.

ix. The project will be financed by 41% in equity from PETROBRAS (US$116 million) and 59% in long-term loans from: (i) the Bank (US$64 million); (ii) a cofinancing arrangement which will be either with a foreign commercial bank or a direct placement of FERTILIZANTES' debt obligations with private investors in the US (US$25 million); (iii) from the National Development Bank (BNDE) for the financing of local equipment, materials and services (US$71 million); and (iv) from PETROBRAS (US$7 million).

x. The project's financial rate of return is satisfactory at 19% before and 15% after tax. Financial projections for the project also show satisfactory results with adequate liquidity, debt service coverage and debt/equity ratio. To safeguard the financial position of the project and of FERTILIZANTES, certain financial covenants similar to the Araucaria project have been agreed upon. The project's economic rate of return is calculated at 17% and would remain satisfactory even under the most adverse forseeable circumstances. The project will contribute to the stabilization of the agricultural sector by reliably providing fertilizers to the farmers at stable prices. In addition, the positive spillover effects from the required infrastructure will benefit this region which is one of Brazil's poorest and least industrialized. The local engineering and manufacturing industry will also benefit, and the project's net annual foreign exchange savings are estimated at US$65 million.

xi. Few major risks are seen in the project. It is unlikely that the project will face major management problems since PETROBRAS has experience in executing similar projects. Engineering and technological risks are also minimal since proven processes are used and Kellogg and Toyo are internationally recognized. Financially, the project is largely dependent on Government controls regarding the input and output prices and the Government has agreed that it will not take any action that would prevent FERTILIZANTES from operating on a sound financial basis. A marketing risk exists in so far as FERTILIZANTES has to rely on others, i.e. the bulkblending and mixing companies to market its products in the Northeast. However, the fertilizer distribution function has so far been attractive enough to the private sector to bring about the needed investments and sales efforts; this situation is expected to continue. Also, FERTILIZANTES is establishing its own market analysis and marketing group to closely monitor the developments in the sector; both therefore should minimize the marketing risk.

xii. On the basis of the agreements which have been obtained with the Government, PETROBRAS and FERTILIZANTES, the project is suitable for a Bank loan of US$64 million to FERTILIZANTES, for 15 years including four years of grace at the Bank's prevailing interest rate to which a fee payable to the Government would be added increasing the cost to FERTILIZANTES to 10%.

# I. INTRODUCTION

## A. Background

1.01 The Government of Brazil has requested a Bank loan of US$64 million equivalent to finance part of the estimated foreign exchange cost of an ammonia/urea plant1/ for the government-owned fertilizer company, Petrobras Fertilizantes (FERTILIZANTES)2/ to be built at Laranjeiras, 20 km northwest of Aracaju, the state capital of Sergipe in the northeast of Brazil (Map IBRD 12276). The project will be located in an area of limited industrialization and will contribute to the Government's policy of decentralizing Brazil's industry while building up the economy of the poverty ridden Northeast. The plant will obtain natural gas which is the most advantageous feedstock for production of nitrogen fertilizer, from the offshore and onshore gas and oil fields of the states of Alagoas and Sergipe where some of the natural gas is flared at present.

1.02 Total financing required for the project is estimated at US$283 million of which about US$102 million or 36% is in direct and indirect foreign exchange. These financing requirements will be met by equity and a loan from PETROBRAS (41% and 3% respectively), by a loan from BNDE, the National Development Bank (25%), by a cofinancing arrangement with foreign private lenders (9%) and the Bank loan (22%). The plant is expected to start commercial production in early 1981 and to produce an estimated 216,000 metric tons per year (TPY) of nitrogen (N) of which about 70% would be sold in the form of urea and the remainder as ammonia.

1.03 The project was appraised in July 1976 with a subsequent mission in September 1976 by Messrs. N. Petry (chief), G. Evans and K. Loos of the Industrial Projects Department. In addition, two consultants were employed for a brief survey of the Northeastern railways and for a study of the gas reserves in the Northeast3/.

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1/ A glossary of technical terms is given in Annex 1.

2/ The abbreviation for Petrobras Fertilizantes used in the Araucaria report was "BRASFERTIL." The new abbreviation conforms to Brazilian usage.

3/ The definition of regions in this report conforms to those used in the Brazilian fertilizer sector (Map IBRD 12054):

South: Rio Grande do Sul, Santa Catarina
Center: Parana, Sao Paulo, Rio de Janeiro, Minas Gerais, Mato Grosso, Goias, and Espirito Santo
North: Acre, Amazonas, Amapa, Para, Rondonia and Roraima
Northeast: Balance of States

Because of its negligible role in the fertilizer sector, the North is not referred to in this report.

B. Bank Group Involvement in the Brazilian Fertilizer Sector

1.04 The proposed loan would be the second loan to FERTILIZANTES 1/. The first of US$50 million was made in May 1976 for the Araucaria ammonia/ urea project 2/. The implementation of the Araucaria project is proceeding satisfactorily. Procurement of time critical equipment is on schedule although the overall procurement activity is about two months delayed due to an initially slower pace of basic engineering work and extensive negotiations with the association of local manufacturers resulting in an increase in the proportion of local equipment from the appraisal estimate of about 50% to about 65% of total equipment cost. The expected project completion date still remains the same as estimated at appraisal, but the financing required has increased by about US$32 million or 14%, all in local currency. Adjustments in the financing plan have been made to cover the additional costs, and no difficulties are foreseen to provide the funds as required. Even with the higher capital cost, the economic rate of return remains satisfactory at about 20%.

1.05 Another project (Valefertil) in this sector, though for phosphatic fertilizers and with different project sponsors, is scheduled for consideration by the Bank's Executive Directors at about the same time as this project.

## II. PROJECT SPONSORS

2.01 The project will be owned and operated by FERTILIZANTES, whose corporate ownership is described in detail in Annex 2.

A. Petrobras Fertilizantes S.A. (FERTILIZANTES)

2.02 FERTILIZANTES was established in early 1976 as a wholly owned subsidiary of the national oil company, PETROBRAS, with the objective of consolidating PETROBRAS' existing and future fertilizer interests. At the beginning of 1977 FERTILIZANTES took over Brazil's three existing ammonia based fertilizer plants (Fafer, Ultrafertil, Petrofertil). FERTILIZANTES also has responsibility for the country's three new ammonia/ urea projects Araucaria, Norte Fluminense 3/ and Sergipe, the project here under consideration. It has not been decided yet whether these three projects will be integrated into FERTILIZANTES as separate independent companies or whether they will be operating divisions of the existing companies. In addition, FERTILIZANTES has a 20% interest in Fertilizantes Fosfatados, a recently established public sector company for the exploitation of the phosphate rock

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1/ The Bank Group also participated in the Brazilian fertilizer sector through an IFC investment in Ultrafertil (para 2.06).

2/ Report No. 1050-BR dated April 23, 1976.

3/ The Norte Fluminense project will use natural gas from the gas and oil fields offshore Campos (Rio de Janeiro). Brazil intends to request the Inter American Development Bank to finance this plant.

deposit at Patos de Minas (Minas Gerais) and will most likely be involved in the exploitation of the potash deposit at Carmopolis (Sergipe). PETROBRAS owns 100% of FERTILIZANTES' shares and will provide technical and management support to build and operate the Company's facilities. Initial authorized capitalization is Cr$1,200 (US$93) million of which Cr$10 (US$1) million is paid in. Once operations become adequately profitable, PETROBRAS plans to offer FERTILIZANTES' shares for sale, particularly to private sector fertilizer companies.

2.03 FERTILIZANTES' organization (Annex 2) is in the early stages of development with staff largely recruited from other PETROBRAS' operations. The vice-president and three directors (industrial, administrative and financial) have been appointed and transferred from PETROBRAS. In mid-1976 the Company had a head-office staff of about 40 to be built up to its full strength of 170-200 by end of 1977. The Board of Directors are from PETROBRAS and FERTILIZANTES and the Company's president is also PETROBRAS' president.

B. Petroleo Brasileiro S.A. (PETROBRAS)

2.04 As noted above, FERTILIZANTES' parent company, PETROBRAS, is the government oil company established in 1953. It owns eight existing refineries1/ and is responsible for the exploration, production and imports of petroleum and petroleum derivatives. PETROBRAS has three other wholly-owned subsidiaries, one for retailing its petroleum products, one for petroleum exploration outside Brazil and one which consolidates its interests in the chemical industry.

2.05 PETROBRAS' financial statements and the consolidated statements for PETROBRAS and its subsidiaries are shown in Annex 2. The consolidated statements are summarized below:

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1/ There are two small refineries not owned by PETROBRAS. However they cannot expand and must buy crude from PETROBRAS. There are some private oil distributors/retailers but they buy refined products from PETROBRAS and retail prices are controlled by the Government.

Brazil - PETROBRAS and Subsidiaries - Consolidated Statements a/
(in US$ million)

| For the Year Ending Dec. 31 | 1973 | 1974 | 1975 |
|---|---|---|---|
| Revenues (net of sales taxes) | 2,303 | 4,594 | 6,395 |
| Cost of Sales | 1,576 | 3,236 | 4,564 |
| Other Charges | 350 | 686 | 968 |
| Monetary Correction on Working Capital | 49 | 132 | 158 |
| Provision for Income Tax | 26 | 32 | 26 |
| Net Income | 302 | 508 | 679 |
| Current Assets | 1,474 | 2,642 | 3,810 |
| Long-Term Investment & Receivables | 51 | 47 | 43 |
| Fixed Assets (net) | 2,001 | 2,187 | 3,272 |
| Other Assets (net) | 77 | 116 | 99 |
| Current Liabilities | 776 | 1,270 | 2,345 |
| Long-Term Debt | 534 | 1,022 | 1,208 |
| Minority Investments | 82 | 34 | 81 |
| Equity | 2,211 | 2,666 | 3,590 |
| Total Assets or Liabilities | 3,603 | 4,992 | 7,224 |
| Long-Term Debt/Equity Ratio | 19:81 | 27:73 | 25:75 |
| Current Ratio | 1.9 | 2.1 | 1.6 |
| Net Incomes as % of Equity (at year end) | 13.7 | 19.1 | 18.9 |
| Exchange Rate Cr$/US$1.00 (at year end) | 6.22 | 7.44 | 8.60 |

a/ Consolidated financial statements for 1976 are not yet available but 1976 results are expected to be similar to 1975 results.

PETROBRAS' consolidated statements indicate a sound financial situation with satisfactory earnings and liquidity and a conservative relationship between debt and equity. PETROBRAS' annual investment program was about US$1.4 billion equivalent during each of 1974 and 1975 and is expected to continue at about this level for the next four years. The annual equity requirements for PETROBRAS' three ammonia/urea projects estimated at less than US$100 million over a four-year period are thus small (7%) in comparison to its overall investment program.

C. Petrobras Quimica S.A. (PETROQUISA) and Present Fertilizer Operations

2.06 PETROBRAS is deeply involved in the production and distribution of petrochemicals and nitrogen fertilizers, through its wholly-owned subsidiary, Petrobras Quimica S.A. (PETROQUISA), which holds PETROBRAS' interests in the chemical and petrochemical industries. PETROQUISA has two operating divisions, seven subsidiaries and participates in 17 joint ventures (Annex 2). It is primarily for the reason of PETROQUISA's expanding involvement in the chemical sector that PETROBRAS removed its growing fertilizer interests from PETROQUISA and consolidated them under FERTILIZANTES. The three existing fertilizer companies, as described in detail in Annex 2, have had a good production record with capacity utilization exceeding 80%. The financial performance of

two of these companies (Fafer and Petrofertil) has also been satisfactory, but Ultrafertil, which was privately owned until PETROQUISA's takeover in 1974 and in which IFC and the original Brazilian shareholder continue to hold about 15% of the equity, is financially weak with poor profitability and an inadequate debt service coverage of 0.5 or less for three out of the four last years. Ultrafertil's weak financial position might seriously endanger the financial viability of FERTILIZANTES unless concrete steps are taken to improve Ultrafertil's profitability and financial position. The Bank has therefore asked and FERTILIZANTES has agreed to prepare and submit to the Bank not later than August 31, 1977 a detailed report analyzing the reasons for Ultrafertil's poor financial performance and setting forth specific measures which have to be taken to improve Ultrafertil's financial position.

2.07 With its existing operations, the PETROBRAS group has the monopoly of ammonia production for fertilizer use, and it is expected that this will continue. Participation of the private sector in the production of nitrogenous fertilizers cannot be expected at this time because of the very high capital requirements of new, large scale plants particularly when compared to the low capitalization of the existing private fertilizer industry in Brazil. The Government took over basic nitrogen production only because of the inability of the private sector to expand in this area. And, as mentioned, it is the Government's intention to offer shares of FERTILIZANTES to the private sector at a later stage.

## III. FERTILIZER MARKET AND MARKETING

### A. Agriculture in Brazil

3.01 Brazil's rising agricultural output has resulted mainly from expansions of cultivated area (Annex 3-1). Although it is expected that the area under cultivation will continue to expand, agricultural growth will have to depend increasingly on raising the productivity of existing land. The Government in its Second Development Plan (1975-1979) has established a goal of a 40% (7% annually) real increase in agricultural output which appears feasible, with the aim of making Brazil one of the world's foremost producers and exporters of foodstuffs. To achieve this, the Government has allocated substantial resources for bringing new areas into production and for increasing agricultural productivity through a number of extension programs and through more use of fertilizer and improved seeds.

3.02 These programs reflect a shift in agricultural policy. While the orientation of the Government's investment for developing the agricultural sector had previously been toward the promotion and establishment of large and commercially oriented agricultural enterprises, the new policies are emphasizing increasingly the importance of raising the productivity of small farmers, especially in the Northeast.

3.03 No sudden eradication of rural poverty, which has been endemic in some regions of Brazil for decades, is likely to be forthcoming from these programs. Nevertheless, responsible efforts to improve the productivity of

Northeast agriculture and at the same time to increase industrial activity in the region have already resulted in a more rapid growth of per capita income in the Northeast than in Brazil as a whole; this process is expected to continue.

B. The Industry and Government Policies in the Fertilizer Sector

3.04 Brazil's fertilizer industry consists of about 50 relatively small private sector and three larger Government-owned companies with a total production capacity in 1976 of 270,000 tons of nitrogen and 690,000 tons of phosphate (Annex 3-2). The industry, especially the private sector, has concentrated on importing, mixing, blending and distributing rather than on establishing large scale, efficient production facilities. Most companies compete at the retail level largely with imported materials while only a few have their own, generally small, production facilities which have to be protected when world fertilizer prices are low (or restrained when world prices are high). The low level of domestic production has been due to Brazil's lack of easily exploitable fertilizer raw materials, the rapidly rising capital requirements for the manufacture of chemical fertilizers and the absence of specific Government policies during the 1960s for the development of the petrochemical sector in general and the fertilizer sector in particular.

3.05 Large amounts of raw, intermediate and finished fertilizer materials, therefore, have been imported. To overcome this dependency on imports, the Government in 1974 embarked on a program whose objective was to attempt to assure self-sufficiency in fertilizers by 1980. For that purpose the Government has published a National Fertilizer Program (NFP), has established an interministerial Fertilizer Commission charged with ensuring the rational development of the sector and has developed a program for large, basic production facilities of which the Araucaria, Sergipe and Valefertil projects form part.

3.06 Production costs of local fertilizers have generally been higher than the cost of imports. To ensure that all domestic production is used, the Government established a quota system that requires retailers to purchase a given proportion of domestic fertilizer for each unit of imported fertilizer. The Government has changed this ratio periodically depending on consumption forecasts and local availability. As the new, large-scale efficient fertilizer plants enter into production, costs of domestic fertilizers are expected to move, in the longer run, in line with long-term international prices, thereby obviating the need for the import quota system.

3.07 International fertilizer prices were at a very high level in 1973-75 (Annex 3-2, Chart I) causing a decline in the purchasing power of agricultural products in relation to fertilizers and inducing a leveling off of fertilizer consumption in Brazil as in many other import dependent countries. Concerned about the impact of lower fertilizer consumption on its plans for expanding agricultural production, the Government, in April 1975, introduced a price subsidy which reduced the price of fertilizers to the farmer by 15 to 30%.

As a result of the rapid decline in international fertilizer prices during 1975 and 1976, the purchasing power of agricultural products in relation to fertilizers increased again and the subsidy could not any longer be justified. The Government therefore eliminated the subsidy in late December 1976. While this action is expected to adversely affect fertilizer demand during the first months of 1977, the prospects for continued significant growth of fertilizer demand are good since the relationship between agricultural products (including export products) and fertilizer prices is still favorable and the Government has assured the Bank that it will remain so in the future. The removal of the subsidy, when it was no longer economically justified, is an indication of the attention the Government is paying to fertilizer and of the Government's determination to follow rational policies in this sector.

C. Historical Consumption and Supply of Fertilizers

3.08 Growth of fertilizer consumption in Brazil has been rapid but also erratic as shown in the table below (Annex 3-2, Charts II and III):

Brazil - History of Apparent Fertilizer Consumption
(1,000 nutrient tons)

| | N | P | K | Total | % Yearly Change | NPK Ratio |
|---|---|---|---|---|---|---|
| 1960 | 65 | 128 | 106 | 299 | - | 1.0:2.0:1.6 |
| 1965 | 70 | 120 | 100 | 290 | - | 1.0:1.7:1.4 |
| 1970 | 276 | 416 | 307 | 999 | - | 1.0:1.5:1.1 |
| 1971 | 278 | 536 | 351 | 1,165 | 17 | 1.0:1.9:1.3 |
| 1972 | 412 | 875 | 460 | 1,747 | 50 | 1.0:2.1:1.1 |
| 1973 | 355 | 790 | 534 | 1,679 | -4 | 1.0:2.2:1.5 |
| 1974 | 389 | 914 | 521 | 1,824 | 9 | 1.0:2.3:1.3 |
| 1975 | 436 | 1,014 | 507 | 1,957 | 7 | 1.0:2.3:1.2 |
| 1976 a/ | 488 | 1,145 | 653 | 2,286 | 17 | 1.0:2.3:1.3 |

a/ As estimated by ANDA (National Association for the Promotion of Fertilizer Use).

Up to 1966 there was little growth reflecting the Government's neglect of the agricultural and fertilizer sector. Stimulating measures introduced in the mid-sixties brought six years of very rapid growth with annual increments averaging 35% through 1972. Over the following three years (1973-75), fertilizer consumption increased only modestly, primarily as a result of the sharp rise in international prices and the scarcity of fertilizer in the world market. As shown above, a significant recovery in consumption was anticipated for 1976 caused by the Government's subsidy and declining international prices. The relatively high share of phosphate consumption is agronomically justifiable on account of soil characteristics in Brazil. Although detailed

fertilizer application rates per crop are not yet available, it is estimated that four crops, namely, sugar, coffee, soybeans and wheat account for 50% to 60% of total consumption.

3.09 On the supply side, domestic fertilizer production has grown at an average rate of 22% since 1965, but in 1976 supply from national sources still represented only about 40% of consumption. On a nutrient basis, 37% of nitrogen, 51% of phosphates and none of the potash comes from the domestic fertilizer industry. Most of the domestic phosphate production uses imported phosphate rock since Brazilian rock production accounts for only 10% of the country's requirements. It is expected, however, that Brazilian phosphate rock production would increase to 60% by 1982.

## D. Projected Demand and Supply of Fertilizers

3.10 Given the erratic nature of past growth of fertilizer consumption in Brazil and the lack of detailed and consistent fertilizer statistics, demand projections carry a considerable amount of uncertainty. Of all the factors influencing fertilizer consumption, the most important is the presence or absence of strong Government support policies to promote the increased use of fertilizers. In view of the Government's interest in (i) higher agricultural production for which fertilizers are an essential input; (ii) its willingness to stabilize the ratio of agricultural product to fertilizer prices; and finally (iii) its declared goal of assuring a stable supply of fertilizers by sharply increasing the share of domestic production, it can be said that the Government is providing a favorable background for significant further growth in fertilizer consumption. The limiting factors appear to be bottlenecks in transportation, deficiencies in the extension services, lack of foreign exchange for the import of fertilizer materials and insufficient allocations of agricultural credit.

3.11 The upper limit for future demand can be estimated by normative analysis from necessary nutrient replacement and by projections of arable land and cropping patterns. Estimates of this nature result in a potential demand of about 12 million nutrient tons (NPK) in 1985, compared to the consumption of 2.3 million nutrient tons expected for 1976 (para 3.08). The average annual growth between 1976 and 1985 would, therefore, be around 23%. Actual growth rates through 1985 are expected to be much lower, however, ranging from 10-12% annually, considering the constraints mentioned in the preceeding paragraph. On this basis, fertilizer demand is projected as follows:

Brazil - Apparent Fertilizer Demand Projections
(Million nutrient tons)

| Year | N | $P_2O_5$ | $K_2O$ | Total | NPK Ratio |
|---|---|---|---|---|---|
| 1980 | | | | | |
| NFP a/ (1974) b/ | 1.4 | 1.6 | 1.0 | 4.0 | 1.0:1.14:0.7 |
| Bank (1976) | 0.8 | 1.7 | 1.0 | 3.4 | 1.0:2.1:1.2 |
| 1985 | | | | | |
| Bank (1976) | 1.4 | 2.6 | 1.7 | 5.7 | 1.0:1.9:1.2 |
| Assumed Average Annual Growth (Bank) (%) | | | | | |
| 1976-1980 | 13.0 | 10.0 | 11.0 | 11.0 | - |
| 1980-1985 | 12.0 | 9.0 | 11.0 | 10.0 | - |

a/ National Fertilizer Program.
b/ Years in which projections were prepared.

The above table also shows the 1980 consumption targets of the National Fertilizer Program (NFP); they are in line with the Bank's estimates for phosphates and potash but considerably higher than our estimates for nitrogen demand. While higher levels of agricultural productivity imply an increasingly larger proportion of N relative to $P_2O_5$ application, the evolving cropping pattern and the opening of new cultivated areas, which require relatively more $P_2O_5$ than N, are expected to result in only a minor change in the country's overall NPK ratio. The regional distribution of fertilizer consumption is assumed to follow the pattern of the last few years with about 10% of total consumption occurring in the Northeast, 60% in the Center and 30% in the South.

3.12 On the other hand, the pattern of future fertilizer supply is expected to differ dramatically from the present one; this is the direct result of the NFP. Although self-sufficiency by 1980 does not appear to be achievable, it is anticipated that during the early 1980s domestic fertilizer supply will have a share of 60%-70% of total NPK consumption as compared to about 40% at present. The table below shows that near self-sufficiency for N and $P_2O_5$ could be reached in the early 1980s, while no domestic production of $K_2O$ is expected until the mid-1980s at the earliest:

Brazil - Fertilizer Demand/Supply Forecast
(1,000 nutrient tons)

| | 1976 (estimate) | 1980 | 1982 | 1985 |
|---|---|---|---|---|
| Demand | | | | |
| N | 488 | 800 | 1,000 | 1,400 |
| $P_2O_5$ | 1,145 | 1,680 | 1,990 | 2,580 |
| $K_2O$ | 653 | 1,000 | 1,200 | 1,700 |
| Total NPK | 2,286 | 3,480 | 4,190 | 5,680 |
| Domestic Production | | | | |
| N | 160 | 570 | 960 | 980 /a |
| $P_2O_5$ | 786 | 1,555 | 1,799 | 2,026 |
| Total NPK | 946 | 2,125 | 2,759 | 3,006 |
| Self-Sufficiency (%) | | | | |
| N | 33 | 71 | 96 | 70 |
| $P_2O_5$ | 69 | 93 | 90 | 78 |
| Total NPK | 41 | 61 | 66 | 53 |

a/ Assumes no further capacity addition beyond Araucaria, Sergipe and Norte Fluminense plants.

The above production estimate takes into account the three new ammonia/urea projects, Araucaria, Sergipe and Norte Fluminese. A fourth plant to be built in Rio Grande do Sul in cooperation with the State Government is presently being evaluated by FERTILIZANTES. From the above, the most appropriate start of production for this fourth project would seem to be in 1982/83. An earlier start-up might lead to a temporary excess production of nitrogen. To keep abreast of the investment plans in the fertilizer sector and to ensure that new plants are built in accordance with as realistic demand projections as possible, assurances have been obtained that the Government will exchange views with the Bank from time to time regarding the expansion and development of the fertilizer sector, including investment plans and import and pricing policies.

## E. Fertilizer Marketing and Distribution

3.13 About 90% of total fertilizer distribution is effected through blenders which are either owned by fertilizer manufacturers (25% of total), independent companies (65%) or cooperatives (10%). The Government intends private firms to continue handling the marketing and distribution functions in the sector. However, the rapid expansion of consumption expected in the next few years, and changing pattern of supply, might create a severe strain on the existing fertilizer marketing and distribution network.

To analyze potential bottlenecks, and their effect on future fertilizer consumption, the Government agreed, in connection with the Bank's loan for the Araucaria project, to undertake a marketing and distribution study under terms of reference satisfactory to the Bank. The study began in October 1976, and its results are expected to be available by late 1977.

F. The Market and Marketing for Sergipe's Fertilizer Production

3.14 The Sergipe plant will be located just south of the main fertilizer consumption center of the Northeast and will cater for that region's nitrogen requirements (Annex 3-3). Growth of fertilizer consumption in this region has averaged about 22% per year over the last decade, compared to rates of 34% and 20% for the South and Center, respectively. Because of the poor soils and the arid and semi-arid climate of the Northeast, fertilizer consumption is primarily restricted to those areas where rainfalls are high or where irrigation schemes provide the required water for efficient use of fertilizers. This is the case in the narrow humid belt along the coast (the Zona de Mata) and in a more limited way in the transition zone (the Agreste) between the humid coast and the arid interior (Map IBRD 12412).

3.15 Up to the late 1960s, the Northeast used fertilizer nearly exclusively for sugarcane, the predominant crop in the coastal belt. A detailed farm survey, however, which was done by a joint effort of SUDENE and the Bank in 1973, revealed that use of fertilizers has become much more diversified. According to the survey, fertilizer was used in 1973 as follows: 50% for sugarcane, 15% for cacao, 15% for beans, 10% for manioc and 10% for other crops. Unfortunately, no time series is available that would indicate how fertilizer applications have changed over time for each crop.

3.16 Also in 1973, the Government contracted ANDA for a three-year program to determine the bottlenecks preventing increased use of fertilizer and to conduct a large number of tests of fertilizer use in the various states and for all the major crops cultivated in the Northeast. The results of this program, which was actively supported by FAO and which is likely to be continued, are now available and are very encouraging; they clearly show that more fertilizer can significantly increase agricultural yields as well as gross revenues and net profits to the farmer at benefit cost ratios which indicate no undue increase in the risk to him.

3.17 Against this background, the prospects for continued growth of fertilizer consumption in the Northeast are good. However, there are no detailed studies of the underlying reasons for the past and future fertilizer demand in the Northeast so that projections have to be based on assumed growth rates. A normative analysis, similar to the one for the whole of Brazil (para 3.11), indicates a potential fertilizer demand of about 1 million nutrient tons by 1985. This would imply an average annual growth rate of about 19% for the period 1977-1985, against one of 22% for the last ten years. Because of the same constraints mentioned for the whole of Brazil (para 3.10) it is more likely that the actual growth rate will be lower and 12% per year is assumed here. The financial and economic risks of the project associated with an even lower than assumed

growth rate of fertilizer demand are discussed further below (paras. 6.10 and 7.07).

3.18 On the supply side, although reserves of natural gas, the ideal raw material for production of nitrogen, are limited in Brazil, they are concentrated in the Northeast and therefore this region is particularly well suited for the production of ammonia and urea. With an existing plant at Camacari in the State of Bahia which is presently being expanded and the Sergipe project, the Northeast will produce considerably more nitrogen than required by this region as shown below:

Northeast - Project Nitrogen Demand/Supply Balance
(1,000 nutrient tons)

| | 1976 (est.) | 1980 | 1982 | 1984 | 1986 |
|---|---|---|---|---|---|
| Demand | 66 | 110 | 140 | 175 | 225 |
| Supply | | | | | |
| Petrofertil (Camacari) | 30 | 225 | 225 | 225 | 225 |
| Sergipe | - | - | 200 | 225 | 225 |
| Total Supply | 30 | 225 | 425 | 450 | 450 |
| Surplus (Deficit) of N to be Shipped to (from) Other Regions | (36) | 115 | 285 | 275 | 225 |

Until 1981, the region's demand for nitrogen will be satisfied by the increasing production from the Camacari plant which will provide an important stimulus to fertilizer consumption in the Northeast. From 1981 onward, the Sergipe plant, because of its proximity to the market, will supply the Northeast with nitrogen while all of the output of the Camacari plant, located near the port of Aratu and some output of the Sergipe plant will have to be shipped to other regions in Brazil (primarily the Center), where it will substitute for imports. By 1986 demand in the Northeast is expected to exceed the production from the project, and in the following years, the Camacari plant will again increasingly supply the Northeastern market.

3.19 Of the total nitrogen consumption in the Northeast, it is estimated that in 1976, 65% was consumed in the form of urea and 35% as ammonium-sulfate. The completion of the Camacari expansion, the Sergipe project and the planned MAP/DAP plants will bring the share of urea consumption to about 70% with the remaining N requirements being satisfied by MAP, DAP and ammonium sulfate, this is not a significant change from the current compositon of N consumption. Urea has been accepted in the market as an efficient fertilizer, and from tests done by the extension services, the universities and the fertilizer companies, it can be concluded that urea is a fully suitable fertilizer.

3.20 The project's urea output will be sold to bulkblenders and mixers who have plants close to the ports of Recife and Maceio. Transportation of urea to Recife and Maceio is planned to be mostly by railway with most of it in bags. However, FERTILIZANTES intends to increase bulk shipments to large customers for which bulk unloading facilities would be economic. Exploitation of the potash deposit at Carmopolis, about 30 km to the northwest of the project site and expected to start by the mid-1980s, will make the area attractive for the location of new mixing and blending installations.

3.21 Of the project's saleable ammonia output of 80,000 TPY of ammonia, 48,000 TPY are expected to be consumed by ammonium phosphate plants planned for Recife and Maceio, and the remaining 32,000 TPY would be shipped to other regions in Brazil via the new chemical port of Aratu, which will include facilities for the storage and handling of ammonia and bulk fertilizer materials. PETROBRAS will be responsible for the coastal shipping of ammonia and will either buy or charter boats for that purpose. The ports of Santos (Center) and Rio Grande (South) to which ammonia can be shipped have adequate special storage and handling facilities for ammonia.

3.22 As a result of the Camacari expansion and this project, the railway transportation requirements in the Northeast will significantly increase. While the capacity of the lines is sufficient to handle the expected traffic up to about 1995, the operations of the Northeastern railways (they are part of the Federal Railway Authority (RFFSA) to which the Bank has made two loans) will have to be improved as described in Annex 3-4. The recommendations made by the Bank to this end have been agreed to in principle by RFFSA and their execution will be supervised by the Bank as part of its follow up of the existing loans to RFFSA. Special rail cars for the transport of liquid ammonia and bulk urea will be purchased by FERTILIZANTES as part of the project. Box cars for bagged urea, tank cars for gas and Bunker C oil and locomotives will be supplied by RFFSA.

3.23 The projected continued growth in fertilizer demand will require significant additional investments in the marketing and distribution system in the Northeast. In the past, the private sector has made these investments as required and as long as the Government support policies keep the marketing and distribution business profitable, the required future investments are expected to be forthcoming. For FERTILIZANTES it is most important to keep in close contact with the developments in the fertilizer sector in the Northeast and all of Brazil. For that purpose FERTILIZANTES has set up its own market analysis and marketing group. The main tasks of this group are (i) to analyze the market in order to gain an understanding of the forces affecting demand (including Government policies); (ii) to make regional and overall fertilizer demand projections; and (iii) to closely monitor the development of the marketing and distribution system which is largely in the hands of the private sector.

## IV. THE PROJECT

### A. Project Scope

4.01 The project involves the construction of a 907 TPD (1,000 short tons per day) ammonia plant and an 1,100 TPD urea plant on a grass roots 100 hectare site at Laranjeiras, about 20 km northwest of Aracaju in the state of Sergipe. The site has good road and rail connections as it is served by the existing road from Aracaju and by the Salvador-Recife railway passing within about 5 km (Annex 4-1). The project will include all necessary production ancillaries, and both the ammonia and urea units will be single train of standard size capacities employing modern commercially proven technologies to ensure reliable operation. On the basis of 330 stream days per year and an assumed maximum capacity utilization of 90% projected for the third year of operations (1983) and thereafter, the plant will produce about 270,000 TPY ammonia and 327,000 TPY urea. Of the ammonia production 190,000 TPY will be used by the project as intermediate in the production of urea with the balance of about 80,000 TPY being sold directly (para 3.21). The project includes specialized railcars for the transport of ammonia and urea and will contain provision for bagging the entire urea output, but it is anticipated that a significant proportion will be shipped in bulk. A detailed description of the project is given in Annex 4-2.

### B. Raw Materials and Utilities

4.02 Principal raw materials to be consumed (Annex 4-3) by the project at full capacity will be natural gas and vacuum gas oil at an annual rate of 215 million $NM^3$ and 109,000 tons, respectively. Additionally, about 50,000 TPY Bunker C fuel oil will be required for steam generation. Natural gas will be supplied by PETROBRAS from its own onshore and offshore deposits in the states of Sergipe and Alagoas. PETROBRAS has determined the total reserves in these areas currently as 19 billion $NM^3$ including 10 billion $NM^3$ proven, out of which the project will be allocated, a quantity of 3.1 billion $NM^3$ sufficient for about 15 years operation at full capacity. Details of these reserves and their projected consumption are given in Annex 4-4 and specifications for the gas, vacuum gas oil and Bunker C fuel oil in Annex 4-5. The gas is especially suitable for ammonia production containing about 97% hydrocarbons and only a very small quantity of sulfur.

4.03 PETROBRAS currently operates a gas transmission pipeline supplying the state of Bahia with gas from its gas compression and distribution center 9 km south of Aracaju. PETROBRAS will construct a new gas liquid separation plant adjacent to this center and a new dry gas supply pipeline to the project site. Additionally, PETROBRAS is constructing a gas gathering and conservation scheme in the states of Sergipe and Alagoas to reduce gas losses and boost supplies to the Aracaju terminal. These facilities are not part of the project but are essential for its operation and are planned for completion well in advance of completion of the project. PETROBRAS has agreed to dedicate a minimum of 3.1 billion $NM^3$ of gas from its offshore and onshore

gas reserves in the states of Alagoas and Sergipe to the exclusive use of the project and to build and maintain any facilities (including the construction of pipelines and compressor stations) that are required to provide the project with adequate supplies of gas.

4.04 Vacuum gas and Bunker C fuel oil requirements will be met from PETROBRAS' Mataripe refinery (near Salvador, Bahia) and will be shipped in rail tank cars via the existing railway service over some 450 km to a storage terminal to be constructed by PETROBRAS adjacent to the project site (Annex 3-4). To supply the project with water and electricity, a water pipeline and additional electrical transmission lines will be built, as described in Annex 4-2. The electrical supply facilities will be constructed by the local authorities independently of the project, but approximately 17% of the cost of the water pipeline will be financed by FERTILIZANTES as part of the project. To ensure that these raw materials and facilities will be available to the project as required, satisfactory arrangements for the supply of natural gas, vacuum gas oil and Bunker C fuel oil and for construction of the water and electricity supply facilities involving firm obligations from suppliers are conditions of loan effectiveness.

C. Project Administration and Implementation

4.05 PETROBRAS' fertilizer project implementation unit (COFEN) 1/ supported by PETROBRAS' engineering department will supervise project execution on behalf of FERTILIZANTES, coordinate the work of the foreign and local contractors, and contract directly with local firms (yet to be selected) for civil works and erection. Procurement of all but critical items will be undertaken by FERTILIZANTES' own procurement department. PETROBRAS has already signed contracts with Pullman Kellogg (USA) for provision of process license, basic engineering design, procurement assistance, and technical advisory services relating to the ammonia unit and general site facilities, and with the Toyo Engineering Company (Japan) for provision of similar services and process license relating to the urea unit. Selection of Kellogg and Toyo as the foreign engineering contractors was based on the results of competitive offers received by PETROBRAS in 1972 for the Petrofertil ammonia/urea project. On the basis of that result, an assessment of these companies' charges for the Sergipe project and the benefits to be gained from standardization of technology and better prospects for technology transfer, FERTILIZANTES' appointment of Kellogg and Toyo for the Sergipe project is acceptable.

4.06 Detailed engineering of the ammonia unit and general plant facilities will be undertaken by a Brazilian firm, Promon Engenharia S.A. (PROMON), acting as a nominated subcontractor and under the supervision of Kellogg. Another local engineering firm, Montreal Engenharia S.A. (MONTREAL), will undertake detailed engineering of the urea unit as nominated subcon-

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1/ Construcao de Fertilizantes Nitrogenados (Construction of Nitrogen Fertilizer Facilities).

tractor and under the supervision of Toyo 1/. Selection of these companies followed a comparison of unit rates charged by local engineering firms adjudged by PETROBRAS to have the necessary qualifications and available capacity. Given the wide experience of PETROBRAS and the availability of technical advisory services from Kellogg and Toyo through the detailed engineering, procurement, construction, and start-up periods, this arrangement is considered satisfactory. Aside from signing contracts with the engineering firms, FERTILIZANTES has already acquired the site for the project and commenced site preparation work, but has not yet entered into any commitments for the supply of equipment and materials. The project schedule shown in Annex 4-6 provides for commencement of commercial operations by January 1, 1981. With four years to commercial production, the implementation schedule is somewhat longer than what has been estimated for similar Bank-financed fertilizer projects. Taking into account, however, the low level of industrialization in the Northeast, the somewhat complicated coordination procedures between FERTILIZANTES and PETROBRAS and the engineering companies, and the actual implementation schedule of projects now being constructed, the above estimate appears realistic.

D. Ecology

4.07 The Sergipe plant will include facilities for removal of contaminants from the condensates of the ammonia unit and urea evaporator before discharge, and for collection and removal of oil from waste waters (Annex 4-2). Additionally, cooling tower blow down will be treated for removal of chromates and demineralization plant waste neutralized. A sewerage treatment plant will be provided for sanitary waste. The overall effluent treatment system inclusive of these facilities will be based on existing Brazilian standards which have been adjudged as satisfactory.

E. Employment and Training

4.08 The project will provide direct employment for about 384 people, most of whom will be professional, skilled or semi-skilled (Annex 4-2). It is expected that most of the staff will be recruited from the Aracaju area or transferred from PETROBRAS refinery or FERTILIZANTES's existing fertilizer plants. Except for an initial period during commissioning when expatriate supervisors will be present, the project will be staffed entirely by Brazilian personnel. It will be the responsibility of FERTILIZANTES to acquire the necessary personnel and have them trained to ensure smooth start-up and operation of the project. FERTILIZANTES will be able to benefit from the excellent facilities that PETROBRAS has for the purpose of training the large number of skilled staff required for its major refinery and petrochemical expansion programs. Additionally, the ammonia/urea complex of Petrofertil will be used for "in-plant" training, and the project's process licensors

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1/ The employment of local engineering firms and the concomitant transfer of technology is an important contribution to the development of Brazil's engineering industry which will facilitate implementation of future projects.

and contractors will provide special training in the process technology involved and some practical training in similar operational ammonia and urea units for selected personnel. FERTILIZANTES has agreed to provide the Bank not later than March 31, 1978, with a detailed plan, acceptable to the Bank, for recruitment, training and staffing of the project.

## V. CAPITAL COST, FINANCING PLAN, PROCUREMENT AND ALLOCATION OF BANK LOAN

### A. Capital Cost

5.01 The total financing required for the project is estimated at US$283.4 million equivalent (Cr$3,500 million) of which US$101.9 million (Cr$1,258 million) is in foreign exchange. The estimate is summarized in the following table and shown in more detail in Annex 5-1 together with the assumptions made:

Summary of Capital Cost Estimate a/

| | Cr$ Million | | | US$ Million | | | |
|---|---|---|---|---|---|---|---|
| | Foreign b/ Exchange | Local Currency | Total | Foreign b/ Exchange | Local Currency | Total | % |
| Land & Civil Works | 32 | 250 | 282 | 2.6 | 20.2 | 22.8 | 12 |
| Equipment & Materials | 673 | 682 | 1,355 | 54.5 | 55.2 | 109.7 | 56 |
| Engineering & Licenses | 112 | 135 | 247 | 9.1 | 10.9 | 20.0 | 10 |
| Erection | 52 | 292 | 344 | 4.2 | 23.7 | 27.9 | 14 |
| Pre-Operating Expenses | - | 202 | 202 | - | 16.4 | 16.4 | 8 |
| Base Cost Estimate (BCE) | 869 | 1,561 | 2,430 | 70.4 | 126.4 | 196.8 | 100 |
| Physical Contingency (8.5% of BCE) | 76 | 136 | 212 | 6.1 | 11.0 | 17.1 | |
| Price Escalation (13.6% of BCE + Phys. Cont.) | 96 | 264 | 360 | 7.8 | 21.4 | 29.2 | |
| Installed Cost | 1,041 | 1,961 | 3,002 | 84.3 | 158.8 | 243.1 | |
| Working Capital | - | 185 | 185 | - | 15.0 | 15.0 | |
| Interest During Construction | 217 | 96 | 313 | 17.6 | 7.7 | 25.3 | |
| Total Financing Req'd | 1,258 | 2,242 | 3,500 | 101.9 | 181.5 | 283.4 | |

a/ The costs expressed in Cr$ have been calculated from the US$ costs using an exchange rate of Cr$12.35 = US$1.0 and are therefore only notional as changes in the exchange rate are expected (para. 5.03).

b/ Including US$32 (Cr$395) million equivalent in indirect foreign exchange based on an estimated average indirect foreign exchange content of 25% for equipment and materials and 15% for civil works and erection.

5.02 The above costs are based on estimates prepared by the foreign contractors and PETROBRAS' engineering department in June 1976 and updated in January 1977, and take into account prices for equipment and materials presently being procured by PETROBRAS on other similar projects. In comparison with capital costs estimates for similar fertilizer projects financed by the Bank, the above estimate appears somewhat high; for this a number of reasons exist: First, the project includes relatively large amounts for infrastructure for water supply and the railway extension and special railcars totalling US$19 million equivalent. Second, charges for price escalation and interest during construction are high because of the somewhat longer implementation period (para 4.06). Third, Brazilian costs for equipment and services are high when expressed in US dollars. This can at least partially be explained by the use of the official rate of exchange which is estimated to overvalue the Cruzeiro by about 25%. And fourth, as a result of the Government's and PETROBRAS' policy to support and develop Brazilian industry, 60% of the equipment and materials required by the project are to be procured locally. This, because of the higher Brazilian costs, is estimated to increase the cost of equipment and materials by about 11% and the total financing requirements at the official exchange rate by a maximum of 5%.

5.03 All imported equipment and materials for the project will be exempt from import duty. The cost of foreign engineering services and licenses included are the estimated values of the contracts which were signed in November 1976. The estimated cost per man-month (exclusive of travel and subsistence allowance) of local and foreign engineering services range from US$3,000 to 4,000 and US$7,000 to 8,000 respectively. Physical contingencies equivalent to about 9% of the base cost estimate have been added. Price escalation for equipment 1/ is calculated on the basis of projected price increases of 8% per year in 1977 and thereafter in major equipment supplying countries because of worldwide inflation. On civil works, escalation rates of 12% per year in 1977 and thereafter have been assumed based on the estimate, as in the recent past, that the cost of civil works in Brazil will rise faster than the general price level. The above cost estimates, including physical and price contingencies, are considered adequate.

5.04 Initial working capital requirements for the project (excluding spare parts and initial supplies of chemicals which are already included elsewhere in the above cost estimate) are detailed in Annex 5-2 and estimated at US$15.0 million equivalent. Interest during construction is estimated at US$25.3 million based on the disbursement as shown in the debt service schedule (Annex 6-3, Page 2) and on interest rates of 10% and 4% for foreign and local loans 2/, respectively.

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1/ The international price inflation rate is also used for estimating price escalation of local purchases (expressed in US dollars) on the assumption that differences in the domestic and international inflation rates will be accounted for by continuing adjustments in the exchange rate as is the Government's policy.

2/ These interest rates are not directly comparable since interest on foreign loans is expressed in current terms while the interest on local loans is given in real terms, i.e., with the interest and principal subject to regular adjustments in line with domestic inflation.

B. Financing Plan

5.05 The financing plan for the project will be as follows:

Proposed Financing Plan

| | (in Cr$ Million) | (in US$ Million) | % |
|---|---|---|---|
| Equity (PETROBRAS) | 1,435 | 116.1 | 41 |
| Debt | | | |
| World Bank | 790 | 64.0 | 22 |
| Cofinancing | 310 | 25.0 | 9 |
| Local Loan BNDE | 875 | 71.0 | 25 |
| PETROBRAS | 90 | 7.3 | 3 |
| Total Debt | 2,065 | 167.3 | 59 |
| Total Financing | 3,500 | 283.4 | 100 |

The project will be financed with about 41% equity and 59% debt. PETROBRAS will provide the entire equity funds and a loan of about US$7.3 million equivalent for local currency expenditures. The latter could also be provided in the form of equity or through other local or foreign loans to be determined jointly by PETROBRAS and FERTILIZANTES. An analysis of PETROBRAS' cash flow projections indicates that PETROBRAS will be able to provide these funds as well as cost overrun financing should this be necessary. The remainder of the local currency financing will come from the National Development Bank (BNDE) which has in principle agreed to provide these funds; nevertheless, BNDE is presently undertaking a final evaluation of the project and loan approval is expected by mid-1977. Repayment terms for the BNDE loan are expected to be about the same as those of the Bank, i.e. 15 years including four years of grace. While the loan will be expressed in constant terms with an interest of 4% per year, loan disbursements and debt service payments will be in current terms using a monetary correction factor tied to the domestic inflation rate.

5.06 The foreign exchange financing will come from the proposed Bank loan and from cofinancing arrangements with foreign private investors. Although untied as to purpose, the cofinancing is intended primarily to cover the foreign component of interest during construction (US$17.6 million). At this time, FERTILIZANTES has not decided whether the cofinancing will come from a foreign commercial bank or through a private placement of its debt obligations with institutional investors in the US. This will be determined by market conditions prevailing at the time FERTILIZANTES will seek such an arrangement. The terms for this type of financing will probably be seven-nine years maturity including three years of grace with an interest rate of about 10% per year1/. FERTILIZANTES agreed that it will make its best efforts to obtain about US$25 million in untied foreign exchange through a cofinancing arrangement not later than six months after Bank approval of the proposed loan.

1/ The financial projections in this report assume maturity of eight years including a grace period of three years and annual interest of 10%.

5.07 A Bank loan of US$64 million is proposed for 15 years including four years of grace at the standard Bank rate (currently 8.5% annual interest) plus a guarantee fee to the Government to bring total annual interest to FERTILIZANTES to 10%. The Bank loan will be made directly to FERTILIZANTES which will also carry the foreign exchange risk.

5.08 As in the Araucaria project, a number of assurances have been obtained from PETROBRAS and the Government regarding the financing plan of the project; these are as follows. Should any shortfall occur in the financing plan or should the project require additional funds, PETROBRAS will assure the provision of all necessary funds in the form of equity and/or loans to complete 1/ the project promptly in such a way that its (the project's) debt/equity ratio will not exceed 60/40 and its current ratio be at least 1.2. PETROBRAS also agreed to assist FERTILIZANTES in its efforts of obtaining financing through the proposed cofinancing arrangements and from BNDE. In the event that some loan repayments will be due before project completion, PETROBRAS agreed to refinance or arrange financing for such repayments. In addition, the Government agreed to take all necessary steps to assure that all funds, including foreign exchange are provided as required to complete the project without delay and in a form satisfactory to the Bank and that all approvals for implementation of the project, and all necessary imports are timely provided.

C. Procurement

5.09 All procurement for the project will be undertaken by FERTILIZANTES's own purchasing department with the exception of some technically specialized items which will be procured by the foreign engineering contractors (Kellogg and Toyo). Prequalification of suppliers to participate in ICB following placement of international notices will be undertaken by PETROBRAS' engineering department utilizing, as appropriate, advisory services from Kellogg and Toyo; the list of prequalified firms will be subject to the Bank's approval. Except for a reserve list of equipment for local manufacture which has been prepared by FERTILIZANTES and will be reviewed by the Ministry of Finance in consultation with the domestic manufacturers' association and which will also be subject to Bank approval (estimated at US$73 million equivalent ex-factory), all remaining equipment and materials for the project (estimated at US$55 million equivalent c.i.f.) will be purchased through ICB (US$30 million equivalent) and through international shopping (US$25 million equivalent) in accordance with the Bank's procurement guidelines. Of the equipment and materials so procured, it is estimated that Brazilian suppliers will be able to compete with offshore suppliers for items totalling about US$20 million of which Brazilian suppliers are expected to win equipment and materials totalling US$12 million equivalent. For the purpose of bid comparison, Brazilian suppliers participating in ICB will be granted a preference of 15%. It is planned to appoint one contractor for all major civil works and one for all plant erection after competitive bidding amongst local firms.

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1/ The project is considered complete when the plant has operated during a period of 60 consecutive days at 80% of its capacity.

D. Allocation and Disbursement of Bank Funds

5.10 The proceeds of the Bank loan would be used to finance 100% of foreign expenditures or 100% of the ex-factory price for products manufactured in Brazil for (i) equipment and materials procured through ICB (US$30.0 million); (ii) imported critical and highly specialized items with restricted bidders lists approved by the Bank (US$13 million); (iii) imported items and packages costing less than US$100,000 each procured through international shopping (US$12 million); and (iv) foreign engineering and advisory services (US$9 million). It is anticipated that prior to loan signature advance contracting will amount to US$9 million for foreign engineering services with consequent retroactive Bank financing of such expenditures not exceeding US$1.5 million. No advance contracting and retroactive financing for equipment and materials will be necessary. The anticipated Bank loan disbursement and allocation schedules are shown in Annex 5-3 and Annex 5-4. Any surplus funds remaining in the loan account after completion of the project will be cancelled.

## VI. FINANCIAL ANALYSIS

A. General

6.01 The medium and long-term financial outlook for FERTILIZANTES is difficult to assess accurately at this time since the details of the takeover of the existing companies are presently being worked out and because it is not yet clear in which manner the presently planned future undertakings will be integrated under FERTILIZANTES. For the next 3 - 4 years, the Company's strength will be dependent on the three existing operations (Fafer, Ultrafertil, Petrofertil) of which only Ultrafertil will need to be significantly strengthened (para. 2.06), the other two being financially sound. From 1980 onwards, however, the financial position of FERTILIZANTES will be increasingly determined by the new large-scale ammonia/ urea plants to be built in Araucaria, Sergipe and Norte Fluminense and the Company's participation in the exploitation of the phosphate and potash deposits at Patos de Minas and Carmopolis respectively. Because of its newness, FERTILIZANTES has so far not prepared any long-term financial projections for all its operations combined. However, FERTILIZANTES should soon be sufficiently well established to prepare a 5-year financial forecast and has agreed to prepare such projections by July 1, 1977 and update them annually and make them available to the Bank as part of the Company's reporting to the Bank. In the absence of such projections at this time the financial analysis is carried out here by treating the project as an independent financial entity and assessing its strength.

6.02 All money values in the financial projections are expressed in current US dollars using an assumed annual inflation rate of 8% until 1979 and 7% thereafter up to 1985. Using US dollars instead of Brazilian Cruzeiros has the advantage that no estimate of Brazilian future inflation is required. This approach assumes that the difference between domestic and international inflation is taken care of by appropriate exchange rate adjustments which has generally been the case in the past. The assumptions made in the financial analysis of the project are given in detail in Annex 6-1 and summarized below.

B. Production, Sales Prices and Operating Costs

6.03 It is assumed that the project will start commercial production in January 1981 and that capacity utilization will increase from 70% during the first year of operations to 90% during the third year (1983) and thereafter. At 90% capacity utilization the project would produce for sale 327,000 TPY of urea and 80,000 TPY of ammonia. It is estimated that about 70% of the urea output would be sold in bags at an estimated bag and bagging cost of US$11 per ton urea.

6.04 So far, FERTILIZANTES has not developed a detailed pricing policy for its fertilizer products. However, it is committed to two main objectives. First, since FERTILIZANTES intends to sell shares to the private sector, prices have to be high enough to generate sufficient profits and dividends to make the Company's shares attractive to private investors. Second, FERTILIZANTES has a mandate from the Government to produce and sell fertilizer materials at stable prices comparable to those prevailing over time in the international market. The Bank's long-term international price forecast indicates, in 1976 terms, a range between US$165 and 171 per ton urea (f.o.b., bagged) from which an ex-factory price for the Sergipe project of about US$205 per ton urea (bulk) destined for the Northeast market, can be determined satisfying both considerations mentioned above. For the urea which will be shipped to other regions, primarily the Center, a lower ex-factory price of US$175 per ton is assumed, reflecting the additional transport costs between the plant and the Center. These prices compare to Petrofertil's mid-1976 ex-factory price for urea of about US$180 per ton and a maximum Government controlled retail price of US$280 per ton. On average, ammonia is assumed to have a 1:1 price relationship to urea (bulk), which reflects the production cost relationship of N in ammonia to N in urea. These pricing principles have been discussed and agreed upon with the Government and FERTILIZANTES.

6.05 The prices of the principal raw materials for the plant (natural gas, vacuum gas and Bunker C oil) are all price controlled by the Government. On July 1, 1976 the Government increased the prices for these materials by about 40% but leaving them still clearly below world market levels. The revised prices are: US$0.84 per MSCF natural gas, US$58.4 per ton vacuum gas oil and US$49.2 per ton Bunker C oil. It is assumed that, except for adjustments for domestic inflation, the above prices will prevail during the planning period. The sensitivity analysis on the financial rate of return (para 6.10) indicates how the project would be affected if economic raw material prices were to be charged instead of the financial ones.

C. Production Costs and Financial Forecasts

6.06 Under the price assumptions made above and at a capacity utilization of 90%, the production cost (excluding financial charges) per ton of ammonia and urea will be US$105 and US$115 respectively in constant 1976 terms (Annex 6-2). Feedstock and fuel, depreciation and others (including labor) each account for about one-third of the estimated total annual operating costs.

6.07 The financial projections as shown in Annex 6-3 and as summarized below indicate a sound financial situation for the project entity:

Sergipe - Summary of Financial Projections
(in current million US$)

| | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|
| Capacity Utilization | 70% | 80% | 90% | 90% | 90% |
| Sales | 86.5 | 112.9 | 135.7 | 149.3 | 161.6 |
| Profit Before Tax | 16.5 | 33.9 | 49.4 | 58.4 | 66.3 |
| Profit After Tax | 11.5 | 23.7 | 34.6 | 40.9 | 46.4 |
| As % of Sales | 13.3 | 21.0 | 25.5 | 27.4 | 28.7 |
| As % of Equity | 7.0 | 12.4 | 15.2 | 15.1 | 14.5 |
| As % of Invested Capital a/ | 3.4 | 7.3 | 10.9 | 13.3 | 15.7 |
| Internal Cash Generation | 36.9 | 50.9 | 63.7 | 72.1 | 79.7 |
| Net Fixed Assets | 298.6 | 292.3 | 283.7 | 272.5 | 258.3 |
| Long-Term Debt | 154.9 | 141.3 | 126.8 | 111.3 | 94.7 |
| Current Ratio | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Debt Equity Ratio | 48/52 | 43/57 | 36/64 | 29/71 | 23/77 |
| Debt Service Coverage | 2.1 | 2.0 | 2.4 | 2.7 | 3.0 |

a/ Total assets minus cash surplus

6.08 The sales value is expected to increase from US$87 million in 1981 to US$136 million in 1983 when the target capacity utilization (i.e. 90%) is expected to be reached for the first full year. The operating ratio (operating profit as % of sales) will improve from 35 to 45% over the same period. The project's profitability is demonstrated by a steady growth of profit after taxes from US$12 million in 1981 to US$35 in 1983 and profitability will further increase thereafter with declining interest payments. By 1983, the profit and cash breakeven capacity utilization is about 52 and 43% respectively.

6.09 The project's cash generating ability together with the assumed loan terms is expected to maintain a debt service ratio of 2.0 or better during the forecast period. In spite of heavy debt service payments which will reach some US$30 million (about 27% of sales value) in 1982 the enterprise can still accumulate sufficient funds for reinvestments. After the first year of operation, the project will be able to make an annual contribution to FERTILIZANTES's dividend payments at a rate of 10% of its equity. It is projected that the project will have no difficulty of maintaining a current ratio of 1.2 or better from the first year of operations. The debt/equity ratio is 48/52 at the end of 1981; it also will steadily improve and benefit from the revaluation of equity over the subsequent years.

D. Financial Rate of Return

6.10 The financial rates of return of the project are 15% after and 19% before taxes; these are satisfactory. Sensitivity tests are presented in

Annex 6-4 and summarized in the table below indicating the relative effect on the above returns resulting from various ± changes in costs or benefit streams:

Sergipe - Sensitivity Tests

| Change in: | ± Relative Change in Financial Rate of Return (before tax) |
|---|---|
| Ammonia/urea prices (± 10%) | 3.0 |
| Capital Costs (± 10%) | 1.9 |
| Operating Costs (± 10%) | 1.1 |
| Operating Costs (Economic Instead of Financial Raw Material Prices) | 2.3 |
| Capacity Utilization (± 10%) | 2.3 |
| Delay in Completion (1/2 year) | 1.4 |
| Capital Costs & Delay in Completion (+ 10%, 1/2 year) | 3.3 |

Similar to other fertilizer projects, the return is most sensitive to a change in sales prices and least sensitive to changing operating costs. As the sensitivity tests in Annex 6-4 indicate, even under the unlikely adverse condition of a 20% decrease in the assumed sales prices the project's rate of return before taxes of 12% would still remain acceptable. If prices for raw materials were to increase to economic or world market levels, the return would drop to 16%. In the event that the annual growth rate of fertilizer demand in the Northeast would, from 1980 onwards, be only half of the projected 12%, thus requiring larger quantities of the plant's output to be shipped to other regions, the project's before tax return would only decrease by about 1% to 18%.

E. Major Risks

6.11 It is unlikely that the project will face major management problems since PETROBRAS has previous experience in executing similar projects such as the ammonia/urea plant at Camacari. Neither does it appear likely that major engineering and technological risks will arise as the engineering contractors are internationally recognized and are using proven technology and processes. The same foreign contractors are being used in the presently implemented expansion of the Camacari plant. The employment of less experienced local engineering firms, more complicated coordination and procurement arrangements than in PETROBRAS' most other projects, are taken into account by giving a 6-month longer period for project execution than in similar cases.

6.12 Financial risks exist because the prices for raw materials, the retail prices of fertilizers and the agricultural product prices are all subject to Government regulations and thus outside FERTILIZANTES' control. Since demand for the Company's products and the profitability of FERTILIZANTES

are governed by these prices, the Government has agreed that it will not take any pricing measures which would prevent the Company from covering its costs, servicing its debts and earning a reasonable return on its investment under conditions of efficient operations.

6.13 The demand for the project's ammonia and urea output is a derived demand originating at the farm level with the bulkblenders and mixers being the intermediary between the farmer and FERTILIZANTES. For the marketing of its products, the Company, therefore, has to rely on the bulkblending and mixing companies without being able to directly influence demand. As mentioned, FERTILIZANTES also has to rely on these companies to meet the investment requirements of the distribution system stemming from a fast growing demand in fertilizers in the Northeast. This constitutes a marketing risk. It will be reduced by FERTILIZANTES' own market analysis and marketing group (para 3.23) and by the actions taken on the recommendations of the Fertilizer Market and Marketing Study (para 3.13) which will indicate the measures that have to be taken by the Government and the other entities involved in the sector.

F. Financial Covenants

6.14 Following project completion, FERTILIZANTES will be required to follow prudent financial practices and has agreed to observe, both as a Company and for the project, the following financial covenants, which are essentially the same as agreed to for the Araucaria project:

i) maintain a debt/equity ratio of 60/40 or better;

ii) maintain a current ratio of at least 1.2:1.0;

iii) not incur any long-term debt if its debt service coverage will fall below 1.5;

and FERTILIZANTES will:

iv) limit its dividend distribution (except for dividends on preferred shares), or its financial commitment to any of its subsidiaries, or prepayment of any debt if such action would cause its current ratio to fall below 1.5;

v) operate the project as a separate profit center with its own income, cash flow and balance sheet accounts for control purposes; and

vi) continue to have its accounts audited by independent auditors acceptable to the Bank.

## VII. ECONOMIC ANALYSIS

### A. General

7.01 In economic terms, the project substitutes temporarily for imports into other regions, primarily the Center as dicussed in para 3.18. For the valuation of the economic benefits, this means that the output of the project has to be valued at c.i.f. prices, since port handling charges and inland transportation to the consumption centers would take place in any case. In addition, the transport patterns with and without the project and their associated costs have been analyzed to determine the incremental transport costs and benefits accruing to the economy as a result of the project.

7.02 For the economic analysis of the project, costs and benefits are divided into tradeable and non-tradeable items and are valued at their respective world market and domestic prices. Most significant in the economic analysis is the valuation of the raw material and fertilizer prices. The economic rate of return has been calculated using a shadow rate of exchange 25% higher than the official rate to reflect foreign trade distortions caused by import tariffs, export taxes and subsidies, as well as other forms of import restrictions or export incentives. The costs and benefits during the project's operating life are expressed in constant 1976 US dollars. The assumptions for the economic analysis of this project are detailed in Annex 7-1.

7.03 After the increases in 1973/74, international fertilizer prices started to fall in 1975 and reached their low point during the first half of 1976. Bagged urea has been selling at about US$120 per ton f.o.b. during the latter half of 1976 and it is expected that real price increases will bring the price level in constant 1976 terms to about US$165 and US$171 per ton in 1979/1985 respectively 1/. Using the price forecast for 1985 as an average f.o.b. price during the project's operating life, a c.i.f. price of US$185 per ton bulk urea is derived after taking into account ocean freight (US$25 per ton) and bagging charges (US$11 per ton). For ammonia, the same price of US$185 per ton is used assuming - as in the financial analysis - an ammonia/urea price relationship of 1:1.

### B. Prices of Raw Materials and Economic Product Costs

7.04 The limited natural gas resources of the Northeast make it necessary to restrict the use of gas to purposes where it can be used as a feedstock for the petro-chemical industries. Other consumers, who would have used the gas for heating purposes, will have to use other fuels, mainly heavy fuel oil, which is readily available. Therefore, the opportunity cost of gas has been established on a calorific equivalent basis with heavy fuel oil. Assuming an f.o.b. crude oil price of about US$11.5 per barrel and an f.o.b. heavy fuel oil price of about US$63 per ton, the oppor-

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1/ Price Prospects for Major Primary Commodities, June 1976, WB Rep. No. 814/76.

tunity cost of the gas consumed by the project is estimated at US$1.48 per MCSF. As fuel, the project requires Bunker C and vacuum gas oil, both traded commodities, with estimated long-term economic f.o.b. prices of US$65 and US$80 per ton respectively. The economic product costs deducted from these price assumptions for raw materials are shown in Annex 6-2.

C. Transportation

7.05 As a result of the project, rail transportation costs of moving fertilizer from the Camacari plant to the market in the Northeast are saved, while additional coastal shipping costs are incurred for moving the Camacari output to other regions, primarily the Center. Economic rail transport costs between Camacari and Sergipe have been estimated at about US$11 per ton of urea which covers all of the railway's variable costs and a portion of total fixed costs attributable to the fertilizer traffic. Costs of coastal shipping between the Northeast and the Center have been estimated by PETROBRAS at about US$12 per ton of ammonia/urea. With these rather conservative cost assumptions it is estimated that the project will add about US$2.0 million per year to the overall transportation costs of the economy (Annex 7-2 and 7-3). These costs are added to the cost streams for calculation of the economic rate of return.

D. Economic Rate of Return

7.06 Under the assumptions outlined above, the project's economic rate of return is 17% (Annex 7-4). This return is slightly lower than the financial return before taxes, mainly because of higher economic costs for feedstock (75%) and fuel (50%) and slightly lower economic revenues. The same sensitivity tests were carried out for the economic analysis as for the financial analysis and are summarized below:

Sergipe - Sensitivity Tests

| ± 10% Change in: | ± Relative Change in Economic Rate of Return |
|---|---|
| Ammonia/urea prices | 3.2 |
| Capital Costs | 1.8 |
| Operating Costs | 1.4 |
| Capacity Utilization | 2.4 |
| Delay in Completion (1/2 year) | 1.2 |
| Capital Costs & Completion Delay | 3.0 |

7.07 The economic rate of return, as the financial return, shows a high sensitivity to changes in product prices and to a lesser degree to changes in capital and operating costs. If gas were abundantly available, and it could be economically justified to use it not only for feestock but also as fuel, the economic rate of return would improve by about 1.2%. If demand for fertilizer in the Northeast from 1980 onwards would grow at only half the

projected growth rate, requiring substantially larger quantities of the project's output to be sent to other regions, the economic rate of return would drop by only about 0.5%. Using the official instead of the shadow rate of exchange the return would be 12%.

E. Other Benefits

7.08 The project, by increasing Brazil's nitrogen capacity by about one-fourth, will contribute to the stabilization of the agricultural sector by reliably providing fertilizers to the farmers at stable prices. Also, the plant will be located in one of the poorest and least industrialized regions of Brazil and there will be positive spillover effects from the required infrastructure and training. The project will also provide support of the Government's policy of industrial decentralization.

7.09 The local engineering firms involved in the project implementation will gain valuable experience (transfer of technology) which will be significant for the execution of future chemical undertakings in Brazil. Out of a total amount for equipment of US$121 million, US$73 million or some 60% of the total will be supplied by local manufacturers; this constitutes an important contribution to the development of the Brazilian industry. Of the project management, engineering and erection services, about 80% or some US$64 million will be provided domestically. The project's net annual foreign exchange savings before provision for principal and interest payments on foreign loans at 90% capacity utilization are estimated at US$65 million (in 1976 terms).

## VIII. AGREEMENTS

8.01 Assurances and agreements were obtained from the Government, PETROBRAS and FERTILIZANTES on the following major points:

1. From the Government that it will:

   (a) Exchange views with the Bank on the development of the fertilizer sector (para 3.12);

   (b) Take all necessary steps to assure that all funds, including foreign exchange, are provided as required to complete the project and that all approvals for implementation of the project, and all necessary imports are timely provided (para 5.08);

   (c) Not take any action with regard to the prices of raw materials required by the project, of urea and ammonia, and of agricultural products that would prevent FERTILIZANTES from making a reasonable return on investment under conditions of efficient operations (para 6.12);

2. From PETROBRAS that it will:

(a) Dedicate a minimum quantity of 3.1 billion $NM^3$ of natural gas to the exclusive use of the project (para 4.03);

(b) Assist FERTILIZANTES in obtaining untied foreign exchange financing of about US$25 million equivalent and a loan from BNDE of about US$71 million equivalent (para 5.08);

(c) Refinance, as necessary, any loan repayments due before project completion (para 5.08);

(d) Supply both foreign exchange and local funds, as necessary, to complete the project, on terms and conditions such that at project completion the project entity will have a debt/equity ratio of 60/40 or better, and a current ratio of at least 1.2 (para 5.08);

3. From FERTILIZANTES that it will:

(a) Submit to the Bank not later than August 31, 1977 a detailed report on the financial condition of ULTRAFERTIL and on its plans for improving the latter's financial performance (para 2.06);

(b) Provide the Bank not later than March 31, 1978, with a detailed plan for recruitment, training and staffing of the project (para 4.08);

(c) Take all necessary steps to obtain a loan from BNDE of about US$71 million equivalent with a grace period and maturity similar to the proposed Bank loan (para 5.05);

(d) Obtain untied foreign exchange financing through a commercial bank loan or private placement of its debt obligations of about US$25 million equivalent not later than six months after the Bank's approval of the project (para 5.06);

(e) Provide the Bank with yearly updated 5-year financial projections for the company as a whole and for each of its units, the first such projections to be submitted to the Bank by July 1, 1977 (para 6.01);

(f) Observe the financial covenants as described in para 6.14.

8.02 In addition, as a condition of effectiveness, satisfactory arrangements will have to be made for the supply of gas, vacuum gas oil, Bunker C fuel oil, and for the construction of water and electricity supply facilities (para 4.04).

8.03 With the assurances listed above, the project is suitable for a Bank loan of US$64 million equivalent, to be made to FERTILIZANTES, for 15 years, including four years of grace at the Bank's prevailing interest rate to which a fee payable to the Government would be added increasing the cost to FERTILIZANTES to 10%.

Industrial Projects Department
March 1977

# BRAZIL - SERGIPE FERTILIZER PROJECT

## GLOSSARY OF TECHNICAL TERMS

Ammonia. A compound of nitrogen and hydrogen ($NH_3$) obtained by synthesis of nitrogen and hydrogen. It is a gas at normal atmospheric temperature and pressure. It can be liquefied at -33°C (-28°F) at atmospheric pressure but it can also be liquefied at ordinary temperatures by application of pressure. For instance at 60°F (15.5°C) a pressure of 107.6 lbs. per sq. in. (7.3 $kg/cm^2$) or about 7 atmospheres would be required. Ammonia is applied as a fertilizer because of its high nutrient content (82% N) but it requires special expensive equipment for storage, transportation and application and soils having high temperatures may result in prohibitive losses.

Ammonium Carbamate. An intermediate chemical formed in solution during synthesis of urea from carbon dioxide and ammonia. On reduction in pressure it decomposes into urea with the formation of byproduct water. Ammonium carbamate is a highly corrosive material and requires the use of special materials in equipment required to handle it.

Ammonium Nitrate. A nitrogenous fertilizer containing 35% nitrogen made by producing nitric acid as an intermediate by the oxidation of ammonia and then reacting with additional ammonia.

Ammonium Phosphate. White crystalline solids made by the interaction of ammonia and phosphoric acid. The two compounds of interest to the fertilizer industry are mono-ammonium phosphate $(NH_4)H_2PO_4$ - (11-48-0), and di-ammonium phosphate $(NH_4)_2HPO_4$ - (21-53-0).

Ammonium Sulphate. One of the earliest chemical fertilizers containing 21% nitrogen, now produced largely as a byproduct in chemical industry. Gradually being displaced by urea although still extensively used, and especially suitable for certain crops notably tea.

Annhydrous Ammonia. Ammonia in pure form either in the gaseous or liquid state having no water content.

Biuret. An impurity, $NH(CONH_2)_2H_2O$ found in commercial urea, brought about by a partial decomposition of the urea to biuret and ammonia. For certain applications, particularly when the urea is ultimately sprayed on citrus trees, the biuret content should be kept as low as possible, in the range 0.1 to 0.3 wt. %.

Bulk Fertilizer. The term bulk fertilizer can be taken to mean commercial fertilizer delivered to the purchaser, either in the solid or liquid state, in a nonpackaged form to which a label cannot be attached.

Bunker C. A heavy residual fuel oil supplied to ships and industry.

Caprolactam. An intermediate in the production of Nylon-6. In the traditional caprolactam manufacturing processes approximately 4.5 tons of byproduct ammonium sulphate are produced per ton of caprolactam.

Chromates. Chemical compounds of chromium sometimes used in the treatment of cooling water to inhibit scaling and corrosion.

Complex Fertilizers. All three primary nutrients (N, $P_2O_5$, $K_2O$) are frequently applied to the soil at the same time in ratios varying with the nutrient requirements of different crops. Complex fertilizers contain at least two chemically combined nutrients. To facilitate handling, the several required chemicals are usually agglomerated into uniform granules for distribution. The analysis of each nutrient is given as a ratio to describe the NPK product. Thus 15-15-15 complex fertilizer contains 15% each of N, $P_2O_5$, and $K_2O$; and 12-24-12 complex fertilizer contains 12% N, 24% $P_2O_5$ and 12% $K_2O$.

Diammonium Phosphate. (See ammonium phosphate.)

Eickmeyer Catacarb Process. A liquid scrubbing process for the removal of carbon dioxide from synthesis gas using hot potassium carbonate solution containing an amine-borate activator and corrosion inhibitor. Process developed and licensed by Eickmeyer and Associates.

Gas Oil. The heaviest vaporizable fraction of petroleum having a viscosity and boiling range between kerosine and lubricating oil. So called because of its previous extensive use in the gas industry in the production of carburetted water gas.

Heavy Fuel Oil. A mixture of the liquid residues from refinery distillation and cracking processes blended with fractions of suitable boiling point range from the distillation of crude oil.

$K_2O$. Historically the potassium nutrient content of a fertilizer has been expressed in terms of potassium oxide equivalent ($K_2O$), even though $K_2O$ as such is never found in fertilizer.

Liquid Ammonia. Ammonia in the liquid phase either by virtue of high pressure, refrigeration or a combination of the two.

MAP. Mono-ammonium phosphate (see ammonium phosphate).

Muriate of Potash. The principal source of potassium for fertilizer. Muriate of potash, the chemical name of which is potassium chloride, is usually sold on the basis of material containing 95-99% KCl, with a $K_2O$ equivalent of 60-62%.

Naphtha. A light petroleum distillate between kerosine and gasoline having a final boiling point up to 220°C.

Nitric Acid. A strong mineral acid. It is produced by the partial oxidation of ammonia over a metallic catalyst and dissolving the reaction products in water.

Nitrochalk. A mixture of ammonium nitrate and finely pulverized limestone approximately in the ratio three parts to two by weight. The material contains 20.5% N.

NPK. (See complex fertilizers.)

Nutrient. Any element taken in by a plant, essential to its growth, and used by it in elaboration of its food and tissue. The primary plant nutrients are nitrogen (N), phosphorous (P) and potassium (K). (See also complex fertilizers.)

$P_2O_5$. Traditionally the phosphorous nutrient content of a fertilizer has been expressed in terms of the available phosphate equivalent ($P_2O_5$).

Phosphate Rock. Phosphate-bearing ore composed largely of tricalcium phosphate. Phosphate rock can be treated with strong acids or heat to make available forms of phosphate. Finely ground rock phosphate is sometimes used in long-time fertility programs.

Phosphoric Acid. ($H_3PO_4$). An inorganic acid used in the manufacture of concentrated calcium phosphates, ammonium phosphates and sometimes for direct application through irrigation water.

Potash. A term used to denote the potassium oxide ($K_2O$) equivalent of materials containing potassium. (See also $K_2O$.)

Potassium Chloride. A salt containing not less than 48% potash chiefly as chlorides and the principal source of potassium.

Potassium Sulphate. A salt containing not less than 48% potash, chiefly as sulphate, and not more than 2.5% chlorine.

Prills. Spherical particles prepared by spraying molten material downward through a countercurrent stream of cooling air; this operation is performed in a prilling tower. The particles obtained have excellent storage and handling properties in that they are hard and have less surface area than crystals.

Refinery Gas. A mixture of gases gathered in a petroleum refinery from the various refining units.

Simple Superphosphate. A product obtained by treating phosphate rock with sulfuric acid and consisting of a mixture of monocalcium phosphate $CaH_4(PO_4)_2$, dicalcium phosphate $CaHPO_4$, tricalcium phosphate $Ca_3(PO_4)_2$, calcium sulphate and other impurities. Tricalcium phosphate is totally insoluble and is not included in the $P_2O_5$ content of the superphosphate (16% to 18%).

Sulfuric Acid. A strong acid made from various sulfur materials. It is used in the manufacture of fertilizers such as ammonium sulphate and superphosphate.

Triple Superphosphate. Obtained by reaction of phosphate rock and phosphoric acid. Since it contains no calcium sulphate, its $P_2O_5$ content (about 46%) is much higher than in single superphosphate.

Urea. Urea is known chemically as carbamide or $NH_2CONH_2$--the normal amide of carbonic acid; this compound contains about 46% N, all in the ammonium form. It is considerably less hygroscopic than ammonium nitrate and it is the most widely used straight nitrogen fertilizer today.

Vacuum Gas Oil. A distillate produced from the distillation of residual oil under vacuum.

Industrial Projects Department
March 1977

# BRAZIL - SERGIPE FERTILIZER PROJECT

## DESCRIPTION OF PROJECT SPONSORS

1. The Sergipe project is sponsored by Petroleo Brasileiro S.A. (PETROBRAS) which will supply all the equity funds for the project. Responsibility for implementation of the project is with PETROBRAS' fertilizer project implementation unit (COFEN) supported by PETROBRAS engineering department on behalf of a recently created wholly owned subsidiary, Petrobras Fertilizantes S.A. (FERTILIZANTES). FERTILIZANTES' proposed organization chart is shown in Chart I. FERTILIZANTES will be the owner of the project and has responsibility for procurement of all but critical items required by the project and for recruiting and training the staff necessary to operate and manage the plant once it is completed. FERTILIZANTES was established to consolidate PETROBRAS' existing and future fertilizer interests. Until the end of 1976, PETROBRAS' existing fertilizer operations were owned by Petrobras Quimica S.A. (PETROQUISA) also a wholly owned subsidiary of PETROBRAS. By early 1977, however, control over these operations has been given to FERTILIZANTES so that PETROQUISA will not any longer be involved in the fertilizer sector. A description of PETROBRAS and the existing fertilizer operations is given below.

### I. Petroleo Brasileiro S.A. (PETROBRAS)

2. PETROBRAS is the Government oil company established in 1953. It owns eight existing refineries, has a large retail system and is responsible for petroleum exploration, all imports and petroleum and gas production. There are two small refineries not owned by PETROBRAS. However, they cannot expand and must buy crude from PETROBRAS. There are some private oil distributors/retailers but they buy refined products from PETROBRAS and retail prices are controlled by the Government.

PETROBRAS' corporate organization chart is shown in Chart II, and the consolidated statements for PETROBRAS and its subsidiaries are shown in Tables 1-5.

PETROBRAS' consolidated investment program was US$0.6 billion in 1973 but increased sharply to US$0.9 billion and about US$1.4 billion during 1974 and 1975, respectively, and is expected to remain at this level for the next four years. Historically (1972-1975) internal funds provided 54% of the total fund sources with new capital including special Government contributions adding 15% and new debt 31%. More than one-half of the funds, about 54%, were utilized for capital investments with the balance used for debt service, additional working capital and dividend payments. Assuming that the new capital and new loans were used exclusively to finance capital investments, the investment program would have been financed with 15% internal funds, 28% new capital and 57% debt which is a sound capitalization structure. Substantially the same pattern of fund sources and uses are projected for the next four years.

PETROBRAS has typically been using foreign commercial bank lines of credit, and tied export or buyer's credits, to finance imported goods. These credits, arranged well in advance of disbursement, are not initially allocated to a specific project. While these buyer's credits are always tied, PETROBRAS, by using them on an unallocated basis coupled with negotiations, apparently has not suffered any particular price disadvantage vis-a-vis ICB.

## II. Existing Fertilizer Operations

### 1. Fabrica de Fertilizantes (FAFER)

FAFER was established in the early 1950s to use the refinery gas of the Cubatao (Sao Paulo) refinery for the production of ammonia, nitric acid, ammonium nitrate and nitrochalk with a concentration of 27% nitrogen (N) to be used as fertilizer. The plant also has a sulfur recovery unit extracting sulfur from the refinery gas. Production started in 1956, but it was only in 1958 that all start-up problems had been overcome and a capacity utilization of 80% reached.

In 1974 FAFER started its nitric acid concentration unit which concentrates the plant's acid of 54% to 63% and 99%. Actual fertilizer production in 1975 reached about 25,000 tons of N which equals about 12% of Brazil's domestic production of N and 6% of Brazil's N consumption in 1975. A summary of the unit's production is given below:

HISTORICAL PRODUCTION OF FAFER
(in tons)

| Product | 1973 | 1974 | 1975 |
|---|---|---|---|
| Nitric Acid (54%) | 15,317 | 23,926 | 9,539 |
| Nitric Acid (63%) | - | 7,910 | 434 |
| Nitric Acid (99%) | - | 674 | 8,710 |
| Nitrochalk | 86,390 | 95,738 | 92,387 |
| Ammonia for Sale | 1,884 | 1,785 | 4,295 |
| Ammonium Nitrate | 11,893 | 14,836 | 11,232 |
| Sulfur | 2,478 | 511 | 4,076 |

Ammonia production has suffered in the past from irregularities of refinery gas supply because of extensive overhauls and modernizations in the refinery. FAFER has therefore imported ammonia when required to maintain full production of the other units in the plant.

Although the plant has now been in production for 20 years, it still operates with a small profit margin, and it is expected that the plant can continue to operate in this manner for a number of years.

Originally, FAFER was a subsidiary of PETROBRAS, but with the creation of PETROQUISA in 1967 it became an operating unit of PETROQUISA. With the reorganization of PETROBRAS fertilizer operations at the beginning of 1977, FAFER became an operating division of ULTRAFERTIL.

2. Industria e Comercio de Fertilizantes S.A. (ULTRAFERTIL)

ULTRAFERTIL was established in 1966 as a joint venture between Phillips Petroleum, a US petroleum and fertilizer company, the Brazilian Ultra group and IFC. In 1974, because of financial difficulties, Phillips sold its shares to PETROQUISA and ownership of the company now is to 85% with FERTILIZANTES, 10% with the Ultra group and about 5% with IFC.

The company's facilities at Cubatao (Sao Paulo) include a 450 ton per day naphtha based ammonia plant with auxiliary facilities to produce ammonium nitrate and diammonium phosphate fertilizers. Port-handling facilities for ammonia and fertilizer materials are also included. At present, the company is completing an ammonia storage tank of 20,000 tons capacity and is altering the ammonia nitrate plant to produce calcium ammonium sulphate in the future.

Together with its production facilities at Cubatao, ULTRAFERTIL established 14 distribution centers intended to handle about half of the company's total production. The centers are located in South Central Brazil, the market area for ULTRAFERTIL. However, soon after production had started in late 1970 it became apparent that the distribution centers were overdesigned and only six of them are now operating, the other being used for storage.

Production has been reasonably stable with capacity utilization for the whole plant averaging about 90% over the last three years:

ULTRAFERTIL - HISTORICAL PRODUCTION
(in 1,000 tons)

| Product | 1971 | 1972 | 1973 | 1974 | 1975 |
|---|---|---|---|---|---|
| Ammonia | 105 | 102 | 118 | 132 | 118 |
| Nitric Acid | 78 | 93 | 152 | 140 | 116 |
| Ammonium Nitrate | 86 | 105 | 189 | 191 | 152 |
| Sulfuric Acid | 199 | 242 | 249 | 274 | 253 |
| Phosphoric Acid | 55 | 69 | 68 | 80 | 67 |
| DAP | 110 | 114 | 146 | 193 | 118 |
| MAP | - | - | - | - | 34 |

With a total N production of around 90,000 TPY, ULTRAFERTIL is presently the largest producer of N in Brazil. ULTRAFERTIL's production equals about 56% of Brazil's domestic production of N and 21% of its consumption in 1975.

Because ULTRAFERTIL also mixes and blends fertilizer materials, part of which is imported, its sales are very diversified as shown below:

ULTRAFERTIL - SALES HISTORY
(in 1,000 tons)

| Products | 1973 | 1974 | 1975 | 1976 (6 mo) |
|---|---|---|---|---|
| Ammonia for Sale | 42 | 63 | 59 | 31 |
| Nitric Acid | 2 | 1 | - | 8 |
| Ammonium Nitrate | 175 | 125 | 115 | 63 |
| Sulfuric Acid | 46 | 53 | 49 | 11 |
| Phosphoric Acid | 1 | - | - | - |
| DAP | 112 | 138 | 88 | 90 |
| Simple Superphosphate | 3 | 2 | 18 | 6 |
| Triple Superphosphate | 3 | 2 | 8 | 3 |
| Potassium Chloride | 5 | 6 | 4 | 1 |
| Ammonium Sulfate | 14 | 3 | 18 | 9 |
| Nitrochalk | 1 | 1 | 6 | 1 |
| Urea | 12 | 1 | 5 | 3 |
| MAP | - | - | 2 | 4 |
| Complex Fertilizers | 201 | 172 | 210 | 71 |
| TOTAL | 617 | 567 | 582 | 301 |

The sales volume has been rather stable over the last three years, and 1976 sales are expected to follow the same trend, although sales of complex fertilizers are lagging behind.

ULTRAFERTIL's financial performance has been less than satisfactory (Table 6). In 1974 the company made, after three years of operation, its first profit of US$21.5 million, which reduced the accumulated deficit from US$33.2 million at the end of 1973 to US$11.7 million at the end of 1974. Profitability in 1975 was marginal with net income being only about 1% of net revenues and a sizeable loss of around US$10 million is projected for 1976. As a consequence of the poor performance, the debt/equity ratio deteriorated to 95/5 in 1973, but has improved in 1974 and 1975 to about 60/40. The debt service coverage has been only between 0.3 and 0.5 except in 1974 when it was satisfactory with 1.3. Additional long-term debt and share capital contributions from PETROQUISA provided the necessary funds to keep ULTRAFERTIL alive.

The reasons for ULTRAFERTIL's poor financial performance are manifold. While the company's production performance has been satisfactory, production costs have been high caused partly by built-in inefficiencies in the plant and partly by high overheads. Also, ULTRAFERTIL had initially difficulties obtaining Government approval for sales price increases for their products. In addition, ULTRAFERTIL is affected by the import quotas, which are established at times of low international fertilizer prices to protect the domestic industry. These quotas, however, are dependent on consumption and production forecasts which are never completely accurate. As a result, there might be an excess of imports, which penalizes higher-cost domestic producers such as ULTRAFERTIL or not enough imports which restricts overall growth of fertilizer consumption.

3. Petrobras Quimica Fertilizantes S.A. (PETROFERTIL)

PETROFERTIL was established in 1966 and started production of ammonia and urea in 1971. The production facilities consist of a 200 TPD ammonia and a 250 TPD urea plant. The plant is located in the Salvador petrochemical complex in Camacari, close to Salvador (Bahia). Natural gas from oil and gas fields of the state of Bahia is used as feedstock and fuel.

The following table gives production and capacity utilization since the beginning of production:

PETROFERTIL - PRODUCTION HISTORY

| | 1971 | 1972 | 1973 | 1974 | 1975 |
|---|---|---|---|---|---|
| Production (000 tons) | | | | | |
| Ammonia | 3.1 | 34.2 | 42.7 | 52.1 | 52.1 |
| Urea | 3.8 | 47.3 | 66.3 | 77.8 | 77.5 |
| Capacity Utilization | | | | | |
| Ammonia Plant | 5% | 52% | 65% | 79% | 79% |
| Urea Plant | 5% | 57% | 80% | 94% | 94% |
| Overall | 5% | 55% | 73% | 87% | 87% |

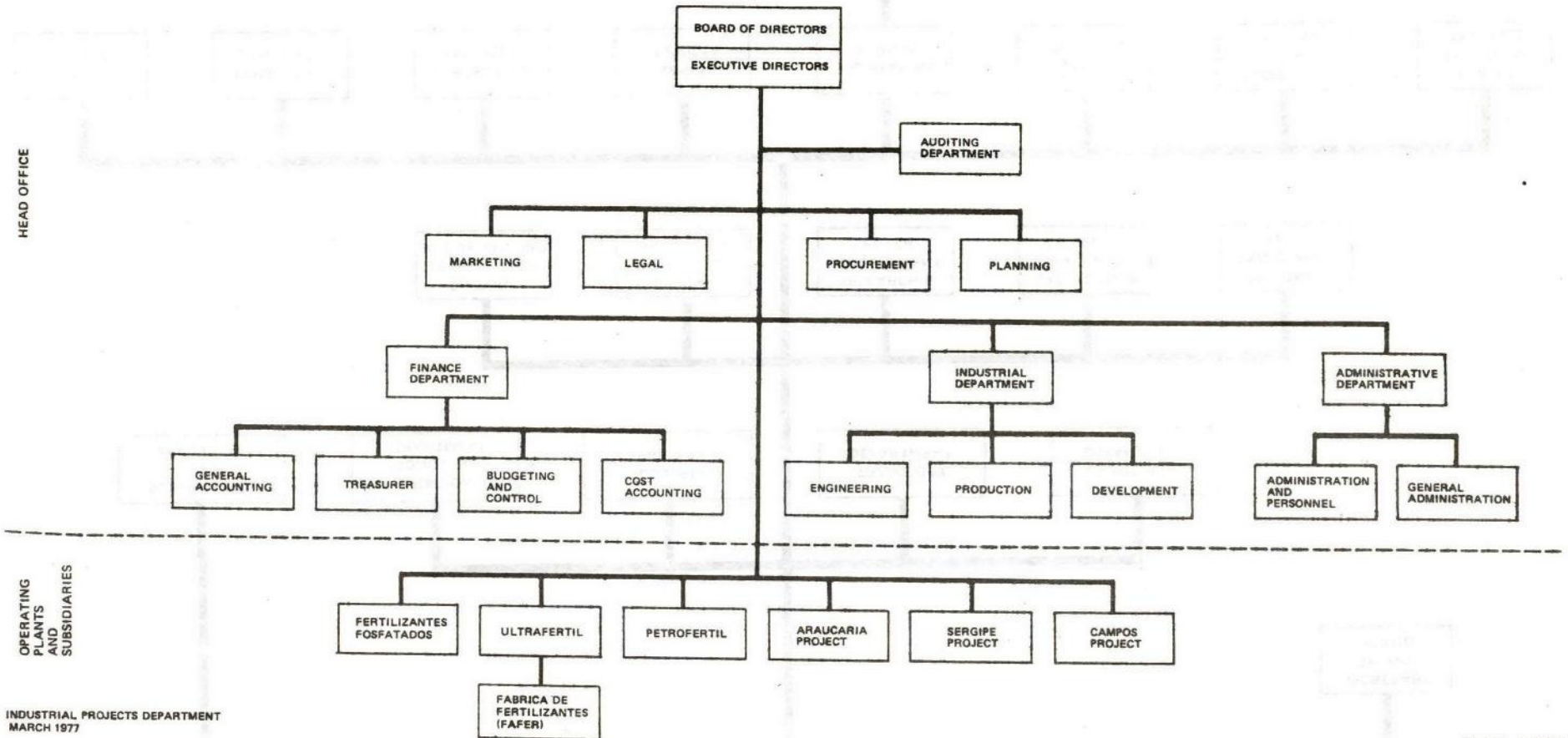
Production performance has thus been satisfactory with the company's overall capacity utilization now stabilizing at about 87%.

Financially, the company is very strong (Table 7), which is somewhat surprising because ammonia plants of this size cannot compete with modern large-scale plants. The reason for the company's high profitability lies in the fact that a considerable portion of the fixed asset costs were absorbed by PETROBRAS before transferring the plant to PETROFERTIL. Depreciation and financial charges are therefore very low, and the company's ammonia and urea production costs are even lower than prices for imported material. Debt/equity and current ratio are also satisfactory.

The company is presently expanding its production facilities and is adding a 900 TPD ammonia and an 800 TPD urea plant which will also use natural gas as feedstock and fuel. However, as for the Sergipe project, the plant is designed to also use vacuum gas oil for fuel if it is necessary to conserve gas. Production from the new plant will start at the end of 1977. PETROFERTIL will then be the largest nitrogen producer in Brazil. By that time, the company expects that the output of the presently producing plant will be consumed entirely by non-fertilizer users.

Industrial Projects Department
March 1977

BRAZIL – SERGIPE FERTILIZER PROJECT
PROPOSED FERTILIZANTES ORGANIZATION CHART

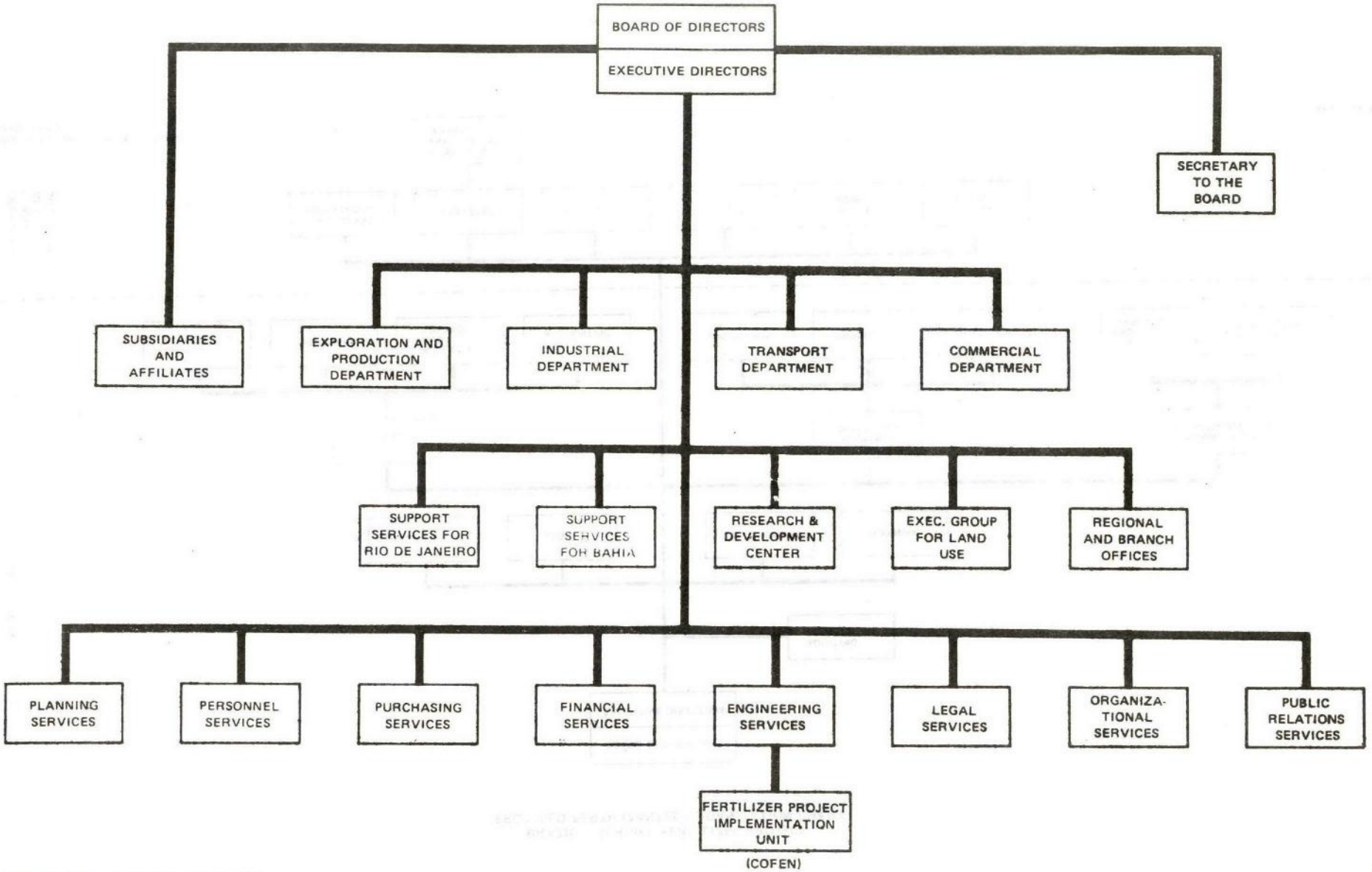



INDUSTRIAL PROJECTS DEPARTMENT
MARCH 1977

World Bank–16423

ANNEX 2
Chart I

BRAZIL – SERGIPE FERTILIZER PROJECT
PETROBRAS CORPORATE ORGANIZATION CHART




INDUSTRIAL PROJECTS DEPARTMENT
MARCH 1977

World Bank–15762

ANNEX 2
Chart II

BRAZIL - SERGIPE FERTILIZER PROJECT

HISTORICAL FINANCIAL STATEMENTS OF PETROBRAS
(in US$ Millions)

| For the Year Ending Dec. 31 | PETROBRAS - FINANCIAL STATEMENTS | | | | PETROBRAS & SUBSIDIARIES CONSOLIDATED STATEMENTS[1] | | |
|---|---|---|---|---|---|---|---|
| | 1972 | 1973 | 1974 | 1975 | 1973 | 1974 | 1975 |
| Gross Revenues | 2,070.6 | 2,957.9 | 5,276.5 | 6,967.8 | 3,334.1 | 5,811.5 | 7,735.5 |
| Sales & Other Taxes | 857.4 | 1,152.5 | 1,524.5 | 1,675.5 | 1,031.2 | 1,218.0 | 1,340.9 |
| Cost of Sales | 797.6 | 1,227.3 | 2,672.8 | 3,944.6 | 1,575.5 | 3,235.8 | 4,563.6 |
| Other Charges | 129.3 | 231.5 | 504.2 | 707.3 | 350.0 | 685.5 | 967.8 |
| Monetary Correction on Working Capital | - | - | 111.6 | 27.9 | 49.4 | 131.8 | 158.7 |
| Provision for Income Taxes | 9.6 | 10.4 | 19.9 | 8.7 | 26.2 | 32.4 | 25.5 |
| Net Income | 276.7 | 336.2 | 443.5 | 636.8 | 301.8 | 508.0 | 679.0 |
| Sources of Funds | | | | | | | |
| Current Operations | 423.0 | 609.3 | 918.0 | 1,008.4 | | 1,052.7 | 1,169.2 |
| Capital Subscription, Government Funds for Investment & Other Sources | 184.0 | 192.6 | 293.5 | 304.0 | | 282.4 | 335.6 |
| Loans | 55.9 | 197.6 | 885.5 | 1,292.7 | | 957.5 | 1,373.3 |
| Total Sources | 662.9 | 999.5 | 2,097.0 | 2,605.1 | n.a. | 2,292.6 | 2,878.1 |
| Uses of Funds | | | | | | | |
| Repayment of Long-Term Debt | 38.9 | 86.5 | 449.5 | 982.0 | | 487.6 | 1,051.5 |
| Capital Investments | 453.5 | 622.0 | 905.4 | 1,231.3 | 640.7 | 937.5 | 1,401.9 |
| Dividends and Other Uses | 27.7 | 101.8 | 75.0 | 183.3 | | 69.8 | 159.9 |
| Addition to Working Capital | 142.8 | 189.2 | 667.1 | 208.5 | | 797.7 | 264.8 |
| Total Uses | 662.9 | 999.5 | 2,097.0 | 2,605.1 | n.a. | 2,292.6 | 2,878.1 |
| urrent Assets | 785.1 | 1,188.4 | 2,255.9 | 3,355.8 | 1,474.2 | 2,642.4 | 3,810.5 |
| Long-Term Investments & Receivables | 24.3 | 28.5 | 321.4 | 395.2 | 51.0 | 47.2 | 42.7 |
| Fixed Assets (Net) | 1,349.1 | 1,779.8 | 1,748.4 | 2,623.6 | 2,001.2 | 2,186.8 | 3,271.9 |
| Deferred Charges (Net) | 36.1 | 28.9 | 70.9 | 53.8 | 76.3 | 115.9 | 98.8 |
| Current Liabilities | 390.7 | 604.7 | 1,100.2 | 2,136.2 | 775.7 | 1,270.3 | 2,344.6 |
| Long-Term Debt | 139.6 | 258.3 | 727.9 | 898.7 | 533.8 | 1,021.5 | 1,207.8 |
| Minority Capital in Subsidiaries | - | - | - | - | 82.5 | 34.2 | 80.8 |
| Equity | | | | | | | |
| Capital | 1,094.8 | 1,146.7 | 1,350.2 | 1,566.0 | 1,146.7 | 1,350.2 | 1,566.1 |
| Retained Earnings & Reserves | 569.4 | 1,015.8 | 1,218.3 | 1,827.4 | 1,064.0 | 1,316.1 | 2,024.6 |
| Total Equity | 1,664.2 | 2,162.5 | 2,568.5 | 3,393.4 | 2,210.7 | 2,666.3 | 3,590.7 |
| Total Assets or Liabilities | 2,194.6 | 3,025.5 | 4,396.6 | 6,428.4 | 3,602.7 | 4,992.3 | 7,223.9 |
| Long-Term Debt Equity[2] Ratio | 8:92 | 11:89 | 22:78 | 21:79 | 19:81 | 27:73 | 25:75 |
| Current Ratio | 2.0 | 2.0 | 2.0 | 1.6 | 1.9 | 2.1 | 1.6 |
| Net Income as % of Equity[2] | 16.6 | 15.5 | 17.3 | 18.7 | 13.2 | 18.8 | 18.9 |
| Exchange Rate Cr$/US$ | 6.22 | 6.22 | 7.44 | 8.50 | 6.22 | 7.44 | 8.50 |

1/ Consolidated statements were prepared starting in 1973. Prior statements were not consolidated.

2/ Including minority capital in subsidiaries for the consolidated ratio.

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BRAZIL - SERGIPE FERTILIZER PROJECT

PETROBRAS: SOURCES AND USES OF FUNDS, 1973-1975, PROJECTIONS TO 1980
(million cruzeiros) 5/

| | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 |
|---|---|---|---|---|---|---|---|---|
| **Source of Funds** | | | | | | | | |
| Internally generated Funds 1/ | 7,283 | 9,955 | 9,784 | 13,998 | 16,005 | 17,603 | 18,527 | 20,889 |
| Externally raised Funds 2/ | 2,306 | 9,602 | 12,543 | 9,220 | 9,652 | 10,659 | 10,000 | 3,018 |
| Other Funds 3/ | 2,248 | 3,185 | 2,950 | 3,098 | 4,415 | 4,024 | 3,611 | 3,018 |
| TOTAL | 11,837 | 22,742 | 25,277 | 26,316 | 30.072 | 32,286 | 32,138 | 33,907 |
| **Use of Funds** | | | | | | | | |
| Investment | 7,259 | 10,258 | 13,526 | 15,291 | 15,990 | 16,347 | 16,009 | 19,325 |
| Exploration & Production | 2,139 | 2,758 | 3,767 | 6,104 | 6,750 | 7,687 | 10,205 | 11,225 |
| Refining | 1,835 | 3,940 | 5,800 | 5,225 | 3,552 | 1,965 | 1,133 | 3,200 |
| Transportation | 1,589 | 2,032 | 2,716 | 3,192 | 3,435 | 1,791 | 1,355 | 1,800 |
| Fertilizer Projects | - | - | - | 155 | 1,320 | 2,770 | 560 | 30 |
| Other Activities | 1,696 | 1,528 | 1,243 | 615 | 933 | 2,134 | 2,756 | 3,070 |
| Other Applications 4/ | 4,578 | 12,484 | 11,751 | 11,025 | 14,082 | 15,939 | 16,129 | 14,582 |
| TOTAL | 11,837 | 22,742 | 25,277 | 26,316 | 30,072 | 32,286 | 32,138 | 33,907 |

1/ Final results of operations, depreciation and installments, readjustment of the exchange rates, contribution for monetary losses.
2/ Financing obtained from Financial Institutions, Suppliers, National Treasury, and Credit Lines.
3/ Capital Subscriptions and other Government Funds.
4/ Increase in working capital, installments and interests on financial loans, dividends, loans to subsidiaries and affiliates, and others.
5/ January 1976 prices.

Source: Petrobras

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ANNEX 2
Table 2

BRAZIL - SERGIPE FERTILIZER PROJECT

PETROBRAS: SOURCES AND USES OF FUNDS, 1973-1975, PROJECTIONS TO 1980
(percent distribution)

| | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 |
|---|---|---|---|---|---|---|---|---|
| **Source of Funds** | | | | | | | | |
| Internally generated Funds 1/ | 61.5 | 43.8 | 38.7 | 53.2 | 53.2 | 54.5 | 57.7 | 61.6 |
| Externally raised Funds 2/ | 19.5 | 42.2 | 49.6 | 35.0 | 32.1 | 33.0 | 31.1 | 29.5 |
| Other Funds 3/ | 19.0 | 14.0 | 11.7 | 11.8 | 14.7 | 12.5 | 11.2 | 8.9 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **Use of Funds** | | | | | | | | |
| Investment | 61.3 | 45.1 | 53.5 | 58.1 | 53.2 | 50.6 | 49.8 | 57.0 |
| Exploration & Production | 18.1 | 12.1 | 14.9 | 23.2 | 22.5 | 23.8 | 31.8 | 33.2 |
| Refining | 15.5 | 17.3 | 22.9 | 19.9 | 11.8 | 6.1 | 3.5 | 9.4 |
| Transportation | 13.4 | 8.9 | 10.8 | 12.1 | 11.4 | 5.5 | 4.2 | 5.3 |
| Fertilizer Projects | - | - | - | 0.6 | 4.4 | 8.6 | 1.7 | 0.1 |
| Other Activities | 14.3 | 6.8 | 4.9 | 2.3 | 3.1 | 6.6 | 8.6 | 9.0 |
| Other Applications 4/ | 38.7 | 54.9 | 46.5 | 41.9 | 46.8 | 49.4 | 50.2 | 43.0 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

1/ - 4/ See Table 2

Source: Petrobras.

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ANNEX 2
Table 3

ANNEX 2
Table 4

BRAZIL - SERGIPE FERTILIZER PROJECT

PETROBRAS: INVESTMENTS IN FIXED CAPITAL & CAPITALIZED COSTS, 1970-1975

(million dollars)

| Area of Activity | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1970-75 |
|---|---|---|---|---|---|---|---|
| Exploration | 145.3 | 122.9 | 143.9 | 173.5 | 279.7 | 282.8 | 1,148.1 |
| Production | 48.1 | 41.3 | 53.3 | 57.8 | 60.6 | 124.7 | 385.8 |
| Refinery | 135.9 | 290.6 | 191.8 | 198.4 | 426.2 | 627.4 | 1,870.3 |
| Petrochemicals | 24.0 | 9.9 | 2.6 | - | 63.9 | - | 100.4 |
| Maritime Transportation | 25.5 | 42.9 | 101.9 | 103.4 | 53.3 | 57.2 | 384.2 |
| Pipelines & Terminals | 59.2 | 88.6 | 41.4 | 68.6 | 166.5 | 236.6 | 660.9 |
| Shale Industrialization | 10.6 | 10.3 | 5.4 | 9.2 | 8.7 | 8.6 | 52.8 |
| Marketing | 14.4 | 14.3 | 16.2 | - | 40.7 | - | 85.6 |
| Subsidiaries | 11.5 | 42.1 | 40.8 | 108.6 | - | 80.4 | 283.4 |
| Miscellaneous | 15.0 | 16.8 | 61.7 | 65.6 | 43.4 | 45.4 | 247.9 |
| TOTAL | 489.5 | 679.7 | 659.0 | 785.1 | 1,143.0 | 1,463.1 | 5,219.4 |

Note: The factor used to convert constant 1976 cruzeiros to constant 1976 dollars was 9.245.

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PETROBRAS: INVESTMENT STRUCTURE, 1970-75
(percentages)

| Area of Activity | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1970-75 |
|---|---|---|---|---|---|---|---|
| Exploration | 29.7 | 18.1 | 21.8 | 22.1 | 24.5 | 19.3 | 22.0 |
| Production | 9.8 | 6.1 | 8.1 | 7.4 | 5.3 | 8.5 | 7.4 |
| Refining | 27.8 | 42.7 | 29.1 | 25.3 | 37.3 | 42.9 | 35.8 |
| Petrochemical | 4.9 | 1.5 | 0.4 | - | 5.6 | - | 1.9 |
| Maritime Transportation | 5.2 | 6.3 | 15.5 | 13.2 | 4.7 | 3.9 | 7.4 |
| Pipelines and Terminals | 12.1 | 13.0 | 6.3 | 8.7 | 14.6 | 16.2 | 12.7 |
| Shale Industrialization | 2.2 | 1.5 | 0.8 | 1.2 | 0.7 | 0.6 | 1.0 |
| Marketing | 2.9 | 2.1 | 2.4 | - | 3.5 | - | 1.6 |
| Subsidiaries | 2.3 | 6.2 | 6.2 | 13.8 | - | 5.5 | 5.4 |
| Miscellaneous | 3.1 | 2.5 | 9.4 | 8.3 | 3.8 | 3.1 | 4.8 |
| TOTAL | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Petrobras, Annual Reports.

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## HISTORICAL FINANCIAL STATEMENTS OF ULTRAFERTIL S.A.
(In Million US Dollars)

| For the Year Ending Dec. 31 | 1972 | 1973 | 1974 | 1975 |
|---|---|---|---|---|
| Net Revenues | 43.9 | 77.9 | 138.0 | 150.5 |
| Cost of Sales | 31.0 | 62.5 | 83.0 | 112.1 |
| Selling and Administrative Expenses | 12.3 | 7.7 | 10.4 | 11.1 |
| Financial Expenses | 9.1 | 9.6 | 15.2 | 17.1 |
| Other Charges | 1.8 | 1.3 | 7.9 | 8.5 |
| Net Income | (16.3) | (3.2) | 21.5 | 1.7 |
| Sources of Funds | | | | |
| Current Operations | (4.1) | 3.0 | 27.3 | 9.6 |
| Decrease in Deferred Charges | - | - | - | 0.1 |
| Capital Subscription | 6.2 | - | 5.0 | 2.5 |
| Increase in Long-Term Debt | - | 8.8 | - | - |
| Total Sources | 2.1 | 11.8 | 32.3 | 12.2 |
| Uses of Funds | | | | |
| Capital Assets | 0.1 | 0.9 | 1.5 | 2.0 |
| Investments | 0.1 | 0.7 | - | 0.6 |
| Decrease in Long-Term Debt | 6.7 | - | 5.3 | 8.8 |
| Increase in Working Capital | (4.8) | 10.2 | 25.5 | 0.8 |
| Total Uses | 2.1 | 11.8 | 32.3 | 12.2 |
| Current Assets | 33.4 | 52.1 | 99.8 | 84.3 |
| Long-Term Investments & Receivables | 0.2 | 0.9 | 0.5 | 1.1 |
| Capital Assets (Net) | 56.7 | 53.5 | 51.3 | 47.2 |
| Deferred Charges | 15.9 | 13.9 | 12.5 | 10.4 |
| Current Liabilities | 38.2 | 46.7 | 69.2 | 52.9 |
| Long-Term Debt | 61.1 | 69.9 | 64.7 | 55.8 |
| Capital Stock | 37.0 | 37.0 | 41.9 | 44.4 |
| Reserves | - | - | - | 0.4 |
| Accumulated Deficit | (30.0) | (33.2) | (11.7) | (10.5) |
| Total Equity | 7.0 | 3.8 | 30.2 | 34.3 |
| Total Assets or Liabilities | 106.2 | 120.4 | 164.1 | 143.0 |
| Long-Term Debt/Equity Ratio | 90/10 | 95/5 | 68/32 | 62/38 |
| Current Ratio | 0.9 | 1.1 | 1.4 | 1.6 |
| Debt Service Coverage | 0.5 | 0.3 | 1.2 | 0.9 |
| Exchange Rate Cr$/US$ | 6.20 | 6.22 | 7.435 | 9.07 |

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## HISTORICAL FINANCIAL STATEMENTS OF PETROFERTIL

| | In millions Cr$ | | In millions US$ | |
|---|---|---|---|---|
| For year ending December 31 | 1974 | 1975 | 1974 | 1975 |
| Net Sales | 114.9 | 185.6 | 15.5 | 20.5 |
| Cost of Sales | 40.1 | 61.5 | 5.4 | 6.8 |
| Selling & Administrative Expenses | 11.3 | 14.0 | 1.5 | 1.5 |
| Financial Expenses | 6.4 | 12.9 | 0.9 | 1.4 |
| Net Income | 57.7 | 90.0 | 7.8 | 9.9 |
| Sources of Funds | | | | |
| Current Operation | 71.6 | 116.6 | 9.6 | 12.8 |
| Long-Term Debt | 41.5 | 132.3 | 5.6 | 14.6 |
| Subscription of Preferred Stock | 28.0 | 17.5 | 3.8 | 1.9 |
| Other | 0.2 | 8.7 | - | 1.0 |
| Total Sources | 141.3 | 275.1 | 19.0 | 30.3 |
| Uses of Funds | | | | |
| Capital Assets | 55.6 | 215.8 | 7.5 | 24.8 |
| Deferred Charges | 5.1 | 25.0 | 0.7 | 2.8 |
| Other | 0.2 | 2.0 | - | 0.2 |
| Dividend | - | 2.0 | - | 0.2 |
| Working Capital | 80.4 | 30.3 | 10.8 | 3.3 |
| Total Uses | 141.3 | 275.1 | 19.0 | 30.3 |
| Current Assets | 127.1 | 157.0 | 17.1 | 17.3 |
| Capital Assets | 117.1 | 336.5 | 15.7 | 37.1 |
| Investments | 12.4 | 19.6 | 1.7 | 2.2 |
| Deferred Charges | 5.1 | 30.1 | 0.7 | 3.3 |
| Other | 6.6 | 26.4 | 0.9 | 2.9 |
| Current Liabilities | 27.7 | 27.3 | 3.7 | 3.0 |
| Long-Term Debt | 44.5 | 194.1 | 6.0 | 21.5 |
| Deferred Credits | 3.2 | 7.5 | 0.4 | 0.8 |
| Share Capital | 128.0 | 193.5 | 17.2 | 21.3 |
| Reserves | 24.9 | 128.9 | 3.4 | 14.2 |
| Retained Earning | 40.1 | 18.4 | 5.4 | 2.0 |
| Total Equity | 193.0 | 340.7 | 26.0 | 37.5 |
| Total Assets or Liabilities | 268.3 | 569.6 | 36.1 | 62.8 |
| Long-Term Debt/Equity Ratio | 20/80 | 35/65 | 20/80 | 35/65 |
| Current Ratio | 4.5 | 5.8 | 4.6 | 5.8 |
| Exchange Rate Cr$/US$ | | | 7.435 | 9.07 |

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## AGRICULTURE IN BRAZIL

### A. Development and Government Policy

1. Over the period 1967-75, the agricultural sector has performed well in supplying domestic demand for food and fibers while producing a rising volume of export commodities, with output growing at an average of 5.5% annually despite adverse climatic conditions in four out of nine years.[1/] The agriculture sector's contribution to NDP has declined from 20% in 1967 to about 15% at present, but its contribution to exports has remained significant and currently accounts for over 50% of the total value of exports. Because of the seriousness of the balance of payments constraint, the strategy of Brazil's Second National Development Plan (1975-79) aims at a more efficient development of Brazil's agricultural potential. Besides its favorable impact on balance of payments, the new growth strategy also has favorable implications for domestic price stabilization and equality of income distribution.

2. Until 1970, growth in agricultural production was attributable almost entirely to expansion of land under cultivation. Little if any effort was expended on improvement of productivity in agriculture. Inspite of having been relatively neglected by policy makers, the agricultural sector managed to grow at about 4.5% annually during 1950-70. Inflation, price controls, erratic Government intervention in marketing of products, overvalued exchange rates and export controls, tended to distort prices particularly in the early 1960s, discouraging production and exports. The movement of agricultural activity into the interior of the country created a need for an elaborate infrastructure to handle product distribution which remained largely neglected until the mid-1960s. Changes in overall economic management since then have helped to eliminate some of these distortions and improve incentives for farmers. Recent growth has tended to be higher, although there have been fluctuations due to climatic factors. Brazil has become the world's largest producer of sugar and its second largest supplier of soybeans, while remaining the world's leading coffee producer. Coffee continues to play a very important role in the agricultural sector accounting for about 12% of output, though its share in total exports has declined from 44% in 1967 to about 11% in 1975. It is expected to rise to almost 17% in 1976 despite a lower volume of exports than 1975 due to a large price increase. Annual variations in coffee production, largely resulting from frosts, are generally responsible for year-to-year fluctuations in the growth of the agriculture sector. The 1975 frosts which caused extensive crop damage in the states of Sao Paulo, Parana, Minas Gerais and Mato Grosso, will result in an estimated 70% decline in coffee production in 1976 and will reduce overall growth of the agriculture sector from an estimated 4% in 1975 to between 0-2% growth in 1976.

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1/ Tables 1-4 of this Annex gives some basic agricultural statistics about development of area, production and yield of the country's main crops.

3. The agricultural policies of the Government have multiple objectives: they are designed to stimulate output to meet the increasing demand of Brazil's population, to encourage production for export to make a substantial contribution to foreign exchange earnings; and, as instruments for raising income levels of the rural poor. The Government's price stabilization objectives depend upon the extent to which agricultural production meets the increases in domestic demand. More balanced and abundant increments in production relative to population increase would alleviate the commodity scarcities which have complicated stabilization efforts in recent years. The agriculture sector in Brazil, besides employing relatively little in way of imported inputs, has enormous potential as a supplier of primary commodities to a world increasingly afflicted by food shortages. Agriculture is and will continue for some time to be a key generator of foreign exchange. The aim of the Government is to make Brazil one of the world's foremost producers and exporters of foodstuffs. Finally, with almost 45% of the population engaged in agricultural activities, a more balanced and equitable development process can only be achieved with comparatively higher increases in agricultural production and productivity than those experienced in recent years. Substantial increases in per worker productivity in the rural areas can alleviate poverty where it currently is most heavily concentrated. The Government is thus giving more attention to the modernization of agricultural production and marketing and expansion of the frontier of cultivation.

4. Brazil has the potential for sustaining relatively high long-term growth in agriculture and the Plan target of a 40% (7% annually) real increase in agricultural output for the 1975-79 period appears feasible. To support these growth objectives, the Government has allocated substantial public resources to programs to incorporate new areas to agricultural production. Brazil is one of the few countries in the world that still has available abundant land on which continued expansion of output can be based, so that reasonably high growth is possible if accompanied by modest improvements in agricultural technology. The goal of these programs is to expand agricultural area by 5% annually and to encourage settlement to bring these areas into production as quickly as possible. A second component of the Government strategy is to increase productivity and production options through modernization of agriculture research and increase domestic production of improved seeds, fertilizers, and substantial expansion in the supply of credit and complementary technical assistance for the purchase of modern agricultural inputs. These inputs should bring about a 2% annual increase in productivity necessary to achieve the overall growth target for the agriculture sector. Government policies and programs are already stimulating considerable progress both in expanding land under cultivation and increasing productivity of activities for domestic and external markets.

5. Following the example of the comprehensive programs created in the early 1970s for the development of Northeast agriculture (PROTERRA), the Amazon (PIN), Mato Grosso and Goias (PRODESTE), Valley of the Sao Franciso River (PROVALE), the Government in 1974, launched a program (POLOCENTRO) to focus on the technical and infrastructure requirements for initially exploiting 3.7 million hectares of land area in the Campos Cerrados area. This

program will also finance agricultural research, feeder roads, rural electrification and agricultural storage facilities. The Government has also initiated a program (POLONORDESTE) designed to improve small farmer productivity in the Northeast through the formulation and execution of integrated rural development projects. This constitutes a significant shift in the emphasis of governmental programs which in the past have concentrated on expanding socially oriented programs in the fields of education, health, nutrition, sanitation and broadening the application of social security and labor legislation rather than on production oriented programs aimed at low income groups. These regional programs are designed to bring about a fuller utilization of the country's land and related resources in order to provide a means for the alleviation of poverty and underemployment, which are particularly pressing in the Northeast. While no overnight eradication of rural poverty, which has been endemic in the Northeast for decades, is likely to be forthcoming from these programs, responsible efforts to improve the productivity of Northeast agriculture together with programs to increase industrial activity in the region already have resulted in a more rapid growth of per capita income in the Northeast than in Brazil as a whole, and with the initiation of new programs this process is expected to continue under the Second Development Plan.

6. Considerable emphasis is also being given to agricultural research and to the dissemination of research findings through a national extension network. The Brazilian Agricultural Research Enterprise (EMBRAPA) and the Brazilian Technical Assistance and Rural Extension Enterprise (EMBRATER) have been strengthened to carry out these objectives. Guaranteed minimum price support and subsidized credit for financing acquisition of modern inputs are being employed to encourage farmers to take advantage of technological improvements resulting from these research and extension activities. A program of agricultural infrastructure improvements (Export Corridors Program) is being implemented in the South and Center regions to facilitate movement of exportable agricultural surpluses from the interior of Brazil through the major ports of the region (Vitoria, Santos, Paranagua and Rio Grande).

7. Since 1965, with the creation of the National System of Rural Credit, the Government has made a continuous effort to increase the amount of loanable funds for agriculture. Agricultural credit is crucial to resolution of the challenges confronting Brazilian agriculture, particularly expansion of land under cultivation and use of modern inputs. Currently, about 27% of total Brazilian bank credit is directed into agriculture principally by the Bank of Brazil and through Central Bank refinancing programs using the private commercial banks as agents. Agricultural credit as a percent of Brazil's agricultural domestic income has increased from about 23% in 1966 to over 80% in 1974. Agricultural credit lines are available for a multiplicity of purposes including working capital, acquisition of modern inputs, irrigation, land acquisition by small holders, retention of breeding stock, pasture improvement, etc. Agricultural credit is extended at subsidized interest rates differentiated in favor of the small holders and of development in certain regions, particularly the Northeast. The Government has also established an insurance scheme or fund to cover debts of farmers

when affected by natural disasters. This Insurance Program for Agricultural and Livestock Activities (PROAGRO) has been extremely useful in reducing risk of credit operations both to lenders and borrowers. The Government recently extended this coverage to 80% of the losses in Parana guaranteed under the PROAGRO program when the State was devastated by the severe frosts of mid-1975.

8. A major difference between the approach of the Second National Development Plan and efforts heretofore made to improve Brazil's agricultural performance lies in better coordination of the activities of the many agricultural development agencies. Institutional changes made since March 1974 suggest that for the first time there is a chance for effective coordination between agro-policy makers, agricultural research and extension agencies, agrarian reform and regional development agencies.

B. Major Export Crops

9. Three agricultural commodities, coffee, soybeans and sugar, generate over 35% of total export earnings and, including unprocessed or semi-processed agricultural exports, the agricultural sector accounts for more than 50% of total value of exports. The diversification of agricultural exports, which over 1967-75 period has been more important than even the spectacular growth of manufactured exports, is all the more remarkable since, unlike manufacturers, they benefit little from fiscal incentives.

10. Brazil is the largest exporter of coffee in the world although its share of the world market has declined from 50% in the early 1950s to an estimated 20% in 1976. With the exception of the 1965-66 harvest, domestic production has been consistently below requirements for domestic consumption (8 million bags) and exports (18 million bags), leading to a gradual depletion of stocks. Due to a large build-up of stocks and the tremendous excess of production capacity in 1966, the Government initiated a coffee tree eradication program. However, the movement of coffee planting into the interior of the state of Parana by the early 1960s had left substantial portions of Brazil's production capacity exposed to frosts. After the frosts of 1969 which reduced 1970 crop to less than 11 million bags, the Government was forced to reverse its policy and establish price and credit incentives for new tree planting. The impact of the program was felt in 1974 with production of some 26 million bags. The severe frosts of 1975, which drastically reduced production capacity with an estimated production of 6 million bags in 1976, may start a new phase in Brazilian coffee history, and coffee production may gradually move out of frost-prone Parana. The danger of movement into the over-production stage of the coffee cycle still exists, though greater attention on the part of the Government and the declining comparative advantage of coffee over other crops tend to forestall this. The increased cost of fertilizer and pesticide, and the emerging shortage of agricultural labor in the coffee regions discriminates severely against coffee since no mechanized means of coffee harvesting has ever been developed. Continuation of a moderate coffee tree planting

program at moderate levels should maintain Brazilian production capacity at adequate levels, and should permit the Government to recoup the decline in Brazil's share in world exports that occurred in 1974-76.

11. With the recent decline in Cuban production, Brazil is now the largest producer of sugar in the world. Until 1970 sugar production increased very slowly but, in response to rapidly rising world prices, large increases took place in 1972 and 1973. Due to unusually bad weather (drought and frosts in Center-South and heavy, unseasonable rains in the Northeast), production declined in 1974 and 1975, and despite exhaustion of its sugar stocks early in 1974, Brazilian sugar export in that year surpassed coffee as Brazil's principal foreign exchange earner. Most of the increases in cane production have been due to expansion in harvested areas, with practically no increases in average yields. Increases in Brazil's exportable sugar surplus (from 1.1 million tons in 1968 to peak of 2.8 million tons in 1973 with 1975 exports of only 1.7 million tons) have been facilitated by a Government program to reform the production and processing of sugar in the Northeast. This reform has various elements including the creation of credit lines to merge and re-equip sugar mills and to integrate and reallocate cane production and milling; the adoption of a uniform sugar price throughout the country; the establishment of a gradually declining subsidy to be eliminated over a six-year period, to compensate for the currently higher production costs of the Northeast; and the allocation of PROTERRA funds to finance the re-employment of cane and mill workers displaced by productivity improvements. Additional planting of land area in sugarcane and improvements in productivity are expected to increase sugar production from about 7.7 million tons at present to about 10 million tons by 1980, out of which only 23% would be for exports due to growing requirements for domestic consumption.

12. The production of soybeans has increased from less than 1 million tons in 1968 to an estimated 11 million tons in 1976, making Brazil the third largest producer in the world, behind the U.S. and the People's Republic of China. Soybeans represent the most startling example of the speed at which new products have been added to the export flow as exports of soybeans, soybean meal and soybean oil increased from US$40 million in 1967 to US$1,302 million in 1975. This vast expansion has taken place mainly in the states of Sao Paulo, Parana, and Rio Grande do Sul and has been instrumental in restructuring southern Brazilian agriculture. Up to 1975, most of the expansion came from double-cropping of wheat areas and cultivation of natural pastures and thus has not provoked any significant reduction in the output of alternative crops. In addition, per hectare productivity has increased and at present Brazilian productivity is only slightly lower than in the U.S. and Canada, and higher than in Japan. Most of the Southern region presents favorable conditions and sufficient land available for further expansion of soybean cultivation. The area under soybean cultivation is expected to increase from 5.2 million hectares in 1974 to 10.5 million hectares by 1980, and production

is expected to reach 18 million tons, with exportable surplus at 11-12 million tons compared to 6.7 million tons in 1975. In terms of production capacity, soybeans clearly constitute one of Brazil's principal opportunities for expansion of agricultural exports.

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GROWTH RATES OF SECTORAL AND GROSS DOMESTIC PRODUCT, 1969-1975
(In Constant Prices)

| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 |
|---|---|---|---|---|---|---|---|
| Growth Rate in % By Sector | | | | | | | |
| Agriculture | 6.0 | 5.6 | 11.4 | 4.1 | 3.5 | 8.5 | 3.4 |
| Industry | 10.8 | 11.1 | 11.2 | 13.8 | 15.5 | 8.2 | 4.2 |
| Services | 9.0 | 9.8 | 11.3 | 10.3 | 11.7 | 10.8 | 4.4 |
| GDP | 9.0 | 9.5 | 11.3 | 10.4 | 11.7 | 9.6 | 4.2 |

Source: Fundacao Getulio Vargas.

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ANNEX 3-1
Table 1

BRAZIL - SERGIPE FERTILIZER PROJECT

EVOLUTION OF AREA UNDER CULTIVATION
(1000 Hectare)

| CROPS | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cereals | | | | | | | | | | | | |
| Rice | 4005 | 4291 | 4459 | 4621 | 4979 | 5042 | 4919 | 4795 | 4162 | 5241 | 6341 | 6677 |
| Corn | 8703 | 9274 | 9584 | 9654 | 9858 | 10709 | 10309 | 9908 | 11895 | 10807 | 11629 | 12184 |
| Wheat | 717 | 831 | 970 | 1407 | 1695 | 2261 | 2050 | 1839 | 2471 | 2967 | 3533 | 4364 |
| Total : | 13425 | 14396 | 15013 | 15682 | 16532 | 18012 | 17278 | 16542 | 18428 | 19015 | 21505 | 23224 |
| Oil Crops | | | | | | | | | | | | |
| Groundnuts | 644 | 694 | 606 | 613 | 670 | 672 | 589 | 506 | 351 | 348 | 418 | 357 |
| Soybeans | 491 | 612 | 722 | 906 | 1319 | 1589 | 2602 | 3615 | 5143 | 5824 | 6274 | 7368 |
| Total : | 1135 | 1306 | 1328 | 1519 | 1989 | 2261 | 3191 | 4121 | 5494 | 6127 | 6692 | 7725 |
| Fruit | | | | | | | | | | | | |
| Pineapple | 28 | 31 | 27 | 31 | 29 | 32 | 31 | 34 | 35 | 32 | 34 | 35 |
| Banana | 250 | 256 | 268 | 273 | 277 | 280 | 298 | 316 | 279 | 300 | 318 | 333 |
| Orange | 165 | 167 | 173 | 183 | 202 | 216 | 333 | 449 | 333 | 410 | 442 | 443 |
| Total : | 443 | 454 | 468 | 487 | 508 | 528 | 662 | 799 | 647 | 742 | 794 | 810 |
| Fibers | | | | | | | | | | | | |
| Cotton | 3898 | 3720 | 3902 | 4195 | 4299 | 4460 | 3246 | 2032 | 3632 | 3833 | 3725 | 4176 |
| Other Crops | | | | | | | | | | | | |
| Coffee | 3057 | 2792 | 2663 | 2571 | 2403 | 2584 | 2332 | 2080 | 2270 | 2714 | 1393 | 2634 |
| Cacao | 456 | 473 | 433 | 438 | 444 | 442 | 429 | 416 | 509 | 453 | 487 | 520 |
| Beans | 3325 | 3651 | 3653 | 3663 | 2485 | 3743 | 3779 | 3815 | 4161 | 4136 | 4260 | 4520 |
| Manioc | 1904 | 1914 | 1998 | 2029 | 2035 | 2047 | 2088 | 2104 | 1989 | 2194 | 2287 | 2504 |
| Sugar Cane | 1636 | 1681 | 1687 | 1672 | 1725 | 1692 | 1825 | 1959 | 1968 | 2276 | 2403 | 2598 |
| Other | 4159 | 4455 | 4598 | 4700 | 6045 | 4841 | 4833 | 5110 | 1707 | N.A. | N.A. | N.A. |
| Total : | 14537 | 14966 | 15032 | 15073 | 15137 | 15349 | 15286 | 15484 | 12604 | 11721 | 10756 | 12684 |
| All Crops | 33438 | 34842 | 35743 | 36956 | 38465 | 40610 | 39663 | 38978 | 40805 | 41483 | 43471 | 48620 |
| % Change | - | 4.2 | 2.6 | 3.4 | 4.1 | 5.6 | -2.3 | -1.7 | 4.7 | 1.7 | 4.8 | 11.8 |

Source:
Years 1966-1973 are actual and 1974 are estimates as per Anuario Estatistico do Brazil; 1975-1977 as per Ministry of Agriculture (SUPLAN) forecasts.

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ANNEX 3-1
Table 2

BRAZIL - SERGIPE FERTILIZER PROJECT

EVOLUTION OF AGRICULTURAL PRODUCTION OF SELECTED PRODUCTS
(In 1000 Tons)

| CROPS | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cereals | | | | | | | | | | | | |
| Rice | 5802 | 6792 | 6652 | 6394 | 7553 | 6065 | 7157 | 7167 | 6483 | 7560 | 9417 | 10522 |
| Corn | 11371 | 12324 | 12814 | 12293 | 14216 | 15187 | 15850 | 14109 | 16285 | 16190 | 18031 | 19509 |
| Wheat | 269 | 317 | 622 | 1029 | 1569 | 1809 | 500 | 2031 | 2859 | 1493 | 3793 | 4737 |
| Total : | 17442 | 19433 | 20088 | 19716 | 23338 | 23071 | 23507 | 23307 | 25627 | 25243 | 31241 | 34768 |
| Oil Crops | | | | | | | | | | | | |
| Groundnuts | 895 | 751 | 754 | 754 | 928 | 962 | 974 | 590 | 439 | 442 | 511 | 457 |
| Soybeans | 595 | 716 | 654 | 1056 | 1508 | 2217 | 3558 | 5012 | 7876 | 9891 | 10616 | 11602 |
| Total : | 1490 | 1467 | 1408 | 1810 | 2436 | 3179 | 4532 | 5602 | 8315 | 10333 | 11127 | 12059 |
| Fibers | | | | | | | | | | | | |
| Cotton | 1865 | 1692 | 1999 | 2111 | 1955 | 2287 | 3087 | 2257 | 1958 | 2269 | 2030 | 2520 |
| Other Crops | | | | | | | | | | | | |
| Coffee | 2406 | 3015 | 2115 | 2567 | 1510 | 660 | 1476 | 1746 | 3220 | 1356 | 468 | 690 |
| Cacao | 170 | 195 | 149 | 211 | 197 | 211 | 191 | 196 | 165 | 285 | 237 | 242 |
| Beans | 2147 | 2554 | 2418 | 2200 | 2210 | 2688 | 2676 | 2229 | 2238 | 2271 | 2426 | 2661 |
| Manioc | 24709 | 27267 | 29211 | 30074 | 29465 | 30229 | 29829 | 26559 | 24715 | 26951 | 28946 | 32204 |
| Sugar (Centrifuge) | 3881 | 4318 | 4204 | 4206 | 5065 | 5065 | 5640 | 5932 | 6683 | 6721 | 7740 | 7800 |
| Total : | 33313 | 37349 | 38097 | 39258 | 38447 | 33788 | 34172 | 36662 | 37021 | 37584 | 39817 | 43597 |
| Grand Total | 54110 | 59941 | 61592 | 62895 | 66176 | 62325 | 65298 | 67828 | 72921 | 75429 | 84215 | 92944 |
| % Change | - | 10.8 | 2.8 | 2.1 | 5.2 | -5.8 | 4.7 | 3.9 | 7.5 | 3.4 | 11.6 | 10.4 |

Source:
Anuario Estatistico do Brazil
Ministry of Agriculture (SUPLAN) Years 1975-1977
Instituto do Acucar e do Alcool (IAA)
Paiva, Schattan, Freitas "Setor Agricola do Brasil"

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ANNEX 3-1
Table 3

## BRAZIL - SERGIPE FERTILIZER PROJECT

### EVOLUTION OF AGRICULTURAL YIELDS
(Kg/ha)

| CROPS | 1947-49 | 1961-63 | 1964-66 | 1968-70 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Cereals | | | | | | | | | | | |
| Rice | 1,552 | 1,634 | 1,536 | 1,464 | 1,337 | 1,623 | 1,495 | 1,533 | 1,446 | 1,484 | 1,576 |
| Corn | 1,256 | 1,311 | 1,283 | 1,365 | 1,515 | 1,413 | 1,424 | 1,480 | 1,498 | 1,551 | 1,601 |
| Wheat | 789 | 658 | 833 | 945 | 979 | 423 | 1,104 | 1,162 | 503 | 1,074 | 1,085 |
| Oil Crops | | | | | | | | | | | |
| Groundnuts | 1,004 | 1,347 | 1,286 | 1,286 | 1,300 | 1,260 | 1,166 | 1,223 | 1,269 | 1,222 | 1,280 |
| Soybeans | N.A. | 1,059 | 1,091 | 1,037 | 1,292 | 1,471 | 1,386 | 1,531 | 1,698 | 1,692 | 1,575 |
| Fibers | | | | | | | | | | | |
| Cotton | 442 | 554 | 482 | 490 | 519 | 541 | 691 | 526 | 448 | 420 | 457 |
| Other Crops | | | | | | | | | | | |
| Coffee | 411 | 415 | 771 | 811 | 1,298 | 1,321 | 839 | 1,419 | 500 | 336 | 262 |
| Cacao | 450 | 312 | 341 | 378 | 489 | 514 | 471 | 322 | 710 | 515 | 564 |
| Beans | 685 | 650 | 656 | 634 | 626 | 674 | 584 | 526 | 549 | 569 | 589 |
| Manioc | 13,347 | 13,404 | 14,120 | 14,662 | 15,523 | 14,529 | 12,623 | 11,560 | 12,284 | 12,657 | 12,861 |
| Sugarcane | 38,333 | 42,773 | 44,841 | 45,551 | 46,516 | 47,202 | 46,904 | 46,621 | 42,674 | 43,466 | 43,773 |

Source:
Paiva, Schattan and Freitas "Setor Agricola do Brasil" for years 1947-1970.
Ministry of Agriculture (SUPLAN) for years 1971-1972, 1974-1977, projections. Soybeans 1961-1970.
Anuario Estatistico do Brazil for 1973

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## THE FERTILIZER SECTOR

### A. Fertilizer Industry - General Background

#### (i) Resource Endowment

1. Brazil is not well-endowed with good raw material resources for the production of chemical fertilizers. Natural gas, the ideal raw material for nitrogen (N) fertilizer production, has been found only in modest quantities in three areas: (a) Sergipe and Alagoas (Northeast), (b) offshore of Campos, near Rio de Janeiro (Center), and (c) 200 km offshore of Amapa (North). The reserves in the Northeast have been known the longest and they have the advantage of being located close to the Northeast fertilizer consumption center. These reserves are limited in size but will provide the feedstock for the Sergipe project and PETROFERTIL's existing and presently expanded ammonia/urea plant. The oil and gas fields offshore Campos have just been discovered, and priority for the use of this gas has been given to fertilizer production. At this time, no information is available on the likely quantities involved. The gas in the North has also just been discovered, but the location of the reserves will make exploitation difficult, and it is not likely that gas from these fields will be used for fertilizer production in the near future. The other feedstocks for N fertilizer production, naphtha and fuel oil, are indirectly imported as they are derived from crude oil, and Brazil imports some 80% of its crude oil requirements. The Araucaria fertilizer project under construction at Parana will use fuel oil, and the proposed project in Rio Grande do Sul will probably also use fuel oil feedstock.

There are six major deposits of phosphate rock (Table 1 and MAP IBRD 12055R1) with an average $P_2O_5$ content ranging from 5% to 17%, well below the 20% to 30% average $P_2O_5$ content found in commercial deposits in other countries (USA, Morocco, Jordan, etc.). At present, only one deposit (Jacupiranga with an average of 5% $P_2O_5$ ore grade) is commercially developed, in conjunction with a cement factory, which improves the economics of the combined cement/phosphate fertilizer enterprise. The Jacupiranga deposit provides the rock for the QUIMBRASIL fertilizer plant and accounts for just about 8% of the 1976 $P_2O_5$ consumption. However, with the recent local development of a commercial beneficiation technology capable of producing ore concentrates with 35% $P_2O_5$ at a high recovery factor[1/] and the increase in the international prices of phosphate rock and phosphatic (P) fertilizers, Brazil has embarked on a phosphate mining/beneficiation

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1/ The beneficiation process is now well proven at Jacupiranga and the Arafertil pilot plant at Araxa. A unique feature of the process is its ability to attain a fair, from 50% to 80%, $P_2O_5$ recovery from the low grade igneous ores common in Brazil. On a comparable basis, the standard metallurgical process used on U.S. sedimentary type ore in the 5% to 8% $P_2O_5$ range shows recovery factors of about 30% to 50%.

investment program to develop its low grade deposits. The ARAFERTIL mining/beneficiation project at Araxa and the VALEP project at Tapira are scheduled for commercial operation by mid-1977 and late-1978, respectively. Feasibility studies for developing the Catalao deposit, the Patos de Minas deposit and the Ipanema deposit are underway. These six deposits have potential reserves of about 345 million tons of $P_2O_5$ of which about one half can be considered as proven. With an average $P_2O_5$ recovery factor of 60%, the proven reserves of about 170 million tons of $P_2O_5$ is equivalent to 90 times the 1976 annual $P_2O_5$ consumption. Elemental sulfur, another important raw material for phosphoric acid production, has not been found in commercial quantities in Brazil.

2. Finally, only one significant potash (K) deposit has been found, in Carmopolis (Sergipe). The deposit is in the form of potassium chlorinated salts with the equivalent of at least 30 million tons of $K_2O$ or equal to about 50 times the 1976 annual consumption. However, the existence of oil in the same area, the lack of adequate technology, and the disagreement among the different parties concerned have so far prevented the commercial development of this deposit. Consequently, all potash requirements will continue to be imported for some time.

(ii) Industrial Structure

3. With international prices for raw materials, intermediates (phosphoric acid and ammonia) and fertilizer products relatively low up to 1973 and because of Brazil's low natural resource endowment, the Brazilian fertilizer industry has concentrated on importing, mixing, blending and the distribution of fertilizers, rather than on establishing large scale, efficient production facilities. Brazil's fertilizer industry, therefore, consists of a large number of small to medium-sized, mostly private sector, firms with relatively uneconomic production facilities. Because of their high production costs, producers have to be protected except when world fertilizer prices are high. Over the next five years, however, the industry will undergo major changes, with new and larger facilities providing economies of scale and being mostly owned by public sector enterprises, notwithstanding the Government's policy of encouraging the private sector to invest in the industry. The large financial requirements for new projects will prevent the private sector, with its limited financial base, from participating in a major way in the capacity expansion of the industry. Consequently, the new, large-scale projects have to be financed and undertaken with the help of sources outside the present industry. Most of the new projects are, therefore, sponsored by the large, Government-owned industrial enterprises such as Petroleo Brasileiro (PETROBRAS), the national oil company, and Companhia Vale do Rio Doce S.A. (CVRD), a large mining company. However, it is expected that the blending, mixing and distribution of fertilizer products will continue to be in the private sector.

4. At present, there are 20 firms producing fertilizers and about 30 more enterprises just engaged in mixing, blending and retail operations. Of the 20 producers, only one firm (ULTRAFERTIL) has primary production facilities for both ammonia and phosphoric acid; three firms (PETROFERTIL,

FAFER and RHODIA) have ammonia production units; and two firms (COPEBRAS and QUIMBRASIL) have phosphoric acid production facilities. However, only QUIMBRASIL uses local phosphate rock. Both COPEBRAS and ULTRAFERTIL use imported rock. The other 14 manufacturing firms import the intermediate products (ammonia and/or phosphoric acid) for final processing and/or produce low analysis products such as thermophosphates and single superphosphates (SSP) which do not require phosphoric acid and ammonia. Of the 20 firms, five produce complex (NP and NPK) fertilizers, another five produce just N fertilizers, and the remaining ten P fertilizers only.

5. Following the extraordinary increase in international fertilizer prices in 1974 (Chart I) which almost tripled the fertilizer import bill from the US$169 million in 1973 to US$492 million in 1974 and about US$500 million in 1975, the Government initiated a National Fertilizer Program (NFP) which stipulated self-sufficiency in fertilizer by 1980. To implement the NFP, the Government established the National Fertilizer Commission with representatives from the Ministries of Finance, Industry, Commerce, Transport, Agriculture, and Planning. The Commission has overall responsibility for planning and formulating policies to facilitate the growth of the industry, especially the expansion of the production capacity.

As a result of the NFP, three new large-scale ammonia/urea projects are now firmly planned at Araucaria (under construction), Sergipe and Norte Fluminense, all of which will be undertaken by FERTILIZANTES, a subsidiary of PETROBRAS. The three projects will almost triple the ammonia capacity from the 1977 level of 477,000 TPY of N to 1,300,000 TPY of N by 1981.

6. One large public sector phosphate fertilizer project is under construction by VALEFERTIL, a CVRD subsidiary, which will more than double the domestic phosphoric acid production capacity from 220,000 TPY of $P_2O_5$ to 510,000 TPY of $P_2O_5$. Three other large phosphate fertilizer projects are planned in the private sector, but all face serious financing problems and are not expected to start production until 1981 or later. The three are: the ARAFERTIL project at Araxa, the Luchsinger project in the South, and the ICC project, also in the South. Both the ARAFERTIL and the Luchsinger projects will have phosphoric acid capacities of about 190,000 TPY of $P_2O_5$ and the ICC project 105,000 TPY of $P_2O_5$. However, only the VALEFERTIL and the ARAFERTIL projects will be based on local phosphate rock. The two projects in the South will have to use imported phosphate rock as no phosphate deposit has been discovered in that region.

In all, there are nine firm projects, supported by the NFP, which are estimated to cost almost US$1.9 billion and include four phosphate rock mining/beneficiation projects (Araxa, Tapira, Ipanema, Patos), two phosphate fertilizer projects (VALEFERTIL, ARAFERTIL), and three ammonia/urea projects (Araucaria, Sergipe, Norte Fluminense).

7. There are four industrial associations for the fertilizer industry: (a) The Associacao Nacional Para Difusao de Adubos (ANDA), which is responsible for the general promotion of and research on fertilizer use;

(b) The Syndicato de Materias Primas, which represents the domestic producers of fertilizers, (c) The Syndicato da Industria de Adubos e Colas do Estado de Sao Paulo, and (d) The Syndicato Estado de Rio Grande. The last two associations represent blenders, mixers and retailers. ANDA also acts as consultant to the Government and in the past has engaged the services of foreign firms (e.g. Tennessee Valley Authority and FAO) for special projects. The syndicates collect and disseminate information on consumption, production, stocks and distribution. They also prepare special studies to support the industry's views to the Government whenever changes in prices, subsidies and import quotas are contemplated. With the Government's manifest interest in the industry, the associations have begun to improve their system of data collection, their role as information sources and are now engaged in forecasting likely fertilizer consumption levels.

B. Agriculture and Fertilizer Use

(i) Factors Affecting Fertilizer Use

8. Four main factors, other than weather, affect the fertilizer usage in Brazil. These are: (a) the development of the cultivated area; (b) soil characteristics; (c) the cropping pattern and the level of agricultural technology; and (d) the Government policies concerning relative agricultural input and output prices, subsidies, credit, agricultural extension services and special programs related to agriculture. The Government's agricultural policies are generally discussed in Annex 3-1, and fertilizer prices and subsidies are discussed in Section C of this Annex.

9. Table 2 provides information on the potential agricultural areas that could be developed in the different regions of Brazil. The total potential agricultural area that could be used is estimated to be between 165 to 250 million ha. with a best estimate of 210 million ha. During the period 1960-1970, cultivated area increased at an annual rate of 3%, from 28.5 to 38.5 million ha. During 1970-1975, however, the cultivated area increased only slightly (Annex 3-1, Table 2) and for 1975 was about 41.5 million ha., representing just about 20% of the estimated potential of 210 million ha. Thus, the Government's Second Development Plan (1975-79) objective of increasing the cultivated area by 4% to 5% annually is slightly higher than the average rate achieved in the past.

Brazilian soils are generally acidic and seriously deficient in phosphorus. Table 3 shows the average phosphorus and potassium content of the soils by states, indicating that on a national basis, an average of 77% of the presently cultivated area is low in phosphorus (or phosphate) with the remaining 23% containing medium to high levels of natural phosphate nutrients. In contrast, only about 29% of the cultivated area is considered seriously deficient in potassium (or potash). This deficiency in phosphorus coupled with the acidity of the soil has led to the unusual NPK consumption ratio of about 1:2.3:1.3 (average for the period 1972-1976), with phosphate consumption more than twice the nitrogen consumption. The planned increase in cultivated area, mostly involving soils with nutrient deficiencies,

will clearly require an increase in fertilizer use, especially phosphatic fertilizers. To correct for soil acidity, large quantities of lime are applied since acidity is not compatible with most crops and in addition, the efficiency of N fertilizers is reduced, depressing agricultural yields. There are adequate domestic lime deposits and production capacity.

10. The cropping pattern and the level of agricultural technology is the third important factor affecting fertilizer use. As shown below, there has been a marked change in the cropping pattern. The area cultivated with coffee, for example, decreased from 4.4 million ha. in 1960 (15.4% of the cultivated area) to 1.4 million ha. in 1976 (3.2% of the cultivated area). In contrast, the area planted with soybeans increased from a 1960 level of 0.2 million ha. (0.7% of the cultivated area) to a 1976 level of 6.3 million ha. (14.5% of the cultivated area). The increase in the areas planted with crops such as wheat, rice and soybeans, which receive more fertilizers than other crops, partly explains the increase in fertilizer consumption experienced during the 1966-1976 period.

BRAZIL - CROPPING PATTERN AND CULTIVATED AREA
(area in million hectares)

| Crop | 1960 | | 1966 | | 1972 | | 1974 | | 1976 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Area | % | Area | % | Area | % | Area | % | Area | % |
| Corn | 6.7 | 23.4 | 8.7 | 26.0 | 10.3 | 25.9 | 11.9 | 29.2 | 11.6 | 26.7 |
| Rice | 3.0 | 10.5 | 4.0 | 12.0 | 4.9 | 12.3 | 4.2 | 10.3 | 6.3 | 14.5 |
| Soybean | 0.2 | 0.7 | 0.5 | 1.5 | 2.6 | 6.5 | 5.1 | 12.5 | 6.3 | 14.5 |
| Blackbeans | 2.6 | 9.1 | 3.3 | 9.9 | 3.8 | 9.6 | 4.2 | 10.3 | 4.3 | 9.9 |
| Cotton | 2.9 | 10.1 | 3.9 | 11.7 | 3.2 | 8.1 | 3.6 | 8.8 | 3.7 | 8.5 |
| Wheat | 1.4 | 4.9 | 0.7 | 2.1 | 2.1 | 5.3 | 2.5 | 6.1 | 3.5 | 8.0 |
| Sugarcane | 1.3 | 4.5 | 1.6 | 4.8 | 1.8 | 4.5 | 2.0 | 4.9 | 2.4 | 5.5 |
| Cassava | 1.3 | 4.5 | 1.9 | 5.7 | 2.1 | 5.3 | 2.0 | 4.9 | 2.3 | 5.3 |
| Coffee | 4.4 | 15.4 | 3.1 | 9.3 | 2.3 | 5.8 | 2.3 | 5.6 | 1.4 | 3.2 |
| Others | 4.8 | 16.9 | 5.7 | 17.0 | 6.6 | 16.7 | 3.0 | 7.4 | 1.7 | 3.9 |
| TOTAL | 28.6 | 100.0 | 33.4 | 100.0 | 39.7 | 100.0 | 40.8 | 100.0 | 43.5 | 100.0 |

Source: 1960-1974 data from Anuario Estatistico de Brasil (IBGE).
1976 data from Ministry of Agriculture (SUPLAN) forecast.

11. The recommended fertilizer application rates, which are shown in Table 4 and summarized below, show that most major crops, with the notable exception of coffee, require more P nutrients than either N or K. Actual fertilizer application rates are difficult to obtain since there is no systematic collection of data on fertilizer use by crops or by year, and only rough estimates can be made on the basis of fertilizer credit application data. One estimate of actual fertilizer application rates for different crops for 1974 is shown below. The recommended levels are low by international standards but are appropriate for the existing level of agricultural

technology. The actual application rates range from about 35% to 70% of the recommended level except for corn and rice, which are much lower. The six crops below account for almost 7% of the total fertilizer used in Brazil.

BRAZIL - RECOMMENDED FERTILIZER APPLICATION AND ESTIMATED 1974 USAGE FOR MAJOR CROPS

| | Kg of Nutrient/hectare | | | | | | |
|---|---|---|---|---|---|---|---|
| | Recommended[1] | | | | Estimated 1974 NPK | 1974 Actual as % of NPK | % of Total Fertilizer |
| Crop | N | P | K | Total NPK | Application | Recommended | Consumption[2] |
| Coffee | 180 | 40 | 82 | 302 | 100-165 | 35-55 | 13 |
| Sugarcane | 70 | 117 | 87 | 274 | 100-175 | 35-65 | 14 |
| Wheat | 50 | 131 | 40 | 221 | 90-120 | 40-55 | 14 |
| Rice | 44 | 77 | 44 | 165 | N.A. | N.A.[3] | 7 |
| Corn | 62 | 71 | 31 | 164 | 10-15 | 5-10 | 10 |
| Soybeans | 5 | 101 | 31 | 137 | 75-95 | 55-70 | 16 |
| TOTAL | | | | | | | 74% |

1/ Estimated national weighted average based on 1973 cultivated area for the crop and region (Table 4). P is in terms of $P_2O_5$ and K in terms of $K_2O$.

2/ This is the estimated average for 1971, 1973, and 1974. The 1971 and 1973 estimates were derived according to the distribution of fertilizer credits. The 1974 data is an ANDA estimate.

3/ This is probably in the 10% to 20% range considering that the corn area was 2.8 times the rice area in 1974 while rice accounted for 7% of fertilizer consumption compared to 10% for corn.

12. The differences between the recommended application rate and the actual rate can be partly explained by (a) the inadequacy of complementary inputs or technologies (plant varieties, cultivation method, correction of soil acidity, etc.) and agricultural extension services; (b) the low level of commercialization in several areas with concomitant high transportation costs for both agricultural inputs and outputs and lack of accessibility to credit sources; (c) the general poverty of the small farmholders who are mostly non-users of fertilizers; and most importantly (d) the decline in the purchasing power of agricultural crops relative to fertilizer prices during 1974 as a result of the large increase in international fertilizer prices (para 26).

13. The cropping pattern also affects the seasonal or monthly usage of fertilizers. About 70% of the fertilizer used for coffee, 60% of the fertilizer used for soybeans and 50% of that used for sugarcane are applied during the four months from July to October. Consequently, more than 50% of the total fertilizer consumption is used during July to October and about 70% is used during the six months from May to October (Table 5). This seasonal pattern of consumption is also reflected in the pattern of imports with about 50% of total imports occurring during May to August.

14. Of the Government policies affecting the use of fertilizers, the policies for the agricultural credit system are particularly important.

The Government has been well aware of the importance of working capital and liquidity for the modernization of agriculture; however, the effectiveness of the programs instituted is somewhat debatable given the relatively low overall efficiency of agricultural production and the lack of sufficient statistical data and analysis. In 1965, the Government created the National Rural Credit System (SNCR) which involved a complete revolution in Brazil's rural credit system. SNCR is made up of the Central Bank (which has a supervisory role in the system) and the Bank of Brazil, Bank of Amazonia, Bank of the Northeast, and the National Credit Cooperative Bank. The National Institute for Colonization and Agrarian Reform (INCRA), the State official banks, the National Savings Bank, the private banks, and the rural credit cooperatives are linked informally to the SNCR. To coordinate, guide and control the behavior of the different components of the credit system, a special department was established in the Central Bank.

15. The subsidy for the modernization of agriculture, specially the consumption of fertilizer, began with the foundation of FUNFERTIL which paid the total interest on loans used for buying fertilizer. In 1964 it was substituted by FUNDAG which provided most credit at an annual interest rate of 7% for buying modern inputs except for fertilizers where credit was interest free until 1974. This accounts for the large (95%) share of fertilizer purchases through the agricultural credit system. In addition rural credit plays a major role in special development programs such as the National Integration Program (PIN), the POLOAMAZONIA and POLONORDESTE. The POLOCENTRO, PRODEPAN and GRANDE DOURADOS programs will be of special importance for the development of fertilizer consumption in the western part of the Center. With the introduction of the price subsidy, interest on fertilizer credit was increased from 0% to 13 and 15% for medium/large and small farmers, respectively. The average maturity for fertilizer credit is 7-10 months, although it can be extended up to two years for crops like sugarcane and coffee, which require a longer gestation period.

16. Rural credit increased by a factor of seven from Cr$12.9 billion to Cr$90 billion in current terms (a factor of 3 in real terms) between 1971 to 1975 (Table 6). The share of fertilizer credit to the total rural credit gradually increased from 7.3% in 1971 to 8.3% in 1973. As a result of the steep rise in fertilizer prices in 1974, the share of fertilizer credit increased to 14% of the total rural credit but declined slightly to 11.4% in 1975 partly reflecting the drop in fertilizer prices and the slower growth in consumption during that year. Regionwise, fertilizer credit has the largest share in the Center followed by the South and the Northeast. It should be noted that the Center region in Table 6 does not include the State of Parana which is included in the South. The regional distribution of fertilizer credit according to the definition of the fertilizer market and marketing regions (where Parana is part of the Center) would have to be adjusted therefore to be about 8%, 75% and 17% for the Northeast, Center and South, respectively, while consumption of fertilizer is about 9%, 60% and 31%. This would indicate that the South is making less use of fertilizer credits than the Center. Lacking more specific data, it is difficult to find an explanation for this.

(ii) Agricultural Productivity

17. Until 1970, the growth in Brazil's agricultural output was mostly accounted for by the expansion of the cultivated area. With the exception of a few crops such as coffee, wheat and potatoes which registered remarkable increases in yields, the productivity of most crops showed only slight improvements from 1961/63 through 1968/70. During 1968/70-1973/74, cotton, cacao and soybeans achieved gains in yields as shown below. Over the period 1961/63-1973/74, five of the major crops achieved average productivity increases exceeding 2% annually.

BRAZIL - YIELDS OF MAJOR CROPS

| Crop | Productivity in 100 Kg/hectare | | | | | Average Annual Increase in Yield (%) |
|---|---|---|---|---|---|---|
| | 1961/63 | 1964/66 | 1968/70 | 1970/72 | 1973/74 | 1961/63-1973/74 1/ |
| Coffee | 4.2 | 7.7 | 8.1 | 10.6 | 8.4 | 6.5 |
| Wheat | 6.6 | 8.3 | 9.5 | 9.9 | 11.0 | 4.8 |
| Cotton | 5.5 | 4.8 | 4.9 | 5.0 | 8.4 | 3.9 |
| Cacao | 3.1 | 3.4 | 3.8 | 4.7 | 4.7 | 3.9 |
| Soybeans | 10.6 | 10.9 | 11.5 | 12.7 | 13.9 | 2.5 |
| Potatoes | 58 | 63 | 71 | 69.5 | 70.7 | 1.8 |
| Sugarcane | 428 | 448 | 456 | 467.4 | 469.0 | 0.8 |
| Corn | 13.1 | 12.8 | 13.6 | 13.8 | 14.2 | 0.7 |
| Cassava | 134 | 141 | 147 | 135.4 | 126.2 | -0.5 |
| Rice | 16.3 | 15.3 | 14.6 | 14.6 | 15.0 | -0.8 |
| Blackbeans | 6.5 | 6.6 | 6.3 | 6.4 | 5.8 | -1.0 |

1/ For estimating the annual increase in yield, the 11-year period, 1962/1973, is used.

18. Different levels of agricultural technology for the various crops account for most of the difference in productivity gains or lack thereof. Coffee, being the most important crop in terms of export earnings, has probably the most advanced agricultural technology in terms of high-yielding varieties, cultivation methods and fertilizer application. In addition, it also has well-developed supporting services such as extension services, credit facilities, and marketing system. As a result, the 50% reduction

in the area cultivated with coffee between 1960 and 1974 was offset by a doubling of yields in the same period. The shift in the coffee areas away from the frost-prone zone of the southern part of the Center region towards the central part of the Central region with its more favorable weather conditions should ensure more stable and better yields in the future.

19. The level of agricultural technology and supporting services, even for the same crop, varies among the different regions in Brazil. In general, the most agriculturally developed region is the South, followed by the Center with the North and Northeast regions the least developed. The regional differences in productivity during 1973 is illustrated in Table 7. The best productivity is in the South and Center regions while the lowest is in the Northeast region. Thus, the regional distribution of the cultivated area for a particular crop affects the overall productivity for that crop. For example, practically all the wheat and the soybean areas are in the South and Center regions. In contrast, about 96% of the sugarcane areas and practically all the cotton areas are in the Center and the Northeast regions. The gains in cotton productivity, however, mostly originate from the Center region, which accounted for 60% of the 1973 cotton output but only 28% of the cultivated area. Finally, most of the recently cultivated land is in less developed areas with a low productivity, thereby depressing the overall national yields for those crops introduced in the newly cultivated land.

20. An international comparison of agricultural productivity, as shown below, indicates a large potential for improving agricultural productivity in Brazil, even among those crops which have shown significant yield improvements during the last 15 years.

COMPARATIVE AGRICULTURAL YIELDS

| Rice | (Kg/ha) | Corn | (Kg/ha) |
|---|---|---|---|
| Japan | 5,838 | U.S.A. | 4,478 |
| U.S.A. | 4,978 | Argentina | 2,840 |
| India | 1,640 | Brazil | 1,339 |
| Brazil | 1,557 | Mexico | 993 |
| **Wheat** | **(Kg/ha)** | **Sugarcane** | **(Kg/ha)** |
| Netherlands | 5,733 | Mexico | 64,773 |
| Canada | 1,497 | India | 50,629 |
| India | 1,158 | Brazil | 47,500 |
| Brazil | 1,100 | Cuba | 37,500 |
| Iran | 820 | | |
| **Coffee** | **(Kg/ha)** | **Soybeans** | **(Kg/ha)** |
| Colombia | 637 | U.S.A. | 1,581 |
| Brazil | 623 | Brazil | 1,565 |
| Ivory Coast | 448 | | |
| Angola | 440 | | |

Source: FAO Production Yearbook 1974

21. While Brazilian agriculture will continue to be extensive in character as opposed to intensive agriculture as practiced in the Netherlands or Japan, the Government's objective of a 2% to 3% annual increase in agricultural productivity during 1975-1979 (Annex 3-1) appears reasonable. Such improvements, however, will require a systematic and deliberate approach to agricultural development considering that most of the newly cultivated land will be located in less developed areas requiring the development of transportation and marketing systems. Both the expansion of cultivated area and the improvement in the level of agricultural technology imply a continued growth in the demand for fertilizers.

22. The extensive nature of Brazil's agriculture is further demonstrated by low fertilizer application rates, when compared to other countries, as shown below:

1974 COMPARATIVE FERTILIZER APPLICATION RATES 1/
(Kg of Nutrient/hectare)

| Country | N | $P_2O_5$ | $K_2O$ | Total NPK |
|---|---|---|---|---|
| Netherlands | 476 | 128 | 137 | 741 |
| Japan | 155 | 150 | 129 | 434 |
| United States | 43 | 24 | 24 | 91 |
| Portugal | 37 | 20 | 7 | 64 |
| Brazil | 13 | 21 | 15 | 49 |
| India | 11 | 4 | 2 | 17 |
| Argentina | 2 | 1 | 1 | 4 |
| World | 26 | 17 | 14 | 57 |

1/ For all crops. Source: FAO Statistical Yearbook - 1974.

C. Agricultural Input and Output Prices

23. In pursuing its agricultural production and productivity objectives, the Government has traditionally relied on two policy instruments: providing credit to finance agricultural inputs (as discussed) and setting minimum prices for agricultural outputs to guarantee a reasonable level of profitability for agricultural production. The system of minimum prices for agricultural output was started in 1945 and has since extended its coverage from six major crops (rice, beans, corn, peanuts, sunflower and soybeans) to almost all agricultural products and most products of animal origin. The Consejo Interministerial de Precos (CIP) is responsible for operating the minimum price system. The minimum price is generally announced 60 days before the crop is planted and the Government guarantees the purchase of the production at this price. Financing is also provided for about 180 to 216 days at 100% of the estimated value of the production based on the minimum price. The geographical coverage of the system has expanded from the export ports and large consumer centers to many intermediate points in the

country thereby creating homogenous price zones. From 1966 through 1974, farm prices of most agricultural products increased in real terms (Table 8).

24. Up to 1974, the Government has not intervened in the determination of fertilizer retail prices, allowing market forces to set prices. Consequently, fertilizer prices have been affected by both international and domestic economic trends as indicated below by the cyclical pattern of prices (in constant terms) during the last 30 years.

BRAZIL - INDEX OF RETAIL FERTILIZER PRICES (IN CONSTANT TERMS)
(Basis 1948/52 = 100)

| Year | Index | Year | Index | Year | Index |
|---|---|---|---|---|---|
| 1948 | 112 | 1958 | 66 | 1968 | 73 |
| 1949 | 106 | 1959 | 61 | 1969 | 71 |
| 1950 | 97 | 1960 | 58 | 1970 | 65 |
| 1951 | 95 | 1961 | 84 | 1971 | 68 |
| 1952 | 90 | 1962 | 99 | 1972 | 72 |
| 1953 | 72 | 1963 | 100 | 1973 | 81 |
| 1954 | 69 | 1964 | 104 | 1974 | 150 |
| 1955 | 82 | 1965 | 124 | 1975 | 126 1/ |
| 1956 | 80 | 1966 | 95 | 1976 | NA 2/ |
| 1957 | 69 | 1967 | 75 | 1977 | NA 2/ |

Source: Instituto de Economia Agricola--IEA

1/ The 1975 index is estimated on the basis of a 40% subsidy. Without the subsidy the index would be 209.

2/ Prices are expected to decline slightly (in real terms) during 1976 and 1977.

25. The combination of real term increases in farm product and decreases in fertilizer prices increased the purchasing power of agricultural products relative to fertilizers as shown below:

BRAZIL - PURCHASING POWER OF AGRICULTURAL CROPS

| Year | Kg of Fertilizer Purchased by 100 Kg of Crop[1/] | | | |
|---|---|---|---|---|
| | Rice | Corn | Coffee | Soybeans |
| 1968 | 166 | 46 | 417 | 128 |
| 1972 | 185 | 64 | 833 | 139 |
| 1973 | 166 | 83 | 833 | 185 |
| 1974 | 98 | 37 | 417 | 79 |
| 1975[2/] | 185 | 64 | 417 | 111 |
| 1976[2/] | 241 | 67 | 868 | 128 |
| 1976[3/] | 163 | 45 | 586 | 87 |

1/ Weighted average price according to apparent NPK consumption.

2/ Considering a 40% subsidy on fertilizer prices and a 15% interest rate on fertilizer credit.

3/ Without the 40% subsidy but with the 15% interest rate on fertilizer credit.

26. The purchasing power of agricultural crops relative to fertilizer declined dramatically during 1974 as a consequence of the large increase in international fertilizer prices. Concerned about the possible adverse effect of the increase in fertilizer prices on fertilizer usage and agricultural production, in 1975 the Government introduced a 40% subsidy towards the purchase of fertilizer and a 15% interest rate on fertilizer credits which had been interest free prior to 1975. The net effect, however, was favorable and brought the purchasing power of most agricultural crops back to the 1972 level. International fertilizer prices began to decline in the third quarter of 1974, and by 1976 have settled back to the 1972/73 levels (Chart I). As a result of the rapid decline in international fertilizer prices during 1975, the purchasing power of agricultural products in relation to fertilizers increased again and therefore the Government eliminated the subsidy in late December 1976. This however, is not expected to have any adverse effect on fertilizer demand, since the relationship between agricultural product and fertilizer prices is expected to remain favorable. The removal of the subsidy, when it was not any longer economically justified, is an indication of the attention the Government is paying to the fertilizer sector and of the Government's determination to follow rational policies in this sector.

27. To avoid abuses within the fertilizer price subsidy program and to prevent the fertilizer industry from making excessive profits arising from the preference position granted to the industry by the import quota system for fertilizers (para 40), the Government in 1975 initiated a system of maximum fertilizer prices at the retail level. The CIP computes the maximum price per nutrient based on the proportion and expected cost of imported and domestically produced fertilizers, and an allowance for blending and distribution costs. The resulting price is then published as a ceiling price and credit or subsidy is only given to fertilizers purchased at prices equal or below the ceiling price. For the first half of 1976, the CIP published the following maximum retail prices: US$640/ton of N, US$690/ton of $P_2O_5$, and US$250/ton of $K_2O$ as derived below.

BRAZIL - MAXIMUM RETAIL PRICES FOR FERTILIZER
(February to June 1976)

| | Cr$/Kg of Nutrient | | |
|---|---|---|---|
| | N | $P_2O_5$ | $K_2O$ |
| Ex-Factory or CIF Cost | | | |
| Domestic Fertilizer | 5.27 | 5.19 | - |
| Imported Fertilizer | 3.47 | 3.74 | 1.78 |
| Share of Total Supply (%) | | | |
| Domestic Fertilizer | 55.6 | 76.9 | - |
| Imported Fertilizer | 44.4 | 23.1 | 100.0 |
| Average Cost | 4.47 | 4.86 | 1.78 |
| Distribution Margin at 42.8% of the Average Cost | 1.91 | 2.08 | 0.76 |
| Maximum Retail Price | 6.38 | 6.94 | 2.54 |
| In US$/ton of Nutrient | 638 | 694 | 254 |
| 1975 Comparative Figures | | | |
| Cr$/Kg | 7.6 | 6.8 | 2.8 |
| US$/ton | 890 | 800 | 329 |

Source: CIP

28. The maximum retail prices, on a US$ equivalent basis, have declined by 28% for N, 13% for $P_2O_5$ and 23% for $K_2O$ between 1975 and the first half of 1976. For the second half of 1976, the CIP has increased the maximum prices at a monthly rate of 1.5%, which is considerably lower than the inflation rate of 2% to 4% per month expected for the same period. This intended reduction in the maximum retail price level in real terms is appropriate considering the downward trend in international prices from 1975 through 1976. As the maximum prices are conservatively estimated and include a safety margin in the import, production and distribution costs, it has been observed and can be expected to continue that, on the average, actual prices because of competitive pressures at the retail level will tend to be 15-20% lower than the stipulated maximum.

29. The estimate for domestic production costs indicate that they are about 52% higher for N and 39% higher for $P_2O_5$ compared to the cost of imported fertilizers. Several factors could explain this difference. Firstly, the domestic production facilities, particularly for N, are small and do not enjoy the economies-of-scale common in the export oriented plants of other countries. Secondly, the industry is based on imported raw materials and intermediate products, particularly phosphate rock, sulfur, phosphoric acid and ammonia whose international prices have not decreased in the same proportion as the prices of finished products. While this is a short-term phenomena that is expected to change, the immediate effect is a situation whereby the cost of importing the raw materials and intermediates required for the production of some fertilizers into Brazil is higher than

the cost of importing the finished product. Finally, the domestic costs are provided by the local firms and the cost data probably contain some upward bias, to ensure higher profits or to incorporate anticipated cost increases that may not be fully matched by increases in the stipulated maximum prices in the future.

30. The export of agricultural output continues to be the primary source of foreign exchange for Brazil. The Government's economic objectives especially the management of the country's precarious balance-of-payments situation, depends heavily on the export performance of the agricultural sector. Thus, there is within the Government increasing attention on agricultural policies designed to increase agricultural exports. To enhance Brazil's competitiveness in the agricultural export market, it is important that agricultural inputs be provided at cost levels comparable to those prevailing in other exporting countries. The introduction and abolishment of the 40% subsidy for fertilizer is illustrative of the Government's increasingly active role. In mid-1976, Brazilian fertilizer retail prices without the subsidy are somewhat higher than those prevailing in the USA as shown below.

BRAZIL - COMPARATIVE FERTILIZER RETAIL PRICES
(US$/Ton of Product)

| Product Formula (NPK) | Brazil[1] With Subsidy | Brazil[1] Without Subsidy | USA[2] |
|---|---|---|---|
| 10-10-10 | 79 | 132 | 113 |
| 12-12-12 | 93 | 155 | 125 |
| 15-15-15 | 114 | 190 | 156 |
| 5-10-10 | 65 | 108 | 99 |
| 8- 8- 8 | 65 | 109 | 98 |

1/ Estimated actual retail prices which are assumed to be 80% of the CIP maximum retail price. Prices are for June 1976 at an exchange rate of Cr$10.80 = US$1.00.

2/ U.S. Dept. of Agriculture, April 1976.

However, during the latter half of 1976, Brazilian fertilizer prices further declined in real terms and in early 1977 they are estimated to be only slightly above those prevailing in the USA. In the longer run, as the new fertilizer production facilities come into operation, the average cost of domestic production is expected to decline and come in line with the lower international prices forecast for the end of this decade.

D. Fertilizer Consumption

(i) Historical Fertilizer Consumption Patterns

31. Between 1959 and 1966, the year-to-year apparent consumption of fertilizer fluctuated considerably, but did not show any underlying growth

trend (Table 9, Chart II), reflecting in part the Government's neglect of the agriculture and fertilizer sectors during that period. By the mid-sixties, however, the improvements in the credit system, the favorable economic climate, the continued expansion of the cultivated area, the shifts in the cropping pattern, the improving relationship of agricultural product to fertilizer prices and the increasing availability of high analysis fertilizer products, provided the stimuli for increased fertilizer use. During the six years from 1966 to 1972, fertilizer consumption increased at an average annual rate of 35%. This rapid growth in fertilizer use is also reflected in the marked improvement in the intensity of fertilizer use between 1966 and 1972 as shown below:

BRAZIL - INTENSITY OF FERTILIZER USE[1/]
(Kg of Nutrient/hectare)

| Nutrient | 1960 | 1966 | 1972 | 1974 | 1976 |
|---|---|---|---|---|---|
| N | 2.3 | 2.1 | 10.4 | 9.5 | 11.1 |
| $P_2O_5$ | 4.5 | 3.5 | 22.0 | 22.4 | 26.3 |
| $K_2O$ | 3.7 | 2.8 | 11.6 | 12.8 | 15.0 |
| Total NPK | 10.5 | 8.4 | 44.0 | 44.7 | 52.4 |
| Index of Real Fertilizer Prices[2/] | 58 | 95 | 72 | 150 | 126 |

1/ Based on apparent consumption and cultivated area.

2/ From para 27. The price index is in real terms with 1963 = 100. For 1976, the index shown is for 1975 and is based on a 40% price subsidy. Without the subsidy, the index would be 209. A slight decrease in real prices is expected between 1975 and 1976.

The strong upward trend was only interrupted by adverse weather in 1969 and 1973 and slowed down by the large increases in international fertilizer prices during 1974 and 1975. The introduction of the fertilizer retail price subsidy (paras 26 to 28) during 1975 helped apparent consumption grow at a modest rate that year. The continuation of the subsidy system and the continued decline in international prices have caused apparent consumption to rise by 17% in 1976.

32. The absence of systematic statistics on changes in the fertilizer inventory levels makes it difficult to estimate actual year by year consumption, which would probably show less annual fluctuations and a more discernable trend compared to apparent consumption. The Ministry of Agriculture has made an estimate of actual consumption for the last six years which shows a more stable growth as shown below:

BRAZIL - COMPARISON OF APPARENT AND ESTIMATED ACTUAL FERTILIZER CONSUMPTION

| Year | Consumption in 1,000 nutrient tons | | % Annual Growth Rate | |
|---|---|---|---|---|
| | Estimated Actual | Apparent | Estimated Actual | Apparent |
| 1970 | 979 | 999 | - | - |
| 1971 | 1,126 | 1,165 | 15 | 17 |
| 1972 | 1,446 | 1,747 | 28 | 50 |
| 1973 | 1,879 | 1,679 | 30 | -4 |
| 1974 | 1,777 | 1,824 | -5 | 9 |
| 1975 | 2,045 | 1,957 | 15 | 7 |
| 1976 | 2,351 | 2,286 | 15 | 17 |

Source: SUPLAN

33. Phosphate is the most important nutrient consumed because of the soil characteristics and cropping pattern in Brazil (paras 9 to 12). This has led to the NPK consumption ratio of about 1:2.3:1.3 for the 1972-1976 period. As can be expected, there is a marked difference in the NPK consumption ratio between the South, the Center and the North/Northeast regions (Table 10, Chart III) as summarized below. The highest ratio of P to N is in the South, where most of the soybean and wheat areas are located.

BRAZIL - AVERAGE REGIONAL NPK CONSUMPTION RATIO 1972-1976

| Region | Average NPK Ratio |
|---|---|
| South | 1:4.1:1.5 |
| Center | 1:2.0:1.3 |
| North/Northeast | 1:1.3:1.1 |
| Brazil | 1:2.3:1.3 |

34. Fertilizer consumption has increased most rapidly in the South, at about 34.4% annually over the last 10 years (Table 11), followed by the Northeast (22.4%) and the Center (19.7%). The higher growth rate in the Northeast compared to the Center reflects the relatively lower consumption levels in the Northeast during the mid-sixties. Although the South is the most intensive user of fertilizer, the Center, with its larger cultivated area, accounts for almost 60% of total nutrient consumption over 1972-76 (Table 12) followed by the South (31%) and the North/Northeast (9%).

35. Although a significant shift towards higher analysis fertilizer products occurred in the late sixties, only the phosphatic fertilizers continued the trend between 1970 and 1974, with TSP displacing SSP (Table 13). The limited domestic production capacity for urea is partly responsible for the continued dominance of low analysis products in the nitrogen fertilizer area.

(ii) Fertilizer Demand Forecast

36. In 1972, the Government commissioned a study of the fertilizer sector. The study was executed by SEITEC under the joint supervision of BNDE (The National Development Bank), IPEA (a planning institute in the Ministry of Planning) and ANDA. The report, published in May 1974 on the basis of actual data up to 1970, estimated fertilizer demand at about 4.0 million nutrient tons by 1980 equivalent to an application rate of 80 kg of nutrient/ha. compared to about 52 Kg/ha. during 1976. The demand forecast formed the basis for the Government's National Fertilizer Plan (NFP) of early 1975.

37. The upper limit for the potential demand for fertilizer can be estimated on the basis of normative analysis of necessary nutrient replacement rates, and projections of both increases in cultivated area and cropping patterns. This approach results in a potential demand estimate of about 12 million nutrient tons in 1985. Given the 1976 consumption of 2.3 million nutrient tons, an upper bound of 23% annual average growth rate from 1976 to 1985 can thus be established. On the basis of the trends of the past ten years, the Government's agricultural programs for achieving its goal of an increase of about 7% annually for agricultural output (Annex 3-1) during the Second Development Plan period (1975-1979), and the increasing availability of more economically produced local fertilizers, demand growth rates ranging from 10% to 15% annually appear likely, which would be somewhat lower than the actual rates for 1970-76 (para 34). Higher growth rates could probably not be sustained because constraints such as a slower development of complementary agricultural technology, and limitations in the extension services, credit facilities and the transportation and marketing systems would be much too difficult to overcome. The Bank's forecast on the basis of a 10% to 11% annual NPK demand growth rate is shown below, together with the forecast contained in the NFP. The NFP forecasts the NPK ratio to shift significantly to about 1.0:1.14:0.7 by 1980, since generally, at more intensive levels of fertilizer use, proportionately more N is required compared to P. However, because of the planned increase in newly cultivated area, which require considerably more P than N; and the evolving cropping pattern showing several major crops such as soybeans and wheat which also require more P than N, it is very likely that only a modest shift in the NPK ratio will materialize.

BRAZIL - FERTILIZER DEMAND FORECASTS

| Year | In Millions of Nutrient Tons N | $P_2O_5$ | $K_2O$ | Total | NPK Ratio |
|---|---|---|---|---|---|
| 1980 | | | | | |
| NFP (1974) | 1.4 | 1.6 | 1.0 | 4.0 | 1:1.14:0.7 |
| Bank (1976) | 0.8 | 1.7 | 1.0 | 3.4 | 1:2.1:1.2 |
| 1985 | | | | | |
| Bank (1976) | 1.4 | 2.6 | 1.7 | 5.7 | 1:1.8:1.2 |
| % Average Annual Growth Rate (Bank) | | | | | |
| 1976-1980 | 13 | 10 | 11 | 11 | |
| 1980-1985 | 12 | 9 | 11 | 10 | |

38. The regional shares of fertilizer demand are expected to follow the consumption pattern of the last five years (1972-76) as shown below:

BRAZIL - PROJECTED REGIONAL SHARES OF FERTILIZER DEMAND (1977-1985)

| Region | % Share of Nutrient Demand | | | |
|---|---|---|---|---|
| | N | $P_2O_5$ | $K_2O$ | Total |
| North/Northeast | 12 | 7 | 10 | 9 |
| Center | 65 | 54 | 64 | 60 |
| South | 23 | 39 | 26 | 31 |
| TOTAL | 100 | 100 | 100 | 100 |

## E. Fertilizer Supply - Imports and Production

### (i) Historical Pattern of Fertilizer Supply

39. Brazil imports a major portion of its N and P and all of its K nutrient requirements in the form of raw materials (phosphate rock), intermediates (phosphoric acid and ammonia) and finished products as mentioned in para 3. From 1960-1965, total nutrient imports accounted for 55% to 65% of apparent consumption. From 1966 to 1975, the share of imports has increased to about 65% to 80% (Table 14) reflecting the low natural resource endowment of the country. Nonetheless, an increasing proportion of imports represented raw materials and intermediates, especially for P, rather than finished products. This reliance on imported fertilizer materials has proved expensive when international fertilizer prices increased threefold between 1973 and 1974 (Chart I). The fertilizer import bill for 1974 and 1975 were about US$500 million compared to US$169 million in 1973.

40. The reliance on imports of finished as well as intermediate products prior to 1973 has helped maintain retail fertilizer prices at reasonable levels, since local production costs were generally much higher than the costs of imports (para 29). To protect local producers and ensure that all local production is consumed, the Government has instituted an import quota system for finished fertilizer products. The system requires retailers to purchase a given proportion of local production for each unit of imported fertilizer product. The ratio changes depending on local availability and consumption expectations. When international prices are exceptionally high as in 1974 and 1975, imports are not restricted. But under more normal international price conditions, when local production costs exceed the cost of imports, the quota system is implemented. For 1976, the quota in the Northeast was 1:1 (1 ton of imports per ton of local purchases) for N and $P_2O_5$ could be imported without limit. In the South and the Center the 1976 quota was 1.6:1 for N (1.6 tons of import per ton of local production) and about 0.4:1 for $P_2O_5$.

41. Imports are seasonal (Table 15), reflecting the seasonal structure of consumption (para 13) and has allowed Brazilian blenders, mixers and distributors to minimize their inventory costs by timing deliveries just slightly ahead of the fertilizer season. The blending and mixing production levels are easily changed from one or two work shifts during the slack season and three to four work shifts during the peak season, thereby also minimizing working capital requirements. About 80% of imports are processed through two ports, Santos (60%) and Rio Grande (20%), reflecting the concentration of consumption in the States of Sao Paulo and Rio Grande do Sul.

42. The historical production of N and P fertilizers are shown in Table 16. Significant increases in production occurred only after 1968/69 when the QUIMBRASIL phosphate project started production with a phosphoric acid capacity of 65,000 TPY of $P_2O_5$ and a total phosphate product capacity of 100,000 TPY of $P_2O_5$. During 1970/71, the ULTRAFERTIL plant (123,000 TPY of N, 65,000 TPY of $P_2O_5$) at Sao Paulo and the PETROFERTIL plant (55,000 TPY of N) in Bahia came on stream. The COPEBRAS phosphate project started production in late 1975 with a phosphoric acid capacity of 90,000 TPY of $P_2O_5$ and a total phosphate product capacity of 145,000 TPY of $P_2O_5$. The PETROFERTIL ammonia/urea expansion project (247,000 TPY of) is scheduled for completion in mid-1977 and will double Brazil's ammonia capacity from 230,000 TPY of N to 477,000 TPY N.

During 1973-75, the local N production accounted for about 35% of N consumption while the domestic P production accounted for about 45% of P consumption. However, since all K nutrients are imported, the total nutrient (NPK) production just represented some 30% of total NPK consumption.

(ii) Production Forecast

43. As discussed (para 3), the Government, through the NFP, is supporting a number of projects which will transform the fertilizer industry into a major industrial sector in Brazil's economy. One fuel-oil-based ammonia/urea project (325,000 TPY N) is under construction at Araucaria, Parana, with a Bank financing of US$50 million (Loan No. 1256 BR). Two other ammonia/urea projects, both gas-based, are in an advanced stage of planning. The most advanced is in Sergipe in the Northeast (247,000 TPY N) which is being proposed for Bank financing. The other is at Norte Fluminense, Rio de Janeiro (247,000 TPY N) which replaced the Paulinea project after the discovery of offshore oil and gas near Campos. The Norte Fluminense project is being proposed for financing by the Inter American Development Bank. The three projects are expected to start commercial operation in 1979 and 1981, respectively, and will be owned by FERTILIZANTES with a combined financing requirement of about US$800 to 850 million. Since ULTRAFERTIL, PETROFERTIL and FAFER will also be subsidiaries of FERTILIZANTES to consolidate all fertilizer enterprises of PETROBRAS, FERTILIZANTES will hold the monopoly of the ammonia/urea production capacity in the country. A fourth ammonia/urea project probably based on fuel oil to be located in the South (Rio Grande do Sul) is in the initial stages of planning by FERTILIZANTES and the State Government, but is not expected to come into production until 1982/83.

44. Table 17 shows the development of the ammonia capacity and production from 1976 through 1985, indicating an almost sixfold increase in capacity between 1976 and 1981. During 1976 through 1979, about 75% to 80% of the ammonia production will be available for fertilizer use, the balance will be needed for industrial uses. By 1980 and 1981, however, when the Sergipe and Norte Fluminense projects start operation, about 85% to 90% of the total ammonia production will be available for fertilizer use.

45. The phosphate rock production capacity of Brazil is also expected to increase about six times from about 130,000 TPY $P_2O_5$ in 1976 to about 875,000 TPY of $P_2O_5$ by 1979 (Table 18) with the operation of three mining/beneficiation projects at Araxa (the ARAFERTIL project - 225,000 TPY $P_2O_5$) in mid-1977, at Tapira (the VALEP project - 345,000 TPY $P_2O_5$) in late-1978 and at Ipanema (the QUIMBRASIL/SERRANA project - 105,000 TPY $P_2O_5$). The Ipanema rock and the output from pilot plants at Patos and Catalao (METAGO), which will start production in 1977, will all be used for direct application. Between 1980 and 1985, three additional mining/beneficiation projects, now under initial planning, are expected to be operational. These are the Patos de Minas project of FERTILIZANTES (350,000 TPY of $P_2O_5$) expected to start operation in 1981 at the earliest; the Catalao project of METAGO (220,000 TPY $P_2O_5$) and another project at Catalao by Mineracao Catalao (200,000 TPY of $P_2O_5$). The two projects at Catalao in the state of Goias are private sector ventures and will probably come into operation about two to three years apart, starting 1983 because of transportation difficulties, financing constraints, and inadequate market demand before 1984. The financing requirements of a large mining/beneficiation project based on low grade rock can range from US$150 to US$200 million.

46. Several phosphate fertilizer projects are also in the planning stage (para 6). The most advanced is the VALEFERTIL project at Uberaba with a phosphoric acid capacity of 290,000 TPY of $P_2O_5$ and a total phosphate product capacity of 333,000 TPY of $P_2O_5$, expected to be completed by mid-1979. The VALEFERTIL project will use the phosphate rock from the VALEP project. A Bank loan has been requested for the VALEFERTIL project. A second project, by ARAFERTIL, will be located at Araxa to use the Araxa phosphate rock. The ARAFERTIL project will have a phosphoric acid capacity of 190,000 TPY $P_2O_5$ and a total phosphate product capacity of 220,000 TPY of $P_2O_5$. While the project has been ready for implementation for sometime, financing constraints have delayed construction and the project is now expected to be completed by 1981. In the meantime, the Araxa rock will be sold to producers in the State of Sao Paulo. Two projects are proposed to be constructed in the South, with a combined phosphoric acid capacity of 285,000 TPY of $P_2O_5$ and a total product capacity of about 330,000 TPY of $P_2O_5$, or about the size of the VALEFERTIL project. These two projects will be owned by LUCHSINGER and by ICC and will likely be completed in 1980. They will both use imported phosphate rock because no phosphate deposit has been discovered in the South. Table 19 contains the forecast of phosphoric acid capacity and production, while Table 20 shows the forecast of total phosphate fertilizer nutrient output.

F. Forecast of Fertilizer Demand and Supply Situation

47. The regional as well as national forecast of fertilizer demand and supply is given in Table 21 for N and Table 22 for $P_2O_5$. All $K_2O$ is expected to be supplied from imports. The forecasts are summarized below and indicate that with the three new ammonia/urea projects Brazil will be increasingly self-sufficient in N with local production accounting for 33% of consumption in 1975 and reaching full self-sufficiency in 1981. The Northeast will have a surplus of N fertilizers which will be shipped to the Center which will continue to be a net importer of N. If demand should continue to grow at 10% annually, a new N fertilizer project will be needed to come into production every two years starting in 1983 to keep local production close to the demand levels. Thus, the ammonia/urea project in the South can be planned for completion by 1983.

BRAZIL - NITROGEN DEMAND/SUPPLY FORECAST
(1,000 Nutrient tons)

| | 1976 | 1978 | 1980 | 1982 | 1985 |
|---|---|---|---|---|---|
| Expected Demand | | | | | |
| North/Northeast | 66 | 85 | 110 | 140 | 200 |
| Center | 314 | 400 | 520 | 650 | 900 |
| South | 108 | 140 | 175 | 210 | 300 |
| Brazil - Total | 488 | 620 | 800 | 1,000 | 1,400 |
| Expected Production | | | | | |
| North/Northeast | 30 | 180 | 225 | 425 | 450 |
| Center | 130 | 110 | 345 | 535 | 530 |
| South | - | - | - | - | - |
| Brazil - Total | 160 | 290 | 570 | 960 | 980 |
| % Self-sufficiency (Brazil) | 33 | 47 | 71 | 96 | 70 |

48. The supply and demand forecast for P indicates that the South will continue to be a deficit region, inspite of the planned doubling of capacity from 328,000 TPY of $P_2O_5$ in 1976 to about 643,000 TPY of $P_2O_5$ by 1980. The deficit could be eliminated by adding another 130,000 TPY of $P_2O_5$ product capacity for 1980/81, and then increasing capacity by about 150,000 TPY of $P_2O_5$ every other year thereafter. The South will also be importing all its phosphoric acid and phosphate rock until 1980 when LUCHSINGER and ICC complete their phosphoric acid projects. By 1981, the South would still be only about 50% self-sufficient in phosphoric acid requirement, and will still import all its rock requirement. While a potential surplus of phosphate rock (from Catalao) exist in the Center region for 1982-1984, the prohibitive local transport cost makes shipment into the South uneconomic except when international prices increase much higher than presently estimated.

49. The phosphate product supply and demand situation in the Center region will change, however, from a deficit situation up to 1978, to a balanced situation in 1979, and then to a potential surplus situation

during 1980 and 1983. The potential surplus is about 100,000 to 150,000 TPY of $P_2O_5$ and exists only because four firms (UNIAO, FERTIBASE, MANAH and INDAG) have the flexibility of producing some TSP, based on imported phosphoric acid, or SSP, based on imported sulfuric acid or sulfur. If these four firms produce the maximum TSP, they will supply 50% more $P_2O_5$ nutrients than if they produced only SSP.1/ The four firms could produce the maximum $P_2O_5$ nutrients (TSP) and ship part of their production to the South, which is expected to have a deficit of about 100,000 to 150,000 TPY of $P_2O_5$ between 1980 and 1983 and a much larger deficit after 1983. But these four producers may not be competitive with imports into the South. The production forecast for phosphate products in Table 21 assume that during 1980 through 1983, these four firms will adjust their product mix between SSP and TSP such that a surplus of $P_2O_5$ nutrients in the Center region is avoided. This assumption is reasonable since the VALEFERTIL and the ARAFERTIL projects, which come on-stream during 1979 and 1981, respectively, will supply the necessary TSP and MAP based on their own phosphoric acid production. By 1984, however, this potential surplus will disappear and a deficit will occur again by 1985. It appears, therefore, that the Center region will not need additional phosphate product capacity, other than the VALEFERTIL and the ARAFERTIL projects, until 1984. Starting 1985 or 1986, additional capacity of about 100,000 TPY of $P_2O_5$ will be required each year to keep production in line with increases in demand.

50. The North/Northeast region will have a deficit of phosphate products up to 1979, when the proposed PROFERTIL TSP project and the AGROFERTIL MAP project are expected to be completed. Beyond 1979, the region should be self-sufficient in $P_2O_5$ products, although it will import all the phosphoric acid and phosphate rock raw materials.

51. A summary of the phosphate product demand and supply situation is given below:

BRAZIL - PHOSPHATE PRODUCT DEMAND/SUPPLY FORECAST
(1,000 tons of $P_2O_5$)

| | 1976 | 1978 | 1980 | 1982 | 1985 |
|---|---|---|---|---|---|
| Expected Demand | | | | | |
| North/Northeast | 83 | 97 | 118 | 139 | 181 |
| Center | 611 | 745 | 907 | 1,075 | 1,393 |
| South | 451 | 538 | 655 | 776 | 1,006 |
| Brazil - Total | 1,145 | 1,380 | 1,680 | 1,990 | 2,580 |
| Expected Supply | | | | | |
| North/Northeast | 8 | 8 | 118 | 139 | 149 |
| Center | 555 | 707 | 909 | 1,110 | 1,299 |
| South | 223 | 382 | 528 | 578 | 578 |
| Brazil - Total | 786 | 1,097 | 1,555 | 1,827 | 2,026 |
| % Self-Sufficiency | | | | | |
| North/Northeast | 10 | 8 | 100 | 100 | 82 |
| Center | 91 | 95 | 100 | 100 | 93 |
| South | 49 | 71 | 81 | 74 | 57 |
| Brazil | 69 | 79 | 93 | 92 | 78 |

1/ The $P_2O_5$ nutrient capacity of these four firms is 300,000 TPY of $P_2O_5$ on the basis of maximum TSP output and only 210,000 TPY of $P_2O_5$ on the basis of SSP production only.

52. The Center region is expected to be self-sufficient in phosphoric acid between 1980 and 1983 with the VALEFERTIL and the ARAFERTIL projects. In addition, the region will also be about 85% to 95% self-sufficient in phosphate rock with the completion of the four projects at Araxa, Tapira, Ipanema and Patos de Minas (Table 18). The present plans for the Patos deposit envisions a mining/beneficiation project (310,000 TPY $P_2O_5$) to be completed perhaps by 1981 to substitute for imported phosphate rock. At that time, the ARAFERTIL fertilizer project will likely come on stream and use the Araxa phosphate rock. Thus, the Patos project will continue to supply rock to the present producers, notably COPEBRAS and ULTRAFERTIL. An expansion project for Patos, probably to be ready by 1985 or 1986, will involve a doubling of the mining output for processing into phosphatic fertilizers. This expansion project will be identical in scale to the combined VALEP-VALEFERTIL complex and will provide the additional phosphoric acid capacity needed in the region. Development of one of the Catalao deposit for production by 1983 and the second Catalao project for operation by 1986 would ensure the Center region self-sufficiency in phosphate rock through the end of the 1980s.

G. Distribution System

53. The structure of the Brazilian marketing and distribution system is schematically shown in Chart IV. Most of the fertilizer passes through three levels on the way to final consumption: (i) primary production, (ii) blenders and (iii) wholesale and retail sales organization. In addition, domestic producers, who supply about one-third of consumption, are also usually involved in importing as well as blending and selling. About 90% of total consumption is processed through blenders, which are either owned by manufacturers (25% of total), independent companies (65%), or cooperatives (10%). Blenders are also involved in importing.

54. Sales organizations are either: (i) dependent organizations of the manufacturers, (ii) commission agents, (iii) independent dealers and (iv) cooperatives. Dependent organizations are extensions of the manufacturer's marketing organization and employees work on a fixed salary. Commission agents depend on the blending operation or the domestic manufacturers by an agreement which obliges them to sell only fertilizer products of the corresponding companies. The local agents who sell on a commission basis can be exclusive fertilizer dealers or general rural salesmen. Companies which sell by commission agents employ one regional sales manager and 4-6 inspectors for every 50-150 local agents. The regional sales manager is a salaried employee of the company, the inspectors may or may not receive fixed salaries. Local agents receive a commission of about 4% from the sales as an average ranging from 3 to 10%. The agent helps the farmer in arranging bank credits and transportation.

55. Independent dealers have lost importance and this trend is continuing. At present they are primarily used in new areas in which the amount of fertilizer sold at the introductory phase does not pay a company-owned selling system. Similarly, cooperatives are not a major sales outlet, and are not expected to grow significantly in the near future. Sales on commission is still the most frequently used marketing channel. However, the exact

distribution on the different market channels is not known, and the percentage numbers given in Chart IV are only rough estimates.

56. The distribution of storage between manufacturers, blenders and local retailers is not accurately known. Blenders try to avoid storage as far as possible because of the lack of working capital. Considering the cost of storage it is usually more profitable for them to adjust their blending operation to the seasonal structure of consumption by increasing the daily working time from 8 to 24 hours, than to store large quantitites over 9 months of the year. Farmers participate only marginally in storage also due primarily to lack of working capital and insufficient discount and credit facilities. Thus, most of storage is done by the manufacturers, who usually rent storage in the peak season. The problem of storage will become more serious with increasing degree of local production, since adjustment by imports will lose its present importance.

57. Transportation is one of the most important distribution elements in Brazil because of the long distance between production and consumption centers. It is also a significant constraint to the growth of fertilizer consumption especially in the regions which will become crucial for the further increase of agricultural production. The Government (GEIPOT) has embarked in 1975 on a country-wide transportation study and has completed Phase I which studied the present and expected transportation pattern of ten commodities which constitute the bulk of Brazil's transportation requirements. One of the commodities studied was fertilizer, and the following is an extract from the Phase I report.

58. In principle, highway transportation, railway transportation and coastal shipping compete against each other. But transport by ship along the coast or on the great rivers has not gained importance in domestic transportation. Road and rail transport are, therefore, the only significant means of transportation, and the split for the two modes is shown below for 1974:

BRAZIL - TRANSPORT MODES OF FERTILIZER, 1974
(in %)

| Region | Product | By Road | By Rail | Total |
|---|---|---|---|---|
| Northeast | Finished Products | 96.9 | 3.1 | 100.0 |
| Center | Raw Materials | 95.9 | 4.1 | 100.0 |
| | Intermediate Products | 88.0 | 12.0 | 100.0 |
| | Finished Products | 84.8 | 15.2 | 100.0 |
| South | Finished Products | 81.7 | 18.3 | 100.0 |

Source: GEIPOT

59. Most fertilizers are thus moved by road transport despite the fact that rail transport may be cheaper in many cases. The principal reason for this pattern is the greater flexibility and convenience provided by road

transport particularly for the distribution of finished fertilizer. Paradoxically, the share of rail transport in the Center is larger for finished products than for raw materials (15.2% versus 4.1%). This is due to the lack of a railway link between the fertilizer terminal in Santos and the railway network of the Center. All raw materials entering the port of Santos have to be loaded on trucks before they can be moved by railway. A rail link is being built and financed under the Bank's First Port Project. The share of fertilizer raw materials carried by the railways in the Center can be expected to increase once the line is completed.

60. The lack of specialized freight cars for corrosive bulk materials and the fact that many manufacturers and blenders do not have adequate facilities for loading and unloading bulk materials from railcars is one of the most important handicaps which have prevented the railways from capturing a larger share of the transport of raw and intermediate materials. Manufacturers generally have to bag intermediate products in order to use the railway's standard box cars. The blender receiving the material has to tear the bags as an additional operation before he can use the material. Unless the distances are very long, the additional cost of bagging and unbagging normally offsets the cost advantage of the railways, thus road transport, which is also generally faster, is used.

61. The industry would use the railway for transport of bulk materials but for the lack of proper railcars. To overcome this situation, it would be necessary to identify those transport routes which carry a considerable amount of bulk materials and to convert such routes to rail transport by working out an agreement between the companies involved and the railroad authority. The necessary analytical work for this is being done as part of the Fertilizer Market and Marketing Study (para 70).

62. The GEIPOT study also evaluated the port situation which is important to the fertilizer industry as over 50% of all the nutrients still come from overseas. In terms of importance, the ports of Santos and Rio Grande rank first and second and they handle about 80% of imported fertilizer materials. The table below gives a breakdown of the volumes handled by each port for 1974 and also an estimate of the fertilizer unloading capacity for some of the ports:

BRAZIL - FERTILIZER IMPORTS THROUGH DIFFERENT PORTS, 1974

| Port | Quantity (000 tons) | Quantity % of Total | Average Unloading Rate (Tons/Hour) |
|---|---|---|---|
| Northeast | | | |
| Cabedalo | 4 | - | N.A. |
| Recife | 196 | 6 | 12 |
| Maceio | 95 | 3 | 15 |
| Salvador | 25 | 1 | N.A. |
| Ilheus | 21 | - | 15 |
| Total | 341 | 10 | |
| Center | | | |
| Santos | 1,713 | 49 | 150 |
| Paranagua | 130 | 4 | N.A. |
| Total | 1,843 | 53 | |
| South | | | |
| Porto Alegre | 333 | 9 | 30 |
| Rio Grande | 1,005 | 28 | 150 |
| Total | 1,338 | 37 | |
| TOTAL | 3,522 | 100 | |

63. Rio Grande is the best equipped port with special fertilizer handling equipment and storage installed by FERTISUL and by LUCHSINGER. Santos also has a special fertilizer terminal with a nominal capacity of unloading 12,000 tons per day per ship. The actual unloading however, reaches only about 1,800 tons per day per ship because of the design of the berths, the low capacity of the grabs, and the tendency of the fertilizer to cake. The other difficulty in Santos is the lack of a railway link as mentioned earlier. The ports in the Northeast are much more inefficient, and Recife, which handles more than 50% of the imports for the Northeast will require a fertilizer terminal to cope with the larger volume expected in the future.

64. The new chemical port being built in Aratu (Bahia) to move the raw materials and finished products of the chemical complex in Camacari (which includes the PETROFERTIL plant) will have excellent fertilizer handling facilities. The excess fertilizer production of the Northeast can thus be very efficiently shipped from Aratu.

65. Port handling charges average about US$20 per ton depending on the port and the material handled. Costs in Rio Grande and the new port of Aratu are and will continue to be much lower than in other ports.

66. Table 23 gives a comparison of some representative routes and costs for rail and road transport in the Center and the South. It shows that while the railroads charge less than the trucking companies on a per ton-km basis, this advantage, particularly for distances less than 600 road km, is offset by the fact that the trains have to cover a much greater distance between any two given points compared to highway travel. There appears to

be an interesting regional difference between the Center and the South. The South's rail tariffs are considerably lower, while road transport charges appear higher, than the Center's. As a result, rail transport in the South is generally cheaper than by truck, while the Center shows a slight advantage for road transport. This probably explains why rail transport has a higher share of fertilizer shipments in the South than any other region.

67. The future transportation pattern will be significantly altered by the expected growth of the fertilizer sector and by the shift from imports to local production of raw and intermediate materials. This will generally ease the load on the ports, but will increase the inland transport requirements significantly. Starting in 1977 when PETROFERTIL's new ammonia/urea plant will commence production, large quantities of ammonia will have to be moved over long distances. At present, only small amounts of ammonia are moved, all by truck. The companies and the railroads have to make a considerable investment in ammonia moving facilities. PETROBRAS is presently studying this problem and specific recommendations are expected by early 1977.

68. Because the Northeast will become a net exporter of nitrogen fertilizers, coastal shipping will become a more important mode of transport to move ammonia and urea. It is also possible that the production from the proposed plant at Norte Fluminense would best be moved by ship, further increasing the role of coastal shipping in the fertilizer sector.

H. Proposed Fertilizer Market and Marketing Study

69. In connection with the Araucaria project, the Government has undertaken a study of the market and marketing aspects of the fertilizer sector. While the Government intends that the private sector handle the marketing and distribution of fertilizers, as has been the case in the past, it is crucial that the Government help identify potential bottlenecks in marketing and distribution, to ensure that the Government's policies and programs complement to the fullest degree, and facilitate, the rapid expansion of fertilizer use. The Government has also agreed to exchange views with the Bank regarding the expansion and development of the fertilizer sector including fertilizer import and pricing policy, and the results and recommendations of the proposed study.

70. The proposed study would have the following major objectives:

(i) Develop a methodology for and estimate fertilizer demand and supply for a 10-year period and propose institutional arrangements for annual updates;

(ii) Make recommendations as to the optimal location of future fertilizer plants considering regional increase in consumption and likely shifts in fertilizer distribution patterns;

(iii) Identify specific constraints that may prevent the more efficient and broader use of fertilizers;

(iv) Define improvements and/or expansion of storage, transportation and mixing/blending facilities that are required to support the expected increases in fertilizer production/consumption; and

(v) Recommend possible new Government policies (including credit and pricing) and programs that would be needed to ensure that the required marketing/distribution investments are undertaken either by the private or public sectors, and encourage broader and more efficient fertilizer use.

71. Detailed terms of reference for the study were prepared by IPEA, which will supervise the study, and have been reviewed by the Bank. It is expected that the final report of the study which began in October 1976 should be available in the fall of 1977.

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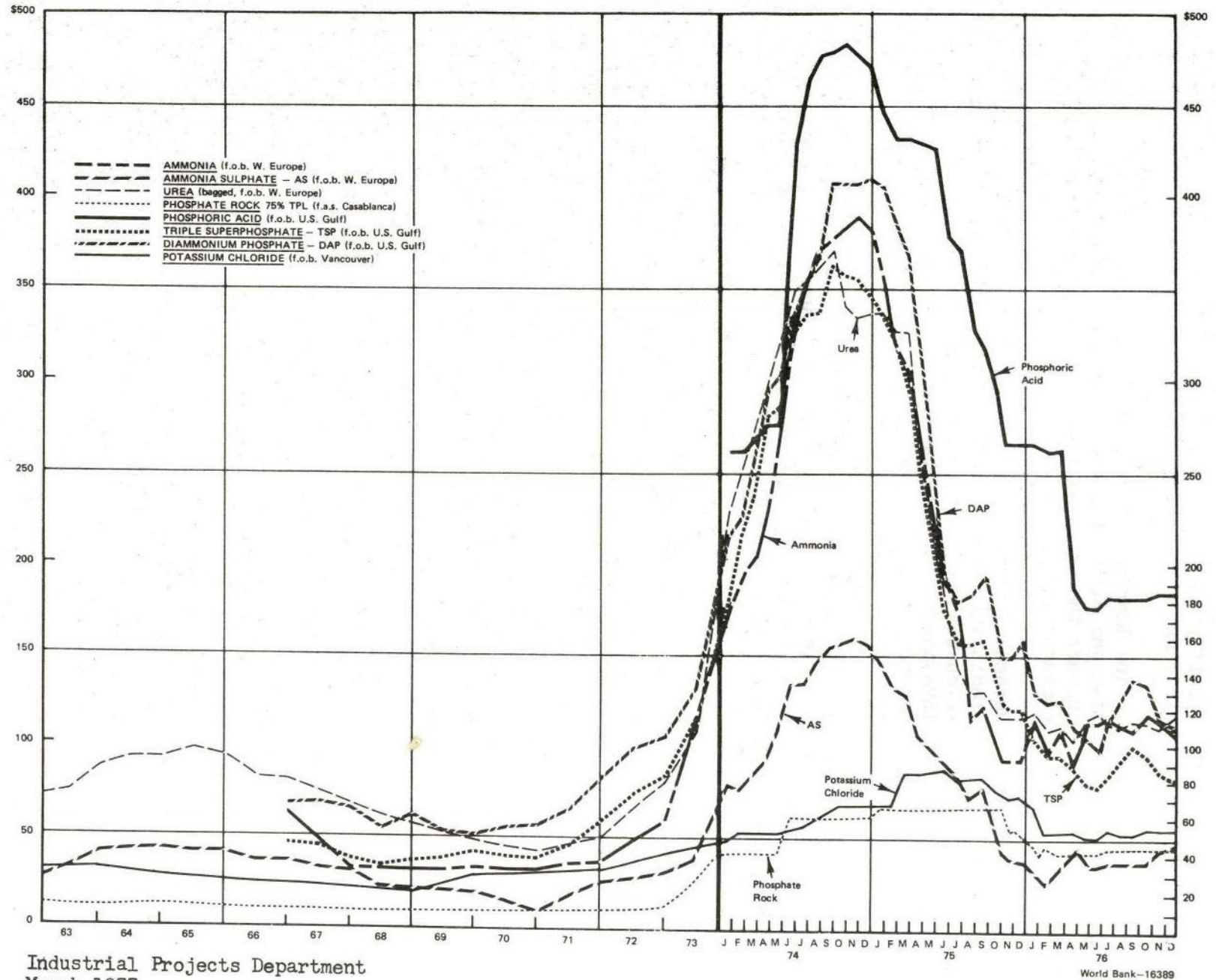
**EXPORT PRICE INDICATIONS FOR SELECTED FERTILIZER MATERIALS**
**(US $ PER TON OF PRODUCT)**

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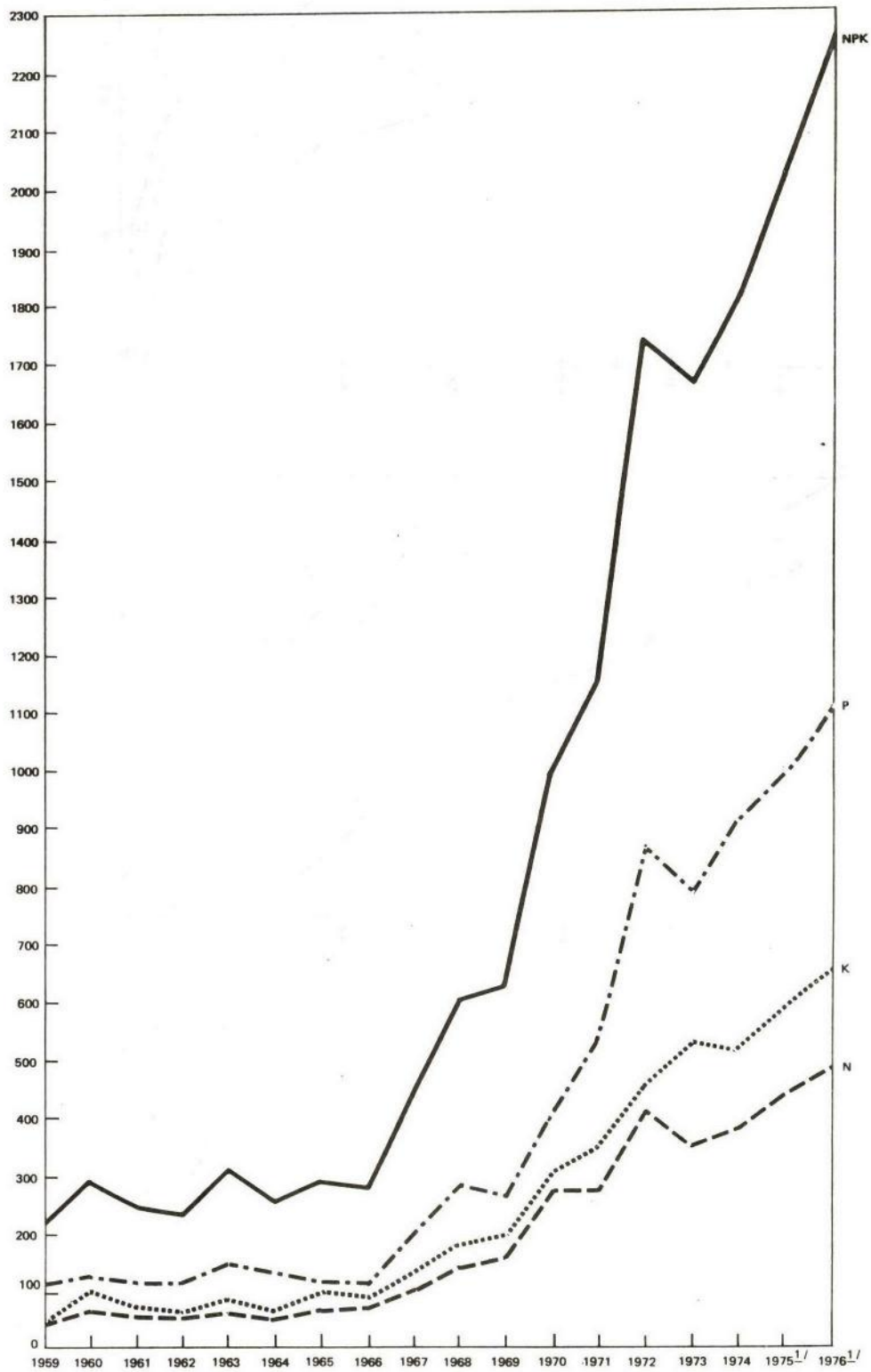
ANNEX 3-2
Chart I

**BRAZIL – SERGIPE FERTILIZER PROJECT**
**APPARENT FERTILIZER CONSUMPTION IN BRAZIL**
**(1,000 nutrient tons)**




1/Estimated by ANDA

Source: SINDICATO DAS INDUSTRIAS DE ADUBOS E COLAS DO ESTADO DE SAO PAULO

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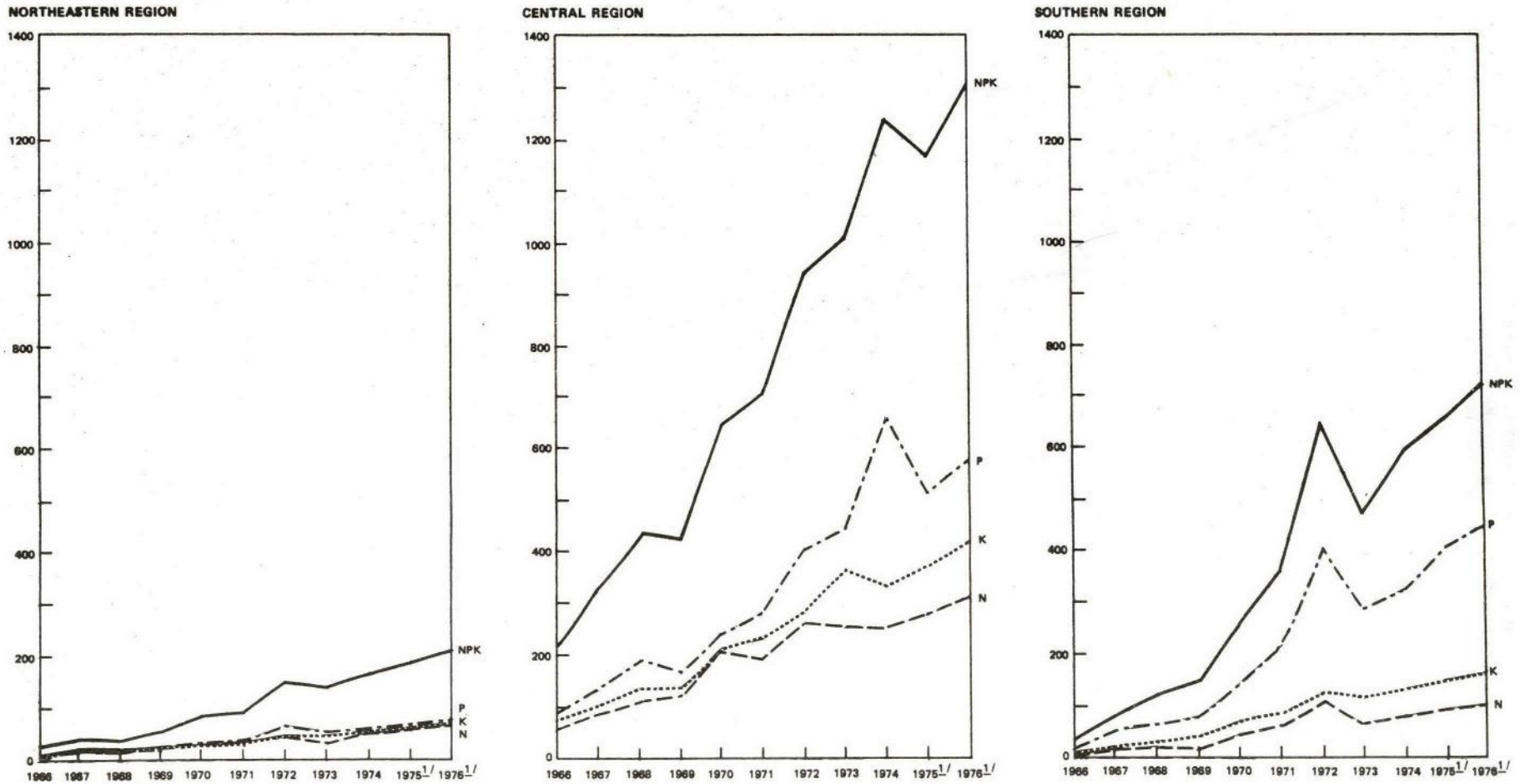
World Bank–16425

BRAZIL – SERGIPE FERTILIZER PROJECT
APPARENT REGIONAL FERTILIZER CONSUMPTION IN BRAZIL
(1,000 nutrient tons)




1/Estimated by ANDA

Source: SINDICATO DAS INDUSTRIAS DE ADUBOS E COLAS DO ESTADO DE SAO PAULO

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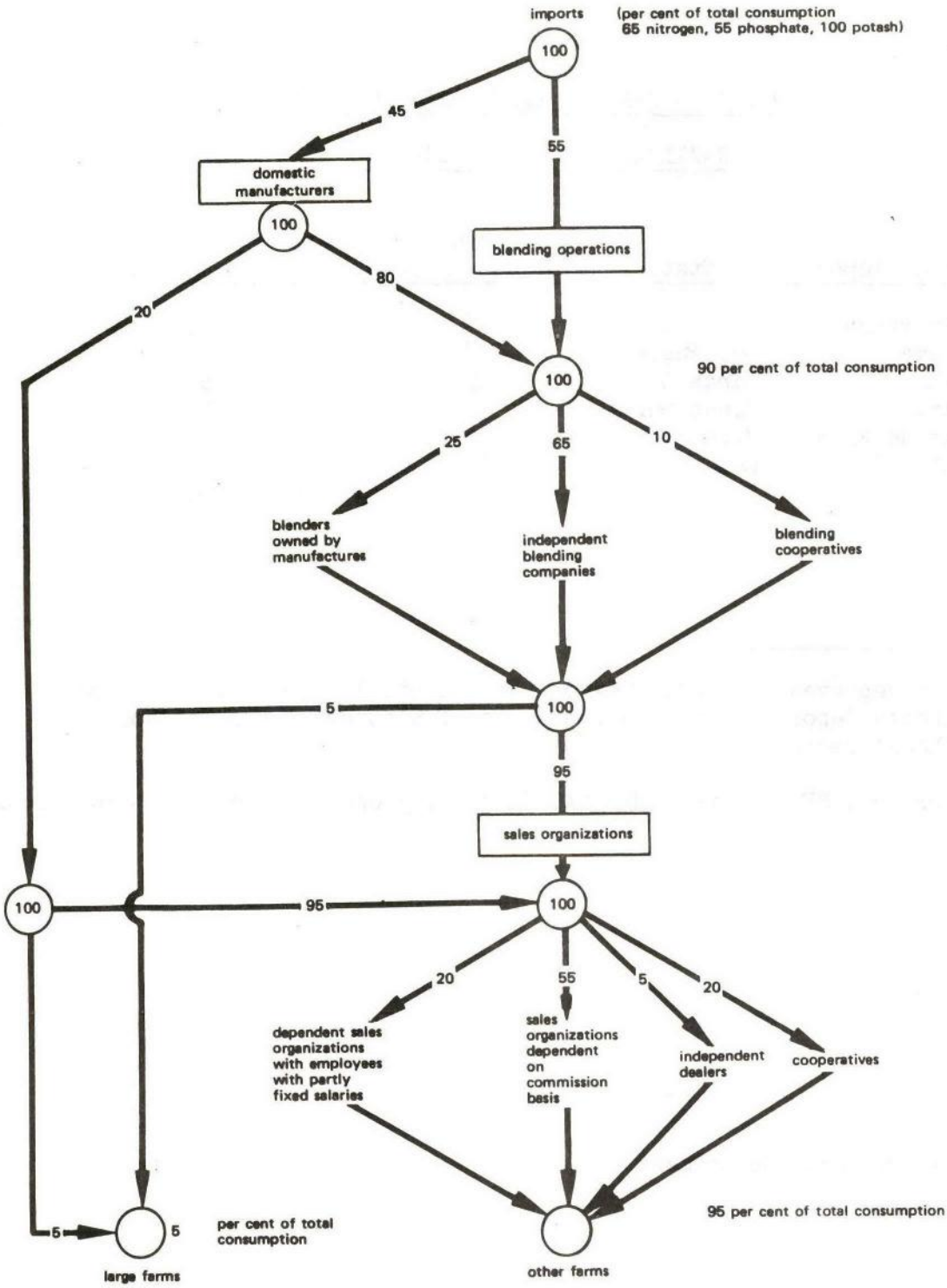
ANNEX 3-2
Chart III

# BRAZIL – SERGIPE FERTILIZER PROJECT
# STRUCTURE OF THE BRAZILIAN FERTILIZER MARKETING SYSTEM




Source: National Fertilizer Study

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## BRAZIL - SERGIPE FERTILIZER PROJECT

## BRAZILIAN PHOSPHATE DEPOSITS

| | Name of Deposit | State | Average Ore Grade (% $P_2O_5$) | Potential Reserves[1] (Million tons $P_2O_5$) |
|---|---|---|---|---|
| 1. | Jacupiranga | Sao Paulo | 5 | 35 |
| 2. | Ipanema | Sao Paulo | 7 | 15 |
| 3. | Araxa | Minas Gerais | 15 | 50 |
| 4. | Tapira | Minas Gerais | 8 | 60 |
| 5. | Patos de Minas | Minas Gerais | 16 | 120 |
| 6. | Catalao[2] | Goias | 12 | 65 |
| | | | Total | 345 |

---

1/ Proven reserves are about 50% of the potential reserves. Other small phosphate deposits exist in Juqia (Sao Paulo) and the North and Northeast regions.

2/ Two groups, METAGO and MINERACAO CATALAO, propose to develop this deposit.

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## POTENTIAL AGRICULTURAL AREAS

1. Brazil's total area — 8,511,965 km$^3$ (8.5 x 10$^8$ ha)

2. Used area — 37 - 40,000,000 ha (4 - 5% of the Brazil area)

3. Total potential agricultural soil — 413,000,000 ha

4. Potential agricultural soil that could be used — (40 - 60%)

   a) Maximum — 250,000,000 ha
   b) Medium — 210,000,000 ha
   c) Minimum — 165,000,000 ha

5. The medium potential (4.b) represents 25% of the Brazil area.

6. Potential area related to existing agriculture area

| Region | Existing (A) | | Potential (B)1/ | | (A/B) x 100 |
|---|---|---|---|---|---|
| | (1,000 ha) | (% total) | (1,000 ha) | (% total) | |
| | 1972 | | | | |
| North | 876 | 2.4 | 110,205 | 53.3 | 0.8 |
| Northeast | 10,939 | 29.5 | 20,307 | 9.8 | 53.9 |
| West | 2,904 | 7.8 | 42,605 | 20.6 | 6.8 |
| Southeast | 9,863 | 26.6 | 15,740 | 7.7 | 62.7 |
| South | 12,517 | 33.7 | 17,755 | 8.6 | 70.5 |
| Total | 37,099 | 100.0 | 206,612 | 100.0 | |

1/ Useful area.

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BRAZIL - SERGIPE FERTILIZER PROJECT

PERCENTAGE OF CULTIVATED AREA DEFICIENT IN PHOSPHORUS AND POTASSIUM

%

| State | PHOSPHORUS | | | POTASSIUM | | |
|---|---|---|---|---|---|---|
| | Low | Medium | High | Low | Medium | High |
| Ceara | 57 | 43 | | 12 | 88 | |
| Rio Grande do Norte | 56 | 44 | | 28 | 72 | |
| Paraiba | 47 | 53 | | 18 | 82 | |
| Pernambuco | 63 | 37 | | 37 | 63 | |
| Alagoas | 73 | 27 | | 37 | 63 | |
| Sergipe | 92 | 8 | | 52 | 48 | |
| Bahia | 84 | 16 | | 38 | 62 | |
| Mato Grosso | 85 | 15 | | 53 | 47 | |
| Goias | 88 | 12 | | 44 | 56 | |
| Minas Gerais | 84 | 16 | | 49 | 51 | |
| Espirito Santo | 80 | 20 | | 30 | 70 | |
| Rio de Janeiro | 82 | 18 | | 30 | 70 | |
| Sao Paulo | 90 | 10 | | 3 | 97 | |
| Parana | 80 | 20 | | 22 | 78 | |
| Santa Catarina | 70 | 30 | | 5 | 95 | |
| Rio Grando do Sul | 95 | 5 | | 5 | 95 | |
| Average Value | 77 | 23 | | 29 | 71 | |

Source: Estudo Nacional de Fertilizantes - 1972.

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## RECOMMENDED FERTILIZER APPLICATION RATES
(kg/ha)

| Crops | Region | N | $P_2O_5$ | $K_2O$ | NPK |
|---|---|---|---|---|---|
| Cotton | North-East | 20 | 28 | 18 | 66 |
| | South-East | 53 | 83 | 32 | 168 |
| | South | 50 | 77 | 37 | 164 |
| Rice | North-East | 6 | 7 | 5 | 18 |
| | South-East | 35 | 55 | 34 | 124 |
| | South | 115 | 284 | 114 | 513 |
| | Central-West | 38 | 56 | 39 | 133 |
| Potatoes | South | 94 | 204 | 68 | 366 |
| Cacao | North-East | 60 | 86 | 46 | 170 |
| Coffee | South | 194 | 42 | 87 | 323 |
| | South-East | 168 | 38 | 78 | 284 |
| Sugarcane | North-East | 100 | 141 | 118 | 359 |
| | South-East | 46 | 96 | 64 | 206 |
| | South | 77 | 147 | 63 | 287 |
| Corn | North-East | 27 | 27 | 20 | 74 |
| | South-East | 72 | 71 | 32 | 175 |
| | South | 72 | 114 | 41 | 227 |
| Wheat | South | 50 | 131 | 40 | 221 |
| Soybeans | South-East | - | 65 | 18 | 83 |
| | South | 7 | 118 | 37 | 162 |
| Tomato | North-East | 110 | 137 | 98 | 345 |
| | South-East | 390 | 1,000 | 230 | 1,620 |

Source: Tecnologia Moderna Para a Agricultura Vo. II
Brasilia 1975

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## BRAZIL - SERGIPE FERTILIZER PROJECT

## SEASONAL DISTRIBUTION (%) OF FERTILIZER CONSUMPTION

%

| Month | North and Northeast | West | Southeast | South | Brasil |
|---|---|---|---|---|---|
| Jan/Feb | 20 | 2 | 8 | 14 | 11 |
| Mar/Apr | 17 | - | 7 | 15 | 11 |
| May/Jun | 17 | 3 | 10 | 20 | 15 |
| Jul/Aug | 17 | 8 | 33 | 23 | 26 |
| Sep/Oct | 20 | 74 | 36 | 22 | 30 |
| Nov/Dec | 9 | 12 | 6 | 6 | 7 |

Source: Estudo Nacional de Fertilizantes - 1972.
Southeast and West form the Central Area.

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## RURAL AND FERTILIZER CREDIT
(billion current Cr$)

| | 1971 | 1972 | 1973 | 1974 | 1975 |
|---|---|---|---|---|---|
| **Total Rural Credit:** | | | | | |
| North/Northeast | 1.81 | 2.58 | 3.88 | 6.08 | 12.61 |
| Center[1] | 6.86 | 9.65 | 10.50 | 24.75 | 43.01 |
| South | 4.20 | 6.44 | 15.95 | 17.44 | 34.38 |
| Total | 12.87 | 18.67 | 30.33 | 48.27 | 90.00 |
| **Fertilizer Credit:** | | | | | |
| North/Northeast | 0.06 | 0.15 | 0.23 | 0.52 | N.A. |
| Center[1] | 0.57 | 0.87 | 1.55 | 4.16 | N.A. |
| South | 0.31 | 0.55 | 0.76 | 2.12 | N.A. |
| Total | 0.94 | 1.57 | 2.54 | 6.80 | 10.28 |
| **% Share of Fertilizer Credit of Total Rural Credit:** | | | | | |
| North/Northeast | 3.3 | 5.8 | 5.9 | 8.5 | N.A. |
| Center[1] | 12.1 | 9.0 | 14.7 | 16.8 | N.A. |
| South | 7.3 | 8.5 | 4.7 | 12.1 | N.A. |
| Total | 7.3 | 8.5 | 8.3 | 14.0 | 11.4 |
| **Regional Distribution of Fertilizer Credit:** | | | | | |
| North/Northeast | 6.4 | 9.5 | 9.0 | 7.6 | N.A. |
| Center[1] | 60.6 | 55.5 | 61.0 | 61.1 | N.A. |
| South | 33.0 | 35.0 | 30.0 | 31.3 | N.A. |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

1/ Center excludes Parana which is included in South and which accounts for about 15% of total agricultural credit.

Source: Banco do Brazil.

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BRAZIL - SERGIPE FERTILIZER PROJECT

CULTIVATED AREA AND PRODUCTION OF MAJOR CROPS - 1973

| Culture | NORTHEAST | | CENTRAL | | SOUTH | | BRAZIL | |
|---|---|---|---|---|---|---|---|---|
| | $10^3$ ha | $10^3$ t | $10^3$ ha | $10^3$ t | $10^3$ ha | $10^3$ t | $10^3$ ha | $10^3$ t |
| Banana[1/] | 102 | 161 | 193 | 165 | 21 | 31 | 316 | 357 |
| Black Bean | 1,697 | 883 | 1,770 | 1,077 | 347 | 269 | 3,814 | 2,229 |
| Cacao | 387 | 189 | 29 | 7 | - | - | 416 | 196 |
| Cassava | 1,178 | 13,355 | 490 | 7,676 | 435 | 5,526 | 2,103 | 26,557 |
| Castor | 327 | 236 | 199 | 212 | - | - | 496 | 448 |
| Coffee | 71 | 41 | 2,008 | 1,704 | 1 | 1 | 2,080 | 1,746 |
| Corn | 2,264 | 1,573 | 5,337 | 8,875 | 2,307 | 3,661 | 9,908 | 14,109 |
| Cotton (arboreous) | 2,347 | 549 | - | - | - | - | 2,347 | 549 |
| Cotton (herbaceous) | 854 | 336 | 1,178 | 1,372 | - | - | 2,032 | 1,708 |
| Grape | - | - | 16 | 109 | 40 | 285 | 56 | 394 |
| Onion | 6 | 43 | 19 | 100 | 24 | 162 | 49 | 305 |
| Orange[2/] | 25 | 1,565 | 402 | 21,536 | 21 | 1,545 | 448 | 26,646 |
| Peanut | 10 | 11 | 484 | 566 | 12 | 13 | 506 | 590 |
| Potato | 80 | 493 | 145 | 1,357 | 141 | 1,299 | 346 | 3,149 |
| Rice[3/] | 974 | 1,259 | 3,297 | 4,252 | 523 | 1,655 | 4,794 | 7,166 |
| Soybean | - | - | 1,188 | 1,886 | 2,427 | 3,126 | 3,615 | 5,012 |
| Sugarcane | 829 | 37,610 | 1,065 | 52,355 | 65 | 1,913 | 1,959 | 91,878 |
| Tobacco | 90 | 66 | 37 | 38 | 107 | 130 | 234 | 234 |
| Tomato | 14 | 232 | 26 | 533 | 3 | 44 | 43 | 809 |
| Wheat | - | - | 394 | 433 | 1,445 | 1,599 | 1,839 | 2,032 |

1/ Expressed in "1,000 bunchs."

2/ Expressed in "1,000 fanits."

3/ Including Hulls.

Source: Anuario Estatistico do Brasil - 1973.

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ANNEX 3-2
Table 7

BRAZIL - SERGIPE FERTILIZER PROJECT

PRICE INDEX OF SELECTED AGRICULTURAL PRODUCTS

| | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|---|---|---|---|
| General Price Index 1966 = 100 | 100 | 128 | 159 | 193 | 231 | 278 | 325 | 374 | 481 |
| Agricultural Products | | | | FARM PRICE INDEX IN REAL TERMS, 1966 = 100. | | | | | |
| Coffee | 100 | 86 | 102 | 126 | 188 | 166 | 181 | 255 | 262 |
| Cacao | 100 | 91 | 136 | 174 | 116 | 82 | 105 | 197 | 234 |
| Cassava | 100 | 125 | 123 | 122 | 143 | 179 | 181 | 185 | 197 |
| Cotton | 100 | 93 | 104 | 93 | 102 | 124 | 118 | 138 | 169 |
| Orange | 100 | 106 | 109 | 125 | 132 | 146 | 145 | 152 | 152 |
| Corn | 100 | 102 | 87 | 99 | 100 | 104 | 118 | 136 | 138 |
| Peanut | 100 | 88 | 96 | 96 | 90 | 102 | 93 | 153 | 132 |
| Banana | 100 | 102 | 93 | 91 | 88 | 96 | 95 | 122 | 131 |
| Tobacco | 100 | 98 | 115 | 117 | 106 | 97 | 126 | 142 | 130 |
| Black Beans | 100 | 65 | 59 | 100 | 106 | 93 | 83 | 181 | 129 |
| Rice | 100 | 101 | 94 | 82 | 74 | 99 | 106 | 99 | 122 |
| Sugar Cane | 100 | 88 | 95 | 98 | 96 | 92 | 93 | 96 | 105 |
| Wheat | 100 | 94 | 90 | 90 | 87 | 78 | 74 | 76 | 93 |
| Potato | 100 | 52 | 38 | 67 | 54 | 45 | 58 | 105 | 80 |
| Fertilizer Price Index (real terms) | 100 | 79 | 77 | 75 | 68 | 72 | 76 | 85 | 158 |

Source: FUNDACAO GETULIO VARGAS

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ANNEX 3-2
Table 8

# BRAZIL - SERGIPE FERTILIZER PROJECT

## APPARENT FERTILIZER CONSUMPTION IN BRAZIL
(1,000 nutrient tons)

| Year | N | $P_2O_5$ | $K_2O$ | Total | % Change | N : P : K |
|---|---|---|---|---|---|---|
| 1959 | 45 | 119 | 57 | 221 | - | 1.0:2.6:1.3 |
| 1960 | 65 | 128 | 106 | 299 | 35 | 1.0:2.0:1.6 |
| 1961 | 57 | 118 | 73 | 248 | -17 | 1.0:2.1:1.3 |
| 1962 | 51 | 118 | 68 | 237 | - 4 | 1.0:2.3:1.3 |
| 1963 | 65 | 157 | 92 | 314 | 32 | 1.0:2.4:1.4 |
| 1964 | 51 | 134 | 70 | 255 | 19 | 1.0:2.6:1.4 |
| 1965 | 70 | 120 | 100 | 290 | 14 | 1.0:1.7:1.4 |
| 1966 | 71 | 117 | 93 | 281 | - 3 | 1.0:1.6:1.3 |
| 1967 | 106 | 205 | 137 | 448 | 59 | 1.0:1.9:1.3 |
| 1968 | 144 | 273 | 184 | 601 | 34 | 1.0:1.9:1.3 |
| 1969 | 164 | 266 | 200 | 630 | 5 | 1.0:1.6:1.2 |
| 1970 | 276 | 416 | 307 | 999 | 59 | 1.0:1.5:1.1 |
| 1971 | 278 | 536 | 351 | 1,165 | 17 | 1.0:1.9:1.3 |
| 1972 | 412 | 875 | 460 | 1,747 | 50 | 1.0:2.1:1.1 |
| 1973 | 355 | 790 | 534 | 1,679 | - 4 | 1.0:2.2:1.5 |
| 1974 | 389 | 914 | 521 | 1,824 | 9 | 1.0:2.3:1.3 |
| 1975 1/ | 436 | 1,014 | 507 | 1,957 | 7 | 1.0:2.3:1.2 |
| 1976 1/ | 484 | 1,145 | 654 | 2,283 | 17 | 1.0:2.4:1.4 |

1/ Estimated by ANDA.

Source: Sindicato das Industrias de Adubos e Colas do Estado de Sao Paulo.

Average Growth Rates (%)

| Period | N | $P_2O_5$ | $K_2O$ | Total |
|---|---|---|---|---|
| 1960-65 | 1.6 | - 1.1 | - 1.1 | - 1.0 |
| 1965-70 | 31.5 | 28.2 | 25.2 | 28.0 |
| 1970-75 | 9.7 | 19.1 | 13.7 | 15.1 |
| 1959-76 | 14.5 | 14.0 | 15.4 | 14.6 |

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## APPARENT REGIONAL FERTILIZER CONSUMPTION IN BRAZIL
(1,000 nutrient tons)

### Northeastern Region

| Year | N | $P_2O_5$ | $K_2O$ | Total | % Change | N : P : K |
|---|---|---|---|---|---|---|
| 1966 | 7.6 | 11.3 | 9.2 | 28.1 | - | 1.0:1.5:1.2 |
| 1967 | 10.7 | 12.8 | 17.0 | 40.5 | 44 | 1.0:1.2:1.6 |
| 1968 | 12.4 | 13.7 | 12.3 | 38.4 | - 5 | 1.0:1.1:1.0 |
| 1969 | 16.4 | 17.4 | 18.6 | 52.4 | 36 | 1.0:1.1:1.1 |
| 1970 | 28.1 | 31.6 | 29.4 | 89.1 | 70 | 1.0:1.1:1.0 |
| 1971 | 26.0 | 35.1 | 33.9 | 95.0 | 7 | 1.0:1.4:1.3 |
| 1972 | 42.7 | 63.4 | 45.4 | 151.5 | 59 | 1.0:1.5:1.1 |
| 1973 | 36.7 | 55.1 | 48.4 | 140.2 | - 6 | 1.0:1.5:1.3 |
| 1974 | 52.8 | 62.9 | 54.0 | 169.7 | 21 | 1.0:1.2:1.0 |
| 1975 1/ | 60.7 | 72.3 | 60.5 | 193.5 | 14 | 1.0:1.2:1.0 |
| 1976 1/ | 66.2 | 83.2 | 67.8 | 217.2 | 12 | 1.0:1.2:1.0 |

### Central Region

| | | | | | | |
|---|---|---|---|---|---|---|
| 1966 | 56.3 | 86.1 | 73.0 | 215.4 | - | 1.0:1.5.1.3 |
| 1967 | 82.5 | 137.2 | 102.3 | 322.0 | 50 | 1.0:1.7:1.2 |
| 1968 | 110.9 | 190.3 | 138.7 | 439.9 | 36 | 1.0:1.7:1.3 |
| 1969 | 120.8 | 167.4 | 138.5 | 426.7 | - 3 | 1.0:1.4:1.1 |
| 1970 | 202.4 | 240.2 | 204.6 | 647.2 | 52 | 1.0:1.2:1.0 |
| 1971 | 190.8 | 284.3 | 234.0 | 709.1 | 10 | 1.0:1.5:1.2 |
| 1972 | 259.0 | 405.3 | 283.9 | 948.2 | 34 | 1.0:1.6:1.1 |
| 1973 | 250.3 | 445.9 | 366.4 | 1,062.6 | 12 | 1.0:1.8:1.5 |
| 1974 | 250.3 | 662.3 | 332.7 | 1,245.3 | 17 | 1.0:2.6:1.3 |
| 1975 1/ | 280.4 | 531.5 | 304.8 | 1,116.7 | -10 | 1.0:1.9:1.1 |
| 1976 1/ | 314.0 | 611.2 | 418.9 | 1,344.1 | 28 | 1.0:1.9:1.3 |

### Southern Region

| | | | | | | |
|---|---|---|---|---|---|---|
| 1966 | 7.2 | 19.2 | 11.1 | 37.5 | - | 1.0:2.7:1.5 |
| 1967 | 13.2 | 54.6 | 17.6 | 85.4 | 127 | 1.0:4.1:1.3 |
| 1968 | 21.0 | 69.0 | 33.3 | 123.3 | 45 | 1.0:3.3:1.6 |
| 1969 | 27.2 | 80.8 | 43.1 | 151.1 | 23 | 1.0:3.0:1.6 |
| 1970 | 45.5 | 144.0 | 72.7 | 262.2 | 74 | 1.0:3.2:1.6 |
| 1971 | 61.5 | 216.4 | 83.0 | 360.9 | 37 | 1.0:3.5:1.3 |
| 1972 | 109.9 | 406.3 | 130.7 | 646.9 | 79 | 1.0:3.7:1.2 |
| 1973 | 68.3 | 289.3 | 118.7 | 476.3 | -36 | 1.0:4.2:1.7 |
| 1974 | 86.1 | 327.7 | 134.6 | 548.4 | 15 | 1.0:3.8:1.6 |
| 1975 1/ | 94.7 | 410.0 | 142.1 | 646.8 | 18 | 1.0:4.3:1.5 |
| 1976 1/ | 104.1 | 451.0 | 166.6 | 721.7 | 12 | 1.0:4.3:1.6 |

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1/ Estimated by ANDA.

Source: Sindicato das Industrias de Adubos e Colas do Estado de Sao Paulo.

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BRAZIL - SERGIPE FERTILIZER PROJECT

FERTILIZER CONSUMPTION AVERAGE ANNUAL GROWTH RATES
(%)

| Period & Region | N | $P_2O_5$ | $K_2O$ | Total |
|---|---|---|---|---|
| Northeast | | | | |
| 1966-1970 | 40.6 | 29.2 | 33.6 | 33.4 |
| 1970-1975 | 16.0 | 17.3 | 15.1 | 16.3 |
| 1966-1976 | 24.2 | 21.4 | 22.1 | 22.4 |
| Center | | | | |
| 1966-1970 | 37.6 | 29.2 | 29.4 | 31.6 |
| 1970-1975 | 6.7 | 16.5 | 12.7 | 12.6 |
| 1966-1976 | 18.7 | 21.0 | 19.1 | 19.7 |
| South | | | | |
| 1966-1970 | 58.5 | 65.5 | 59.5 | 62.5 |
| 1970-1975 | 16.5 | 23.2 | 15.6 | 20.3 |
| 1966-1976 | 31.0 | 37.0 | 31.3 | 34.4 |

Source: Sindicato das Industrias de Adubos e Colas do Estado de Sao Paulo.

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## SHARE OF NUTRIENT CONSUMPTION BY REGION
(in %)

| Year | N | $P_2O_5$ | $K_2O$ | Total |
|---|---|---|---|---|
| Northeast | | | | |
| 1966 | 11 | 10 | 10 | 10 |
| 1967 | 10 | 6 | 12 | 9 |
| 1968 | 9 | 5 | 7 | 6 |
| 1969 | 10 | 7 | 9 | 8 |
| 1970 | 10 | 8 | 10 | 9 |
| 1971 | 9 | 7 | 10 | 8 |
| 1972 | 10 | 7 | 10 | 9 |
| 1973 | 10 | 7 | 9 | 8 |
| 1974 | 14 | 7 | 10 | 9 |
| 1975 | 14 | 7 | 12 | 9 |
| 1976 | 14 | 7 | 10 | 10 |
| Average last 5 years | 12 | 7 | 10 | 9 |
| Center | | | | |
| 1966 | 79 | 74 | 78 | 77 |
| 1967 | 78 | 67 | 75 | 72 |
| 1968 | 77 | 70 | 75 | 73 |
| 1969 | 74 | 63 | 69 | 68 |
| 1970 | 73 | 58 | 67 | 65 |
| 1971 | 69 | 53 | 67 | 61 |
| 1972 | 63 | 46 | 62 | 54 |
| 1973 | 71 | 56 | 69 | 63 |
| 1974 | 64 | 72 | 64 | 69 |
| 1975 | 64 | 52 | 60 | 57 |
| 1976 | 65 | 53 | 64 | 59 |
| Average last 5 years | 65 | 54 | 64 | 60 |
| South | | | | |
| 1966 | 10 | 16 | 12 | 13 |
| 1967 | 12 | 27 | 13 | 19 |
| 1968 | 14 | 25 | 18 | 21 |
| 1969 | 16 | 30 | 22 | 26 |
| 1970 | 17 | 36 | 23 | 26 |
| 1971 | 22 | 40 | 23 | 31 |
| 1972 | 27 | 47 | 28 | 37 |
| 1973 | 19 | 37 | 22 | 29 |
| 1974 | 22 | 21 | 26 | 22 |
| 1975 | 22 | 41 | 28 | 33 |
| 1976 | 21 | 40 | 26 | 31 |
| Average last 5 years | 23 | 39 | 26 | 31 |

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## STRUCTURE OF FERTILIZER CONSUMPTION
(Percent)

| Product | Year 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|
| NITROGEN | | | | | |
| Ammonium Sulphate | 52 | 38 | 35 | 33 | 31 |
| Urea | 22 | 16 | 25 | 20 | 18 |
| Ammonium Nitrate | 2 | 11 | 6 | 13 | 14 |
| Nitrochalk | 2 | 6 | 4 | 7 | 6 |
| Ammonium Phosphate | 19 | 26 | 29 | 24 | 26 |
| Other | 3 | 3 | 1 | 3 | 5 |
| | 100 | 100 | 100 | 100 | 100 |
| PHOSPHATE | | | | | |
| Single Superphosphate | 37 | 34 | 23 | 28 | 27 |
| Triple Superphosphate | 24 | 26 | 35 | 39 | 33 |
| Ammonium Phosphates | 37 | 38 | 36 | 30 | 35 |
| Other | 2 | 2 | 6 | 3 | 5 |
| | 100 | 100 | 100 | 100 | 100 |
| POTASH | | | | | |
| Muriate of Potash | 96 | 98 | 98 | 95 | 96 |
| Potassium Sulphate | 3 | 1 | 1 | 2 | 2 |
| Other | 1 | 1 | 1 | 3 | 2 |
| | 100 | 100 | 100 | 100 | 100 |

Source: Sindicato das Industrias de Adubos e Colas do Estado de Sao Paulo.

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ANNEX 3-2
Table 14

## BRAZIL - SERGIPE FERTILIZER PROJECT

### FERTILIZER IMPORTS
(1,000 t of nutrient)

| | N | $P_2O_5$ | $K_2O$ | Total | Imports as % of Total Consumption |
|---|---|---|---|---|---|
| 1960 | 51 | 32 | 106 | 189 | 63 |
| 1961 | 43 | 30 | 73 | 146 | 59 |
| 1962 | 38 | 26 | 68 | 132 | 58 |
| 1963 | 52 | 38 | 92 | 182 | 58 |
| 1964 | 44 | 27 | 70 | 141 | 55 |
| 1965 | 56 | 26 | 100 | 182 | 63 |
| 1966 | 65 | 28 | 93 | 186 | 66 |
| 1967 | 98 | 74 | 137 | 309 | 69 |
| 1968 | 135 | 105 | 184 | 424 | 70 |
| 1969 | 158 | 138 | 200 | 496 | 79 |
| 1970 | 256 | 247 | 307 | 810 | 81 |
| 1971 | 209 | 292 | 351 | 852 | 73 |
| 1972 | 323 | 586 | 460 | 1,369 | 78 |
| 1973 | 241 | 472 | 534 | 1,247 | 74 |
| 1974 | 239 | 527 | 521 | 1,287 | 71 |
| 1975 | 274 | 497 | 507 | 1,278 | 65 |

Source: Sindicato das Industrias de Adubos e Colas do Estado de Sao Paulo

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BRAZIL - SERGIPE FERTILIZER PROJECT

MONTHLY IMPORTS OF FERTILIZERS IN 1974
(Percent)

| Month | Nitrogen | Phosphate | Potash | Total |
|---|---|---|---|---|
| January | 11.9 | 9.1 | 4.1 | 7.4 |
| February | 5.6 | 7.6 | 6.0 | 6.5 |
| March | 8.1 | 5.9 | 6.5 | 6.6 |
| April | 8.0 | 4.0 | 6.7 | 6.0 |
| May | 11.6 | 18.2 | 8.4 | 12.5 |
| June | 8.5 | 5.1 | 8.0 | 7.1 |
| July | 8.8 | 11.4 | 15.7 | 12.8 |
| August | 10.1 | 13.7 | 16.3 | 14.1 |
| September | 6.7 | 5.2 | 7.4 | 6.5 |
| October | 7.6 | 2.3 | 5.1 | 4.6 |
| November | 2.6 | 0.2 | 7.7 | 4.0 |
| December | 10.5 | 17.3 | 8.1 | 11.9 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Sindicato das Industrias de Adubos e Colas do Estado de Sao Paulo

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## DOMESTIC PRODUCTION OF FERTILIZERS

| Year | NITROGEN | | PHOSPHATE[1] | | TOTAL (N+P+K) | |
|---|---|---|---|---|---|---|
| | 1,000 t | Percent of Consumption | 1,000 t | Percent of Consumption | 1,000 t | Percent of Consumption[2] |
| 1960 | 14 | 21 | 42 | 56 | 56 | 23 |
| 1961 | 14 | 24 | 45 | 59 | 59 | 29 |
| 1962 | 13 | 26 | 52 | 68 | 65 | 33 |
| 1963 | 13 | 20 | 67 | 64 | 80 | 31 |
| 1964 | 7 | 14 | 70 | 73 | 77 | 36 |
| 1965 | 14 | 20 | 61 | 71 | 75 | 29 |
| 1966 | 6 | 9 | 64 | 69 | 70 | 28 |
| 1967 | 8 | 8 | 92 | 56 | 100 | 25 |
| 1968 | 9 | 6 | 109 | 51 | 118 | 22 |
| 1969 | 6 | 4 | 128 | 48 | 134 | 21 |
| 1970 | 20 | 7 | 169 | 41 | 189 | 19 |
| 1971 | 69 | 25 | 244 | 46 | 313 | 27 |
| 1972 | 89 | 22 | 289 | 33 | 378 | 22 |
| 1973 | 114 | 33 | 333 | 42 | 447 | 27 |
| 1974 | 150 | 39 | 387 | 42 | 537 | 29 |
| 1975 | 162 | 35 | 517 | 51 | 679 | 35 |

1/ Only soluble phosphates.

2/ Including $K_2O$ (all imported).

Source: Sindicato das Industrias de Adubos e Colas do Estado de Sao Paulo.

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ANNEX 3-2
Table 17

BRAZIL - SERGIPE FERTILIZER PROJECT

PROJECTED AMMONIA SUPPLY
(Production in 000 tons of N)

| Producer (State) | Capacity 000 TYP N | Status[2] | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985[3] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Existing[1] | | | | | | | | | | | | |
| Fafer (Sao Paulo) | 27 | on-stream | | | | | | | | | | |
| Ultrafertil (Sao Paulo) | 123 | on-stream | | | | | | | | | | |
| Rh dia (Minas Gerais) | 25 | on-stream | | | | | | | | | | |
| Petrofertil I (Bahia)) | 55 | on-stream | | | | | | | | | | |
| Sub-total | 230 | | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 | 210 |
| Proposed/Under Construction[4] | | | | | | | | | | | | |
| Petrofertil II (Bahia) | 247 | 1977 | - | 50 | 180 | 225 | 225 | 225 | 225 | 225 | 225 | 225 |
| Araucaria (Parana) | 329 | 1979 | - | - | - | 160 | 260 | 295 | 295 | 295 | 295 | 295 |
| Sergipe (Sergipe) | 247 | 1981 | - | - | - | - | - | 170 | 200 | 225 | 225 | 225 |
| Norte Fluminense (Rio de Janeiro) | 247 | 1981 | - | - | - | - | - | 100 | 180 | 225 | 225 | 225 |
| Sub-total | 1,070 | | - | 50 | 180 | 385 | 485 | 790 | 900 | 970 | 970 | 970 |
| Total | 1,300 | | 210 | 260 | 390 | 595 | 695 | 1,000 | 1,110 | 1,180 | 1,180 | 1,180 |
| Required for Uses Other Than Fertilizer | | | 50 | 60 | 100 | 110 | 125 | 135 | 150 | 165 | 185 | 200 |
| Supply Available for Fertilizer Use | | | 160 | 200 | 290 | 485 | 570 | 865 | 960 | 1,015 | 995 | 980 |
| of This in | | | | | | | | | | | | |
| Northeast | 549 | | 30 | 70 | 180 | 225 | 225 | 395 | 425 | 450 | 450 | 450 |
| Center | 751 | | 130 | 130 | 110 | 260 | 345 | 470 | 535 | 565 | 545 | 530 |
| South | - | | - | - | - | - | - | - | - | - | - | - |

1/ Existing plants assumed to operate at 90% capacity utilization
2/ Dates are year of initial operation
3/ Omits other plants which could be operating by 1985
4/ Proposed plants assume to operate at 90% capacity utilization in third year of operation

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BRAZIL - SERGIPE FERTILIZER PROJECT

FORECAST OF PHOSPHATE ROCK CAPACITY AND PRODUCTION
(In 1000 tons of $P_2O_5$)

| Region | Annual Capacity | Year Installed | % $P_2O_5$ Content Beneficiated Rock | -Estimate- 1975 | 1976 | Forecast 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I. Phosphate Rock Production | | | | | | | | | | | | | | |
| Center Region[1] | | | | | | | | | | | | | | |
| Jacupiranga (QUIMBRASIL) | 98 | 1969 | 35 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 |
| Araxa (CAMIG)[2] | 40 | 1974 | 28 | 26 | 26 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Catalao (METAGO)[3] | 6 | 1976 | 35 | - | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Patos (FERTILIZANTES)[3] | 43 | 1977 | 26 | - | - | 20 | 39 | 39 | 39 | 39 | 39 | 39 | 39 | 39 |
| Araxa (ARAFERTIL) | 228 | 1977 | 35 | - | - | 57 | 170 | 205 | 205 | 205 | 205 | 205 | 205 | 205 |
| Tapira (VALEP) | 345 | 1978 | 35 | - | - | - | 65 | 259 | 310 | 310 | 310 | 310 | 310 | 310 |
| Ipanema (QUIMBRASIL)[3] | 105 | 1979 | 38 | - | - | - | - | 30 | 70 | 95 | 95 | 95 | 95 | 95 |
| Patos (FERTILIZANTES) | 345 | 1981 | 35 | - | - | - | - | - | - | 75 | 230 | 310 | 310 | 310 |
| Catalao (METAGO) | 220 | 1983 | 35 | - | - | - | - | - | - | - | - | 55 | 165 | 198 |
| Catalao (MINERACAO) | 200 | 1985 | 36 | - | - | - | - | - | - | - | - | - | - | 50 |
| Total | | | | 114 | 119 | 206 | 403 | 662 | 753 | 853 | 1008 | 1143 | 1253 | 1336 |
| II. Phosphate Rock Production As % of Total $P_2O_5$ Demand | | | | | | | | | | | | | | |
| Center Region | | | | 21 | 19 | 30 | 54 | 80 | 83 | 86 | 94 | 98 | 98 | 96 |
| Brazil (All Regions) | | | | 11 | 10 | 16 | 29 | 44 | 45 | 47 | 57 | 53 | 53 | 52 |

1/ Only the Center Region has commercial phosphate deposits to-date.
2/ One-half of the output is for direct application. The production is from an industrial pilot plant.
3/ For direct application.

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ANNEX 3-2
Table 18

BRAZIL - SERGIPE FERTILIZER PROJECT

PHOSPHORIC ACID CAPACITY, PRODUCTION AND DEMAND FORECAST
(In 1000 tons of $P_2O_5$)

| REGION | Annual Capacity | Year Installed | -Estimate- 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | Forecast 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I. PHOSPHORIC ACID PRODUCTION | | | | | | | | | | | | | |
| North/Northeast | | | | | | | | | | | | | |
| None | | | | | | | | | | | | | |
| Center | | | | | | | | | | | | | |
| QUIMBRASIL | 65 | 1969 | 57 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 |
| ULTRAFERTIL | 65 | 1971 | 57 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 |
| COPEGRAS | 90 | 1975 | 44 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| YALEFERTIL | 290 | 1979 | - | - | - | - | 71 | 214 | 257 | 257 | 257 | 257 | 257 |
| ARAFERTIL | 190 | 1981 | - | - | - | - | - | - | 48 | 140 | 171 | 171 | 171 |
| Total | 700 | | 158 | 196 | 196 | 196 | 267 | 410 | 501 | 593 | 624 | 624 | 624 |
| South | | | | | | | | | | | | | |
| LUSCHINGER | 180 | 1980 | - | - | - | - | - | 161 | 161 | 161 | 161 | 161 | 161 |
| ICC | 105 | 1980 | - | - | - | - | - | 44 | 94 | 94 | 94 | 94 | 94 |
| Total | 285 | | - | - | - | - | - | 205 | 255 | 255 | 255 | 255 | 255 |
| All Regions | 985 | | 158 | 196 | 196 | 196 | 267 | 615 | 756 | 848 | 879 | 879 | 879 |
| II. PHOSPHORIC ACID DEMAND 1/ | | | | | | | | | | | | | |
| North/Northeast | | | - | - | - | - | 79 | 91 | 94 | 112 | 122 | 122 | 122 |
| Center | | | 169 | 259 | 301 | 307 | 378 | 437 | 501 | 593 | 644 | 721 | 734 |
| South | | | 79 | 169 | 271 | 316 | 364 | 460 | 510 | 510 | 510 | 510 | 510 |
| Total | | | 248 | 428 | 572 | 623 | 821 | 988 | 1105 | 1215 | 1276 | 1353 | 1366 |
| National Surplus (Deficit) | | | (90) | (232) | (376) | (427) | (554) | (373) | (349) | (367) | (397) | (474) | (487) |
| % Self-Sufficiency (National) | | | 64% | 46% | 34% | 31% | 33% | 62% | 68% | 70% | 69% | 65% | 64% |

1/ Phosphoric acid demand is derived from the production forecasts for TSP (71% of $P_2O_5$ nutrient comes from phosphoric acid); NPK, DAP and MAP (100% of $P_2O_5$ nutrient comes from phosphoric acid); and double superphosphate (0-30-0 with 44% of the $P_2O_5$ coming from phosphoric acid).

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ANNEX 3-2
Table 19

BRAZIL - SERGIPE FERTILIZER PROJECT

FORECAST OF PHOSPHATE FERTILIZER PRODUCTION
(In 1000 tons of $P_2O_5$)

| REGION AND COMPANY | Type of Fertilizer 1/ | Annual Capacity (1,000 tons $P_2O_5$) | Year in Operation | --Estimate-- 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Northeast | | | | | | | | | | | | | | |
| PROFERTIL | SSP | 9 | EXISTING | 6 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | TSP | 72 | 1979 | - | - | - | - | 65 | 65 | 65 | 65 | 65 | 65 | 65 |
| | MAP | 31 | 1982 | - | - | - | - | - | - | - | 18 | 28 | 28 | 28 |
| AGROFERTIL | MAP | 53 | 1979 | - | - | - | - | 33 | 45 | 48 | 48 | 48 | 48 | 48 |
| Total | | 165 | | 6 | 8 | 8 | 8 | 106 | 118 | 121 | 139 | 149 | 149 | 149 |
| Center | | | | | | | | | | | | | | |
| COPEBRAS | MAP | 60 | EXISTING | 26 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| | TSP | 30 | -do- | 18 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 | 28 |
| | S30 | 15 | -do- | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| | SSP | 40 | -do- | 33 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| QUIMBRASIL | MAP | 65 | -do- | 57 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 | 58 |
| | SSP | 35 | -do- | 31 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| ULTRAFERTIL | DAP | 70 | -do- | 57 | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 | 59 |
| INDAG 2/ | TSP | 80 | -do- | 6 | 49 | 73 | 73 | 73 | 28 | - | - | 12 | 65 | 73 |
| | SSP | 53 | -do- | 17 | 32 | 48 | 48 | 48 | 48 | 48 | 35 | 48 | 48 | 48 |
| UNIAO 2/ | TSP | 31 | -do- | - | 6 | 28 | 28 | 28 | 7 | - | - | 4 | 25 | 28 |
| | SSP | 32 | -do- | - | 21 | 29 | 29 | 29 | 29 | 29 | 25 | 29 | 29 | 29 |
| FERTIBASE 2/ | TSP | 24 | -do- | 20 | 22 | 22 | 22 | 22 | - | - | - | 4 | 20 | 22 |
| | SSP | 32 | -do- | 21 | 29 | 29 | 29 | 29 | 29 | 29 | 25 | 29 | 29 | 29 |
| MANAH 2/ | TSP | 15 | -do- | - | 10 | 14 | 14 | 14 | - | - | - | 4 | 12 | 14 |
| | SSP | 35 | -do- | 4 | 16 | 32 | 32 | 32 | 32 | 32 | 30 | 32 | 32 | 32 |
| FERTICAP | SSP | 28 | -do- | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 20 | 25 | 25 | 25 |
| | TSP | 20 | 1977 | - | - | 10 | 18 | 18 | 2 | - | - | 4 | 14 | 18 |
| FOSFANIL | SSP | 21 | EXISTING | 16 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 | 19 |
| MITSUI | THP | 19 | -do- | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 | 17 |
| ELEKEIROZ | SSP | 17 | -do- | 12 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| VALEFERTIL | MAP | 168 | 1979 | - | - | - | - | 42 | 126 | 151 | 151 | 151 | 151 | 151 |
| | TSP | 165 | 1979 | - | - | - | - | 41 | 124 | 148 | 148 | 148 | 148 | 148 |
| ARAFERTIL | MAP | 110 | 1981 | - | - | - | - | - | - | 28 | 82 | 99 | 99 | 99 |
| | TSP | 110 | 1981 | - | - | - | - | - | - | 28 | 82 | 99 | 99 | 99 |
| Others (for direct application) 3/ | Phos. Rock | 160 | - | 13 | 18 | 43 | 62 | 92 | 132 | 157 | 157 | 157 | 157 | 157 |
| TOTAL | | 1435 | | 385 | 555 | 680 | 707 | 820 | 909 | 1002 | 1082 | 1172 | 1280 | 1299 |
| South | | | | | | | | | | | | | | |
| FERTISUL 4/ | DAP | 51 | EXISTING | 22 | 37 | 37 | 46 | 46 | 46 | 46 | 46 | 46 | 46 | 46 |
| | TSP | 103 | EXISTING | 36 | 48 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| | SSP | 11 | -do- | 14 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| | MAP | 48 | 1977 | - | - | 12 | 43 | 43 | 43 | 43 | 43 | 43 | 43 | 43 |
| LUCHSINGER 5/ | NPK | 97 | EXISTING | - | 31 | 72 | 77 | 82 | 87 | 87 | 87 | 87 | 87 | 87 |
| | DAP | 34 | -do- | - | 14 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| | TSP | 61 | -do- | 35 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 | 55 |
| | SSP | 4 | -do- | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | MAP | 48 | 1979 | - | - | - | - | 43 | 43 | 43 | 43 | 43 | 43 | 43 |
| CRA 6/ | TSP | 29 | EXISTING | 9 | 20 | 20 | 20 | 20 | 26 | 26 | 26 | 26 | 26 | 26 |
| | SSP | 5 | -do- | 6 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | MAP | 48 | 1980 | - | - | - | - | - | 43 | 43 | 43 | 43 | 43 | 43 |
| ICC | MAP | 104 | 1980 | - | - | - | - | - | 44 | 94 | 94 | 94 | 94 | 94 |
| Total | | 643 | | 126 | 223 | 337 | 382 | 430 | 528 | 578 | 578 | 578 | 578 | 578 |
| BRAZIL TOTAL | | 2243 | | 517 | 786 | 1025 | 1097 | 1356 | 1555 | 1701 | 1799 | 1899 | 2007 | 2026 |

1/ DAP-diammonium phosphate; MAP - monoammoniom phosphate; TSP - triple superphosphate; S30 - double superphosphate (0-30-0); SSP - single superphosphate; THP - thermophosphate; NPK - complex fertilizers.
2/ The TSP units of these four firms can produce either or both TSP and SSP. The production forecast assumes that the product mix will be adjusted to avoid a surplus of $P_2O_5$ nutrient in the Center region.
3/ See Table 19 for firms and year of installation.
4/ The capacity includes expansions of 50,000 TPY $P_2O_5$ for TSP and 10,000 TPY $P_2O_5$ for DAP by 1977 and 1978 respectively.
5/ The NPK product has an average formula of (6-32-12). The planned phosphoric acid plant (Table 20) is to substitute for imports and will not add to product capacity.
6/ The capacity includes an expansion of 7,000 TPY for TSP by 1980.

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## BRAZIL - SERGIPE FERTILIZER PROJECT

## DEMAND/SUPPLY BALANCE FOR NITROGEN
(1,000 tons of Nutrient)

| | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|---|
| DEMAND | | | | | | | | | | |
| Northeast (14%) | 66 | 75 | 85 | 95 | 110 | 125 | 140 | 155 | 175 | 200 |
| Center (64%) | 314 | 355 | 400 | 460 | 520 | 580 | 650 | 730 | 820 | 900 |
| South (22%) | 108 | 120 | 140 | 155 | 170 | 195 | 210 | 235 | 265 | 300 |
| All Brazil | 488 | 550 | 625 | 710 | 800 | 900 | 1,000 | 1,120 | 1,260 | 1,400 |
| SUPPLY | | | | | | | | | | |
| Northeast | 30 | 70 | 180 | 225 | 225 | 385 | 425 | 450 | 450 | 450 |
| Center | 130 | 130 | 110 | 260 | 345 | 480 | 535 | 565 | 545 | 530 |
| South | - | - | - | - | - | - | - | - | - | - |
| All Brazil | 160 | 200 | 290 | 485 | 570 | 865 | 960 | 1,015 | 995 | 980 |
| SURPLUS (DEFICIT) | | | | | | | | | | |
| Northeast | (36) | (5) | 95 | 130 | 115 | 260 | 285 | 295 | 275 | 250 |
| Center | (184) | (225) | (290) | (200) | (175) | (100) | (115) | (165) | (275) | (370) |
| South | (108) | (120) | (140) | (155) | (170) | (195) | (210) | (235) | (265) | (300) |
| All Brazil | (328) | (350) | (335) | (225) | (230) | (35) | (40) | (105) | (265) | (420) |
| Supply as % Demand | 32.7 | 36.3 | 46.7 | 69.2 | 71.3 | 96.1 | 96.0 | 90.6 | 79.0 | 70.0 |

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BRAZIL - SERGIPE FERTILIZER PROJECT

FORECAST OF PHOSPHATE FERTILIZER DEMAND AND PRODUCTION
(In 1000 tons of $P_2O_5$)

| | - Estimate - | | Forecast | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
| **Demand and Production of Phosphate Products** | | | | | | | | | | | |
| **Demand** | | | | | | | | | | | |
| North/Northeast | 72 | 83 | 88 | 97 | 106 | 118 | 128 | 139 | 152 | 166 | 181 |
| Center | 532 | 611 | 680 | 745 | 821 | 907 | 988 | 1075 | 1172 | 1280 | 1393 |
| South | 410 | 451 | 492 | 538 | 593 | 655 | 714 | 776 | 846 | 924 | 1006 |
| Total | 1014 | 1145 | 1260 | 1380 | 1520 | 1680 | 1830 | 1990 | 2170 | 2370 | 2580 |
| **Production** | | | | | | | | | | | |
| North/Northeast | 6 | 8 | 8 | 8 | 106 | 118 | 121 | 139 | 149 | 149 | 149 |
| Center | 385 | 555 | 680 | 707 | 820 | 909 | 1002 | 1082 | 1172 | 1280 | 1299 |
| South | 126 | 223 | 337 | 382 | 430 | 528 | 578 | 578 | 578 | 578 | 578 |
| Total | 517 | 786 | 1025 | 1097 | 1356 | 1555 | 1701 | 1799 | 1899 | 2007 | 2026 |
| **Production as % of Demand** | | | | | | | | | | | |
| North/Northeast | 8 | 10 | 9 | 8 | 100 | 100 | 94 | 100 | 98 | 90 | 82 |
| Center | 72 | 91 | 100 | 95 | 100 | 100 | 101 | 101 | 100 | 100 | 93 |
| South | 31 | 49 | 68 | 71 | 72 | 81 | 81 | 74 | 68 | 63 | 57 |
| Brazil (all regions) | 51 | 69 | 81 | 79 | 89 | 93 | 93 | 90 | 88 | 85 | 78 |

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ANNEX 3-2
Table 22

BRAZIL - SERGIPE FERTILIZER PROJECT

TRANSPORT DISTANCES AND COSTS, 1974

| | DISTANCE BY ROAD (km) | DISTANCE BY RAIL (km) | FREIGHT BY ROAD (Cr $/ton) 1/ | FREIGHT BY RAIL (Cr $/ton) 2/ | UNIT FREIGHT BY ROAD (Cr $/ton/km) | UNIT FREIGHT BY RAIL (Cr $/ton/km) | DISTANCE RATIO ROAD/RAIL | FREIGHT RATIO ROAD/RAIL | UNIT FREIGHT RATIO ROAD/RAIL |
|---|---|---|---|---|---|---|---|---|---|
| From Sao Paulo to | | | | | | | | | |
| Registro | 184 | - | 35 | - | 0.19 | - | - | - | - |
| Santos | 72 | 78 | 70 | 29 | 0.97 | 0.37 | 0.92 | 2.41 | 2.62 |
| Ourinhos | 364 | 454 | 70 | 83 | 0.19 | 0.18 | 0.80 | 0.84 | 1.06 |
| Bauru | 355 | 396 | 85 | 73 | 0.24 | 0.18 | 0.90 | 1.16 | 1.33 |
| Presidente Prudente | 575 | 740 | 90 | 120 | 0.16 | 0.16 | 0.78 | 0.75 | 1.00 |
| Marilia | 402 | 527 | 75 | 93 | 0.19 | 0.18 | 0.76 | 0.81 | 1.06 |
| Catanduva | 329 | 456 | 75 | 83 | 0.23 | 0.18 | 0.72 | 0.90 | 1.28 |
| Ribeirao Preto | 329 | 401 | 70 | 76 | 0.21 | 0.19 | 0.82 | 0.92 | 1.11 |
| Goiania | 939 | 1,227 | 165 | 173 | 0.18 | 0.14 | 0.77 | 0.95 | 1.29 |
| Campos | 729 | 768 | 150 | 123 | 0.21 | 0.16 | 0.95 | 1.22 | 1.31 |
| Vitoria | 995 | 1,090 | 120 | 158 | 0.12 | 0.14 | 0.91 | 0.76 | 0.86 |
| From Rio Grande to | | | | | | | | | |
| Sao Borja | 730 | 859 | 115 | 94 | 0.16 | 0.11 | 0.85 | 1.22 | 1.45 |
| Santa Maria | 365 | 600 | 115 | 70 | 0.32 | 0.12 | 0.61 | 1.64 | 2.67 |
| Santa Rosa | 651 | 923 | 80 | 90 | 0.12 | 0.10 | 0.71 | 0.89 | 1.20 |
| Cachoeira Do Sul | 409 | 716 | 115 | 82 | 0.28 | 0.11 | 0.57 | 1.40 | 2.55 |
| Baje | 240 | 280 | 100 | 41 | 0.42 | 0.15 | 0.86 | 2.44 | 2.80 |

1/ Represent normal tariffs. Higher tariffs prevail during the peak season, which is three-six months of the year.

2/ Published tariffs. Applied tariffs are often lowered through negotiated contracts.

Source: GEIPOT

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ANNEX 3-2
Table 23

# BRAZIL - SERGIPE FERTILIZER PROJECT

## FERTILIZER MARKET AND MARKETING IN THE NORTHEAST

### A. Fertilizer Use and Agriculture in the Northeast

With a population of about 30 million inhabitants and an average per capita income of less than US$200, the Northeast of Brazil contains the largest concentration of poverty in Latin America. Almost 60% of the population lives in rural areas. Agricultural yields in the region are generally low as the facts of poor ecological conditions--semiarid weather and scarcity of fertile lands--are compounded by problems emerging from concentration of land ownership and associated sharecropping and renting arrangements. Important bottlenecks to agricultural development, such as inadequate research, insufficient technical assistance, poorly developed marketing channels, primitive production techniques, uneconomic allocation of credit, insufficient economic and social infrastructure and weak public institutions have persisted despite considerable concern and efforts to alleviate them.

The Bank in its report, "Rural Development Issues and Options in Northeast Brazil" (June 1975), has analyzed the agricultural sector of the Northeast in detail. The Bank is also conducting an extensive agricultural sector survey together with SUDENE, and some results of this are now available. No attempt is made here to summarize the findings of these and other reports dealing with the Northeast. Instead, this discussion concentrates on the state of agriculture only insofar as the past and future consumption of fertilizer is affected.

Fertilizer consumption in the Northeast is concentrated geographically by being nearly exclusively restricted to the coastal "Zona de Mata" and the "Agreste," the transition zone between the humid coast and the arid center (Map IBRD 12412).

This geographical concentration of fertilizer use is basically explained by the fact that mainly the Zona de Mata along the coast and in a more limited way the Agreste has the climate and the soils which lend themselves to the successful use of fertilizers. The remaining area with the exception of some fertile, relatively high rainfall pockets has a semiarid or arid climate with a high incidence of droughts. To use fertilizers in these areas has a high element of risk, and it has been shown that for most crops the farmer is better off using the traditional farming methods, which do not use fertilizer, and have correspondingly low yields. It appears that a considerable amount of research is required to develop technological packages particularly suited to these areas of the Northeast. Undoubtedly, these packages will have to include intensive use of irrigation which so far is very little used in the Northeast. One area where irrigation is used successfully and where agricultural production and fertilizer use has

increased quite significantly over the last years is along the San Francisco river valley where mostly vegetables, particularly onions, are grown.

From the Bank - SUDENE farm survey of 1973, some more specific insights can be obtained about the geographical distribution of fertilizer users. In terms of the percentage of farms using fertilizer, the following breakdown can be derived by physiographic area:

PERCENTAGE OF FARMS USING FERTILIZER, 1973

| Zone | Zone Description | % |
|---|---|---|
| A | Frontier Maranhao | 0.64 |
| B | Middle Maranhao | 0.02 |
| C | Sertao | 1.34 |
| D | Southeast Bahia | 9.00 |
| E | Zona de Mata (excl. Bahia) | 14.40 |
| F | Zona de Mata (Bahia) & Cacao Area | 34.30 |
| G | Agreste | 9.95 |

From this it can be observed that the level of adoption of fertilizer use is generally low and does even in the Zona de Mata not exceed 35%. As could be expected, adoption levels are highest at the coast and rapidly decrease for the interior. Farms in the Sertao and the interior of Maranhao practically do not use any fertilizer at all.

From the available statistics, it can be seen that adoption of using fertilizer is best correlated to (i) the value of land; (ii) the density of landless labor; (iii) the capital endowment and size of family farms; and (iv) the price of fertilizers. Of these variables, the value of land and the price of fertilizer were found to be by far the most important ones. Since the value of land in turn is highly correlated to population density, adoption of use of fertilizer is therefore largely a function of the population pressure and fertilizer prices.

For the geographical distribution of fertilizer consumption, the following table can be obtained:

ESTIMATED FERTILIZER CONSUMPTION BY ZONE

| Zone | Zone Description | % of Total Consumption |
|---|---|---|
| A & B | Frontier & Middle Maranhao | - |
| C | Sertao | 2% |
| D | Southeast Bahia | 4-5% |
| E & F | Zona de Mata & Cacao Area | 57-70% |
| G | Agreste | 25-35% |

As indicated by the range in the percentages, there is considerable uncertainty about the consumption breakdown for zones E, F and G. But even with this uncertainty, a share of fertilizer consumption of 25% or more for the Agreste indicates that diffusion of fertilizer use is taking place at a rate greater than what is generally believed. From the evidence available, it appears that fertilizer use is not any longer restricted to the coastal strip of the Zona de Mata, but that its use is spreading into the Agreste.

With respect to the cropwise use of fertilizer, a similar diffusion process can be observed. During the 1960s, surveys showed that about 85% of all the fertilizer was used for sugarcane. From the Bank - SUDENE survey of 1973, it appears that only about 50% is used for sugar with other crops receiving more and more of the fertilizer as shown below:

ESTIMATED FERTILIZER CONSUMPTION AND

AVERAGE APPLICATION RATES BY CROP

| Crop | % of Consumption | Average Application Rate (kg/ha) |
|---|---|---|
| Sugarcane | 50% | 160 |
| Cacao | 15% | 84 |
| Beans | 15% | 34 |
| Manioc | 10% | 36 |
| Maize | 3% | 6 |
| Cotton | 2% | 8 |
| Orange | 1% | 111 |
| Rice, Banana, Coconut | 4% | - |
| | 100% | |

Although sugarcane has become less important a fertilizer user than before, it still is the only crop using significant application rates with an average rate of about 160 kg/ha, which compares to a recommendation of 250-300 kg/ha. Because of the importance of sugar to the fertilizer sector in the Northeast, a brief description of the history and future potential for sugarcane production is given below.

Sugarcane has been grown in the Northeast for over 400 years. The industry was started in 1532; and in less than a century, the region became one of the major sugar producing areas in the world. With the recent decline in Cuban production, Brazil is now the largest producer of sugar in the world; and Brazilian sugar exports in 1974 surpassed coffee as Brazil's principal foreign exchange earner. Although sugarcane production was originally restricted to the Northeast, the Center region, in particular

the states of Sao Paulo and Rio de Janeiro, gained more and more importance. By 1940 already 45% of total sugar production came from the center, and its share further increased to about 65-75% at present. The main advantages of the Center are the better soils, a more favorable topography and a well-established economic and social infrastructure. As a result, production costs in the Northeast are higher than those in the Center; and the Government has established a gradually declining subsidy program to be eliminated over a six-year period to compensate for this.

As can be seen from Table 1, more and more of the sugarcane production has been used for production of sugar. For the next few years it is expected that about 75-80% of the sugarcane production would be used for sugar, 10-15% as animal feed and 10% for other uses, particularly for alcohol production.

Increases in production have come mainly from an increase in area. Agricultural and industrial yields in the Northeast and Center have more or less stagnated with around 45 tons/ha as the average agricultural yield. This is low in comparison to other regions in the world of which some show yields of 150 tons/ha and higher. One of the main reasons for the low and stagnating yields besides the limited fertility of the soils and the unfavorable topography is the lack of higher yielding varieties in the Northeast. Although, as mentioned above, sugarcane has been in the area for four hundred years, serious development effort for higher yielding varieties started only in 1970. Since it takes between six-eight years to develop new varieties to the level of commercialization, this effort will only start to pay off in the late seventies.

Agricultural practices in the Northeast in sugarcane farming vary considerably. Generally, the large mill owners, representing about 40% of the production of cane, use more advanced farming methods than the smaller, independent farmers. Much of the soil preparation is done manually making use of relatively cheap labor. About 25-30% of the sugarcane growing area is on steep hills with a gradient of 20% or more where heavy soil preparation equipment cannot be used. With labor becoming more expensive, it is necessary to use these lands for pasture or reforest them and concentrate the sugarcane production in those areas that are more favorable to mechanized farming methods.

In 1933 the Government created the Institute of Sugar and Alcohol (IAA) as an independent federal body that is charged with regulating the supply of sugar to the domestic and export markets in order to avoid wide fluctuations in the production of sugar. The IAA determines the production of sugar for each season, specifies by state how much is to be made available to the local and how much to the export market. Minimum prices for sugarcane as well as raw and crystal sugar are set, and the IAA purchases all exportable surplus and is responsible for its marketing. The main export market has traditionally been the USA with a market share of up to 50%. Recently, the USSR and Mainland China have purchased significant amounts totaling 25% of Brazil's exportable sugar surplus.

With a domestic demand growth of 4-5% annually and a promising outlook for the export market, the prospects for increased sugar production in Brazil are good. With its more favorable position, the Center will continue to supply the major share of Brazil's production, but the Northeast should be able to hold its share by increasing sugarcane planting on the topographically more favorable areas by phasing out sugarcane production on steep hills and by improving productivity through increased use of mechanized equipment, new higher yielding varieties and modern inputs, particularly for ratoon crops which appear to be neglected at present.

C. Past Fertilizer Consumption and Future Demand

Apparent fertilizer consumption data for the period 1966-1976 is given in Annex 3-2, Table 4, and shows a nearly eightfold increase equivalent to an average annual growth of about 22% during that period. As in the other regions, apparent fertilizer consumption has fluctuated widely and no data is available for estimated real consumption. This very rapid growth is contrasted by a slow growth for sugarcane production which increased by only about 25% during the same period which is equivalent to an average annual growth of only about 2.1%. Although fertilization of sugarcane has significantly increased over the past ten years, the high growth rates for fertilizer consumption can only be explained by the geographical and cropwise diffusion process described earlier. However, without a year-by-year history of fertilizer consumption by region and crop, no detailed analysis and explanation for the rapid growth is possible.

The relationship between realized sugarcane prices and the cost of fertilization has, as in the case of other crops, deteriorated with increased world fertilizer prices during the 1973-75 period, but improved very significantly in 1976. The table below shows the amount of cane that could purchase the fertilizer required for one ha using a formula of 50-150-100 kg/ha:

PURCHASING POWER OF SUGARCANE

| | 1972 | 1973 | 1974 | 1975 | 1976 |
|---|---|---|---|---|---|
| Tons of Sugarcane Required for Purchase of 300 kg of Fertilizer | 8.5 | 14.6 | 20.4 | 17.2 | 5.1 |

The figure for 1976 takes the 40% price subsidy into account. However, even without the subsidy the cane requirement would be about back to the 1972 levels. Considering that the cost of fertilizers should be not more than about 20% of the value of the crop, equivalent to about 12 tons of cane, the present ratio is conducive to stimulating the use of fertilizer for sugarcane.

Four years ago, the Government had contracted ANDA to embark on a three-year program of determining the bottlenecks preventing increased use of fertilizer consumption and of conducting a large number of tests for fertilizer use in the various states and for all the major crops cultivated in the Northeast. The results of this program, which was actively supported by FAO and which is likely to be continued, are now available and are very encouraging. As bottlenecks, ANDA identifies as the two greatest problems the ignorance of farmers on the use of fertilizers and the difficulty of obtaining fertilizers in many areas of the Northeast where a considerable potential for increased consumption exists. As a result of ANDA's efforts, which included more than 5,000 demonstration and research tests, many more farmers are now aware of the beneficial effects of fertilizer and modern agricultural practices, and new companies start to move into areas previously not serviced by fertilizer suppliers.

As mentioned, with the limited amount of data available, it is not possible to gain a real insight into the many factors which influence fertilizer consumption in the Northeast. Projections for the future development of the Northeastern fertilizer market are therefore bound to have a considerable degree of uncertainty. As is the case for the whole of Brazil, Government policies in the agricultural and fertilizer sector are probably the single most important factor which affect the continued growth in fertilizer consumption. Through the National Fertilizer Program, the establishment of the Fertilizer Commission, and the introduction of the subsidy, a considerable amount of interest has been generated in this sector and it appears that Government policies will be favorable to the continued growth. Considering that the area averaged an annual growth of about 22% over the last 10 years, the assumed future growth rate of about 12% per annum used in Annex 7-2 appears feasible.

D. Fertilizer Marketing

The urea and ammonia output of this project will not be sold directly to the farmer, but to the manufacturers, blenders and mixers located in the Northeast which will retail complex fertilizers in a variety of formulas. Traditionally, the Northeast has depended on imports of raw materials and finished fertilizers and at present only about 50% of N, less than 10% of soluble $P_2O_5$ and none of the $K_2O$ is manufactured in the Northeast. The industry has therefore settled close to the ports of Recife, Maceio and Salvador. Of the 16 companies registered in the Northeast, 12 are located in Recife, three in Salvador and one in Maceio. However, the mixing and blending capacity is distributed more closely to the pattern of demand with about 60% located in Pernambuco (mostly Recife), 20% in Alagoas (mostly Maceio) and the remaining 20% in other states. In the near future this pattern is going to continue, but in the long run a change can be expected with the exploitation of the Carmopolis potash deposits which is likely to take place during the 1980s. The Carmopolis deposit is only about 30 km to the north of this project so that two of the three required nutrients would be located very close to each other favoring the location of mixing

and blending plants in the same area. This would be a particularly attractive location if a new port is built nearby through which the required $P_2O_5$ could be efficiently imported and the excess $K_2O$ exported to other Brazilian regions.

During the initial years of the project, production of N is likely to exceed the requirements of the Northeast (Table 2) and ammonia as well as urea will have to be shipped to the new port of Aratu and from there to other regions. Because of the locational advantage of this project to supply the Northeast with fertilizer, the production from the existing and expanded plant in Camacari will have to be exported to the Center and South either via railway but more likely through coastal shipping from Aratu.

Transportation of finished fertilizer in the Northeast is presently to 97% by road and to only 3% by rail. With the quite limited railway network and its present inefficiencies, it can be expected that road transport will remain the dominant mode for finished fertilizers.

Distances for shipping raw and intermediate fertilizer materials are generally very small because the mixers and blenders are located close to the ports through which these materials are imported. The only exception is the urea produced in Salvador which is to 70% shipped by rail to the companies in Recife and Maceio. The lack of appropriate bulk cars and of bulk handling equipment at the receiving companies require that PETROFERTIL ship all the urea which is transported by rail in bags. At the receiving end, the companies have to tear the bags open to use the urea in their blending and mixing operations. So far, the volume involved was relatively small because of the limited capacity of the PETROFERTIL plant in Camacari. However, with the coming on stream of the expansion in Camacari, all of the nitrogen required in the Northeast will have to be shipped from Camacari making it more attractive to ship in bulk although some bag shipments will still be required to companies which are too small to install bulk unloading facilities. With the necessity of shipping more intermediate products over large distances, the railways should become a more important transport mode in the Northeast. The capacity of the railways to do so and the problems that have to be overcome have been analyzed by a railway consultant, and his report is summarized in Annex.

At 90% capacity, the output of the project will include about 80,000 TPY of ammonia for sale of which about 60,000 TPY are likely to be consumed by ammonium phosphate plants to be built in Recife, Maceio and Salvador. At present none of these plants is being built, but plans exist by about five companies of which three are expected to go ahead and build these plants. The remaining 20,000 TPY of ammonia will probably be exported to other Brazilian regions together with the excess ammonia of PETROFERTIL's plant in Camacari.

Only very small amounts of ammonia are presently shipped in the Northeast, and no railway cars are available at this time. Since the output of ammonia from the Sergipe plant will have to be moved to Recife, Maceio and

Salvador, proper rail cars will be required to do so. Because of the specialized nature of these cars, BRASFERTIL will most likely have to purchase and own the cars required and will obtain an appropriate tariff reduction from the railways in return. The proposed Bank loan includes US$8 million earmarked for the procurement of specialized railway cars. The exact requirements have still to be determined by BRASFERTIL in collaboration with the railway authorities.

The change from importing nitrogen to local production in the Northeast will make it necessary to increase the overall storage capacity to accommodate the cyclical nature of fertilizer consumption. With the very high cost of short-term financing for working capital, blenders and mixers try to keep their inventories as low as possible and prefer to adjust to the cyclical pattern of consumption by working more or less hours per day. To enable BRASFERTIL to produce steadily at the highest capacity utilization possible, some form of sharing of inventories with the mixers and blenders will have to be worked out. It might also be possible to motivate the farmer to keep higher inventories during the off season by offering him financial incentives to do so.

Under the growth assumption of 12% per annum made for the Northeast, the retail and distribution facilities have to be expanded to accommodate this growth. These facilities are entirely in the private sector, and it is the Government's policy to provide the policy framework required for the continuation of the private sector role. In the past, the retail and distribution system have been able to accommodate very significant fluctuations in the volumes processed, and it is expected that the private sector, with the support from the Government, will continue to provide the necessary flexibility. The Fertilizer Market and Marketing Study presently carried out by the Government has as one of its objectives the identification and formulation of Government policies which would further facilitate the continued growth of fertilizer use.

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BRAZIL - SERGIPE FERTILIZER PROJECT

SUGAR PRODUCTION STATISTICS

| | 1967/68 | 1968/69 | 1969/70 | 1970/71 | 1971/72 | 1972/73 | 1973/74 | 1974/75 | 1975/76 | 1976/77 |
|---|---|---|---|---|---|---|---|---|---|---|
| Sugarcane Produced (1,000 tons) | | | | | | | | | | |
| North-Northeast | 27,500 | 27,300 | 27,242 | 27,334 | 30,414 | 37,610 | 32,650 | 31,476 | N.A. | N.A. |
| Center-South | 49,110 | 47,943 | 52,511 | 52,261 | 54,692 | 54,267 | 63,762 | 59,910 | N.A. | N.A. |
| TOTAL | 76,610 | 75,243 | 79,753 | 79,595 | 85,106 | 91,877 | 96,412 | 91,386 | 97,140 | 104,457 |
| Sugarcane Milled (1,000 tons) | | | | | | | | | | |
| North-Northeast | 15,827 | 14,957 | 17,595 | 18,631 | 21,213 | 23,924 | 24,964 | 27,717 | N.A. | N.A. |
| Center-South | 32,227 | 28,643 | 29,392 | 38,447 | 39,321 | 43,946 | 50,874 | 46,792 | N.A. | N.A. |
| TOTAL | 48,154 | 43,600 | 46,987 | 57,078 | 60,534 | 67,870 | 75,838 | 74,509 | N.A. | N.A. |
| % of Total Sugarcane Production | 62.8 | 57.9 | 58.9 | 71.7 | 71.1 | 73.9 | 78.6 | 81.5 | N.A. | N.A. |
| Sugar Production (1,000 Bags of 60 kg) | | | | | | | | | | |
| North-Northeast | 24,667 | 23,280 | 26,761 | 28,969 | 30,819 | 33,314 | 32,926 | 38,095 | 44,200 | 39,760 |
| Center-South | 45,595 | 45,251 | 45,455 | 56,539 | 58,955 | 65,561 | 78,456 | 73,915 | 84,800 | 90,240 |
| TOTAL | 70,262 | 68,531 | 72,216 | 85,328 | 89,774 | 98,875 | 111,382 | 112,010 | 129,000 | 130,000 |
| % in Northeast | 35.1 | 33.9 | 37.0 | 33.9 | 34.3 | 33.6 | 29.5 | 34.0 | | |
| Sugar Destined for | | | | | | | | | | |
| Domestic Consumption (%) | 76.3 | 75.1 | 76.4 | 78.6 | 51.0 | 49.8 | 65.6 | 65.0 | 66.3 | 73.1 |
| Exports (%) | 23.7 | 24.9 | 23.6 | 21.4 | 49.0 | 50.2 | 34.4 | 35.0 | 33.7 | 26.9 |
| Agricultural Yield (tons/ha)[1/] | | | | | | | | | | |
| North-Northeast | 44.8 | 45.4 | 42.5 | 43.3 | 45.0 | 45.7 | 52.0 | 44.8 | N.A. | N.A. |
| Center-South | 45.8 | 44.8 | 50.3 | 49.2 | 49.6 | 47.7 | 47.6 | 50.9 | N.A. | N.A. |
| AVERAGE | 45.4 | 45.0 | 46.2 | 47.1 | 47.2 | 46.9 | 49.0 | 48.6 | 42.7 | 43.5 |
| Industrial Yield (%)[2/] | | | | | | | | | | |
| North-Northeast | 9.3 | 9.6 | 9.1 | 9.3 | 8.7 | 8.4 | 7.9 | 8.2 | N.A. | N.A. |
| Center-South | 8.5 | 9.5 | 9.3 | 8.8 | 9.0 | 9.0 | 9.3 | 9.5 | N.A. | N.A. |
| AVERAGE | 8.8 | 9.5 | 9.2 | 9.0 | 8.9 | 8.7 | 8.8 | 9.0 | N.A. | N.A. |
| % of Milled Sugarcane Production[3/] by Mill Owner | | | | | | | | | | |
| North-Northeast | 45.0 | 47.5 | 45.6 | 43.4 | 44.8 | 42.4 | 38.0 | 38.9 | N.A. | N.A. |
| Center-South | 49.5 | 54.5 | 55.8 | 56.1 | 54.9 | 53.7 | 56.2 | 61.4 | N.A. | N.A. |
| AVERAGE | 47.9 | 52.1 | 51.9 | 52.0 | 51.4 | 49.8 | 50.2 | 52.7 | N.A. | N.A. |

1/ Agricultural yield is defined as the ratio between sugarcane production and area planted with sugarcane.

2/ Industrial yield is defined as the ratio between production of centrifuged sugar and sugarcane volume processed.

3/ Production statistics are generally given in two categories; namely, cane supplied by mill owners (propria) and independent farmers (fornecedor).

Source: Instituto do Acucar e do Alcool, Suplan, Anuario Estatistico do Brazil.

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ANNEX 3-3
Table 2

BRAZIL - SERGIPE FERTILIZER PROJECT

AMMONIA AND UREA SHIPMENTS FROM PLANT
('000 tons)

| | 1981 | 1982 | 1983 | 1984 | 1985 and Thereafter |
|---|---|---|---|---|---|
| Demand for Nitrogen in the Northeast | 125 | 140 | 155 | 175 | 200 |
| Project Output (Nutrient): | | | | | |
| Urea | 117 | 134 | 150 | 150 | 150 |
| Ammonia | 51 | 58 | 66 | 66 | 66 |
| Ammonia Requirement for MAP/DAP Plants in Recife/Maceio | 40 | 40 | 40 | 40 | 40 |
| Balance of N Required in the Northeast in the form of Urea | 85 | 100 | 115 | 135 | 160 |
| Shipments of Urea from Sergipe to: | | | | | |
| Aratu (N) | 32 | 34 | 35 | 15 | - |
| Recife/Maceio (N) | 85 | 100 | 115 | 135 | 150 |
| Aratu (Product) | 70 | 74 | 76 | 33 | - |
| Recife/Maceio (Product) | 185 | 217 | 250 | 293 | 326 |
| Shipments of Ammonia from Sergipe to | | | | | |
| Camacari (N) | 11 | 18 | 26 | 26 | 26 |
| Recife/Maceio (N) | 40 | 40 | 40 | 40 | 40 |
| Camacari (Product) | 13 | 22 | 33 | 33 | 33 |
| Recife/Maceio (Product) | 49 | 49 | 49 | 49 | 49 |

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## BRIEF SURVEY OF THE NORTHEASTERN RAILWAYS

The project will be dependent on the railways for the supply of vacuum gas oil and Bunker C and for shipping ammonia and urea to bulk-blenders and mixers in Pernambuco, Alagoas, Sergipe and Bahia. The Federal Railways of Brazil (RFFSA) which operates the railway system in the Northeast, is the recipient of two Bank loans (Loan 786-BR in 1971 of US$46 million and Loan 1074-BR in 1975 of US$175 million) and is now under active review as part of the Bank's regular project supervision activities. As part of its appraisal, the Bank asked a consultant to evaluate the capacity of the railways to reliably move this additional traffic at a speed acceptable to PETROBRAS and its clients. Most of the traffic will be along the Salvador-Aracaju-Maceio-Recife line on which the analysis concentrates. The consultant's findings are briefly summarized below.

### I. Traffic Projections

RFFSA has recently, with the help of consultants, completed traffic origin destination studies for the whole system using 1974 as a base year. These traffic origin destination figures have now been projected for the year 1980, and it is hoped in the near future to have these extended to 1985. The figures for the Salvador-Recife corridor, however, do not include the expected traffic from the proposed ammonia/urea plant at Laranjeiras (18 km northwest of Aracaju).

Using RFFSA's projections for 1980 and projecting them to 1995 assuming a 5% per annum growth and adding the traffic which will be generated by the project results in an upper bound traffic which is probably somewhat optimistic but which can be used to determine whether line capacity is sufficient. Table 1, gives some details for the expected traffic between Salvador and Aracaju which indicates that any reasonably expected traffic level for the forseeable future is well below what the line in its present condition can carry at acceptable standards of service. Tonnages projected for the Aracaju-Recife corridor have not been fully completed, but are considered lower than those of Salvador-Aracaju.

The characteristics of the line are such that even assuming that unexpected increases over and above those projected were to take place, the lengthening of selected crossing sidings and the use of multiple fraction to haul longer trains could be easily and economically carried out.

No serious problems regarding future line capacity can therefore be expected as relatively rapid and economic solutions are possible.

II. Track

Track alignment is not difficult, with minimum curves of 150 m radius and relatively short ruling grades of 17/000. With the exception of some 28 kms of earth ballast, stone ballast is used. However, much of it (70%) is large, improperly crushed stone which requires cleaning and re-crushing to allow efficient and economical use of mechanized maintenance equipment.

RFFSA's track renewal program for the Salvador-Recife corridor for the next three years, which is considered adequate, includes complete renewal of all sections of the main line with no stone ballast and presently laid with 60 lb. rail. Strengthening or replacing of bridges with a less than 20 ton axle load limit is also included.

III. Speed and Reliability

Density on the Salvador-Recife line is low, with no passenger service and only an average of 2.5 freight trains per day. All trains are pick-up trains and consequently average speeds are low because much time is lost in yards switching and locating cars for unloading. Freight train maximum speeds are established at 40 km/h and running speeds average about 30 km/h. With small improvements in track maintenance levels, it should be possible to raise maximum train speeds to 50 km/h.

Average commercial speeds over the whole of this system are 18 km/h. This could be considerably improved by programmed unit trains between Recife, Maceio, Camacari, Mataripe and the project site. The transport requirements of the project lend themselves very well to unit trains, and this would constitute a significant improvement over present operations where trains are not scheduled but are run according to demand.

It is estimated that about 10% of the trains running in the North-east have some form of a derailment often caused by poor track maintenance, non-obeyance of speed limits and other operator errors. This large number of derailments must definitely be reduced to reliably move the products required for the project. This is particularly required for the safe transport of ammonia, a hazardous cargo with a great destructive potential.

IV. Rolling Stock

Besides locomotives and standard boxcars for bagged urea shipments and to be supplied by RFFSA, three type of special cars are needed for the project:

(i) Standard fuel tank cars for shipping vacuum gas oil and Bunker C. These will be supplied by RFFSA with no purchases additional to those already included in the investment program;

(ii) Liquid ammonia tank cars will have to be procured by FERTILIZANTES since they will be the only user of these cars. It is estimated that 65 cars are required; and

(iii) Covered hopper cars, fully lined for the transport of urea in bulk. These will also have to be procured by FERTILIZANTES, and an estimated 45 cars are required. These cars would initially be used to ship the surplus urea to the port of Aratu and later for the supply of bulk urea to companies in the Northeast.

FERTILIZANTES has already exchanged letters with RFFSA agreeing in principle to the above division of procurement. Agreements on who will be responsible for maintenance of the cars to be owned by FERTILIZANTES will still have to be worked out.

## V. Recommendations

RFFSA is at present in a unique and favorable situation with regard to the Salvador-Aracaju-Maceio-Recife line. Present traffic is insignificant with no priority passenger traffic to take precedence.

The alignment, trace and installations have been built to basically good standards and the renewal and upgrading program between now and 1979 can provide a rail line capable of handling 1,000,000 tons annually and of being further upgraded at reasonable cost to handle very much larger tonnages. Due to the present low traffic density, upgrading and renewal can be carried out under optimum conditions and a complete new working timetable can be established for the future. Preference should therefore be concentrated on this work as indicated in the following recommendations.

### 1. Operation

RFFSA should make a new study of proposed traffic for the Salvador-Recife line and establish a timetable based on scheduled trains giving priority to through freight and special traffic moved by unit trains.

Consideration should also be given to determine the overall economies in speed and turnaround of using two locomotives instead of one, increasing the train loads to 17 to 18 cars. Train routing would then prove more flexible and terminal operations more economical.

### 2. Track

The renewal program as now drawn up should be reviewed and priorities allotted to those sections whose work can be carried out rapidly during daylight hours without interference from traffic.

Improved track maintenance is a must if speed and reliability is to be increased and derailments avoided.

3. Stations

Secondary track and auxiliary track in stations is laid with lighter rail and, although in acceptable condition for the existing services, should be put into better condition for the expected future increase in traffic.

Switches and turnouts should be thoroughly repaired and brought up to standard to avoid excessive speed restrictions and danger of derailments. Switch position indicators on the main line should be installed and switch blade locking bars used also on main line switches in the interests of speed and safety.

VI. Implementation of Recommendations

The consultant's report has been made available to FERTILIZANTES and to RFFSA and the appraisal mission discussed the consultant's findings in detail with these two organizations. The railways in principle agreed to the consultant's recommendations, but it will be up to FERTILIZANTES to ensure that the necessary steps are taken to their implementation. Since the Bank is already actively involved in RFFSA, the Industrial Projects Department's supervision effort to monitor implementation of the above recommendations will be coordinated with the Bank's regional project department's transportation staff.

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BRAZIL - SERGIPE FERTILIZER PROJECT

TRAFFIC PROJECTIONS FOR NORTHEASTERN RAILWAYS

| Section | Distance (km) | (Traffic in 000 Net Tons) Actual 1974 | RFFSA Projections 1980 [1] | Estimated 1995 [2] |
|---|---|---|---|---|
| Salvador - Mapele | 22 | 26 | 40 | 83 |
| Mapele - Salvador | 22 | 159 | 182 | 448 |
| Mapele - Irapui | 62 | 133 | 358 | 949 |
| Irapui - Mapele | 62 | 82 | 114 | 400 |
| Irapui - S. Francisco | 39 | 70 | 273 | 734 |
| S. Francisco - Irapui | 39 | 160 | 202 | 561 |
| S. Francisco - Aracaju | 305 | 71 | 266 | 729 |
| Aracaju - S. Francisco | 305 | 55 | 78 | 219 |

Notes: 1/ Excluding any traffic from the project.

2/ Derived by assuming 5% growth per annum over 1980 projections and adding traffic generated by the project.

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ANNEX 3-4
Table 1

*The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.*

BRAZIL

# SERGIPE FERTILIZER PROJECT
## Location of Plant Site and Services

**PROJECT**
- PLANT SITE

**REQUIRED FOR PROPER OPERATION OF THE PROJECT**
- FUTURE GAS PIPELINES
- FUTURE WATER PIPELINE
- FUTURE RAIL LINK

**EXISTING**
- GAS PIPELINE
- OIL PIPELINES
- TOWNS
- RAILROAD
- ROADS
- RIVERS

South America
Aracaju
BRAZIL
Pacific Ocean
Atlantic Ocean

ALAGOAS
BAHIA
SERGIPE
Area of map
Aracaju
Atlantic Ocean
BAHIA

37°15' 37°10' 37°05' 37°00'
10°20' 10°25' 10°30' 10°35' 10°40'

Riachuelo Substation
To Maceió
From Carmapolis
From São Francisco River
PLANT SITE
Sergipe R.
Laranjeiras
Cotinguiba R.
Guajara Substation
Sal R.
Pomanga R.
Sergipe River
ARACAJU
Santa Maria R.
Airport
Canal Santa Maria
Existing gas/oil terminal
ATLANTIC OCEAN
Future natural gas liquid plant
From offshore wells
To offshore loading
To Salvador
To Bahia State
São Cristovão
Baza Barris R.

0 1 2 3 4 5 6 7 8 KILOMETERS
0 1 2 3 4 5 MILES

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## PROJECT DESCRIPTION

### A. Production Processes

1. The rated output of the plant will be 1100 MTD urea and 269 MTD ammonia after use of 638 MTD ammonia as an intermediate in the production of urea. Annual production of end products based on 330 days operation at 100% capacity will be 363,000 tons urea and 88,800 tons ammonia. For the production of ammonia, the Kellogg high pressure steam reforming process shall be used starting with natural gas feed originating from PETROBRAS on and off shore deposits in Sergipe and Alagoas states. Typical gas compositions for both dry and wet gas are given in Annex 4-5 and the reformer unit and catalyst will be chosen to handle either composition although dry gas will be the normal feedstock. For the production of urea, the Mitsui Toatsu total recycle C process will be used, using ammonia and carbon dioxide produced in the ammonia process as raw materials. Specifications of ammonia produced both for sale and conversion into urea will be :

| | |
|---|---|
| Anhydrous ammonia | 99.8 wt. % max. |
| Water and residue content | 0.2 wt. % max. |
| Oil content (by weight) | 10 ppm max. |

Liquid ammonia produced for storage and sale will be at -33°C. Urea shall be produced in prilled form to the following specifications :

| | |
|---|---|
| Total nitrogen (by weight) | 46.3% min. |
| Biuret (" " ) | 0.9 % max. |
| Moisture (" " ) | 0.3 % max. |
| Iron (" " ) | 2 ppm max. |
| Ash (" " ) | 20 ppm max. |
| Free ammonia (" " ) | 200 ppm max. |
| Grain size 1.2 - 3 mm ( " ) | 90 % min. |

Consumption of raw materials and services in the production of ammonia and urea are given in Annex 4-3.

2. For the production of ammonia synthesis gas, natural gas feedstock shall be delivered to the plant at a minimum pressure of 200 psig and then compressed inside the plant to 450 psig by a steam driven centrifugal compressor and desulphurised by reaction with hot zinc oxide. Ammonia synthesis gas is produced from the compressed sweetened feedgas in a series of steps beginning with a primary reforming with steam. Here the feed gas is combined with superheated steam in an amount approximately equal to a 3 to 1 steam/carbon ratio. The combined stream at a pressure of approximately 450 psig is then preheated to about 950 degrees F. and passed through catalyst-filled 25/20 chrome nickel alloy tubes suspended in the radiant section of the reformer. In passing through the tubes the hydrocarbon components, mostly methane, are partly converted to carbon oxides and hydrogen and exit at a

temperature normally in excess of 1500° F. The reformer tubes are heated externally by combustion of vacuum gas oil having a very low heavy metal content (less than 0.2 ppm vanadium and 0.1 ppm nickel) to avoid contamination and weakening of the reformer tube alloy material. The reformer is also equipped with soot blowers to remove any unburnt material from the tube surfaces. The partially reformed gas from the primary steam reformer then passes to a secondary reformer where it is mixed with preheated air in a quantity necessary to reform the unconverted hydrocarbons and at the same time provide the required amount of nitrogen for ammonia synthesis. Air required for the secondary reforming step is supplied from a centrifugal steam turbine driven compressor. Reformed gas from the secondary reformer now containing less than about 0.4% methane is cooled in waste heat boilers down to about 700° F. prior to introduction to the high temperature shift converter where part of the carbon monoxide content of the gas is converted to carbon dioxide by reaction with steam with an equivalent production of hydrogen. To complete this conversion of carbon monoxide the gas after cooling in additional waste heat boilers and after a protective fine sulphur removal is introduced into a second stage low temperature converter where the carbon monoxide content of the gas is reduced to less than 0.5%. The raw synthesis gas now contains essentially hydrogen, nitrogen, carbon dioxide and small amounts of hydrocarbons and carbon monoxide and now goes through a series of purification steps to provide an ammonia synthesis gas with a hydrogen/nitrogen ratio of 3 to 1. In the first of these carbon dioxide is removed via the Eickmeyer "Catacarb" process using hot potassium carbonate solution containing an amine-borate activator and corrosion inhibitor as absorbent and a split stream absorption/desorption cycle to reduce energy consumption. Remaining oxides of carbon are then removed from the semi-purified synthesis gas by conversion to methane and water by reaction with hydrogen over a suitable catalyst. The final synthesis gas consisting of nitrogen and hydrogen then contains less than 10 ppm oxides, (the maximum that can be tolerated by the ammonia synthesis catalyst), as well as small amounts of methane which are continually purged from the following ammonia synthesis loop.

3. In the synthesis of ammonia fresh synthesis gas (nitrogen and hydrogen) and ammonia converter recycle gas containing about 11% ammonia, are compressed to a pressure of approximately 2500 psig in a two case steam turbine driven centrifugal compressor. The compressed gas is then water cooled and subjected to three stages of chilling to condense out ammonia which is removed in a liquid separator. The disengaged gas containing only about 2% ammonia vapour, is then reheated by heat exchange with the compressor discharge gas and converter effluent before entering the convertor. Ammonia synthesis takes place in this converter which contains four beds of triply promoted iron catalyst and is of special design to remove the reaction heat developed while maintaining optimum reaction temperature for maximum yield and catalyst life. The converter effluent containing about 11% ammonia is cooled from the reaction temperature of about 900° F first in preheating boiler feedwater and then by heat exchange with incoming converter feed gas, before recycling to the second case of the synthesis gas compressor as described. A three stage refrigeration system provides the refrigeration for ammonia condensation in the synthesis loop, recovery of ammonia from purge gas, synthesis compressor interstage chilling, and refrigeration of the anhydrous liquid ammonia product. Liquid ammonia from the separator is let down through a low-pressure separator and the refrigeration system before being delivered at -33°C to storage.

4. In the production of urea, carbon dioxide (desorbed from the $CO_2$ removal process rich solution) and ammonia are combined at a pressure of 2,000 - 3,500 psi and a temperature of approximately 200 degrees C when ammonium carbamate is formed as an intermediate product, which is subsequently dehydrated with formation of urea. Neither of these reactions, however, proceeds to completion with the result that the reaction product consists of a urea/ammonia carbamate solution containing large quantities of dissolved ammonia and carbon dioxide. The next step in the production of urea therefore is to separate the non-converted carbamate and reaction gases and recycle them to the reactor, and the means of doing this represents the major distinction between the various processes commercially available. In the Mitsui Toatsu Total Recycle C improved process gaseous carbon dioxide (compressed to reaction pressure by combined centrifugal and reciprocating compression system) and liquid ammonia enter the urea synthesis reactor together with recycle ammonium carbamate solution. The operating conditions in the reactor are 3675 psig and 195° C and the molecular $NH_3/CO_2$ ratio is 4, giving a one-pass conversion of carbon dioxide to urea of about 68%. The reaction products consisting of urea, unconverted ammonium carbamate, excess ammonia and water leave the top of the reactor through a pressure let-down valve and pass to the decomposition section of the process, where excess ammonia and unconverted ammonium carbamate are separated from urea solution step wise in a high pressure decomposer, low pressure decomposer, vacuum decomposer, and filter, operating at 257 psig, 29 psig, and 9 psig respectively. The urea solution leaving the vacuum decomposer has a composition of about 72% urea, 0.3% ammonia and 0.3% biuret. In the recovery section of the plant the overhead gases from the three decomposers are condensed and absorbed in their respective condensers or absorbers using condensate from the vacuum absorber as absorbent for the low pressure absorber and solution from the low pressure absorber as absorbent for the high pressure absorber with the solution from the high pressure absorber being finally pumped back to the urea reactor. The overhead gas from the high pressure absorber, pure ammonia, is absorbed in water and also returned to the reactor. The urea solution from the vacuum decomposer after filtration is sent to the vacuum concentrator for concentration up to 83% by weight and then pumped to the urea solution evaporator on top of the prilling tower to produce a 99.7% urea melt. As the molten urea falls down the prilling tower, it is prilled and cooled by up-coming air from the fluidised bed cooler at the base of the tower and from natural draft. The effluent air from the top of the tower containing urea dust is scrubbed with urea solution in an effluent scrubber located on top of the tower. The prilled urea is removed from the base of the tower by a belt conveyor, through a trommel to remove any lumps, and a belt scale to measure production.

B. Plant Facilities

5. The following facilities for the storage and handling of products are provided as part of the project. Prilled urea after weighing is conveyed to a urea coating plant for coating with an agent consisting of clay, limestone and diatomacious earth. The bulk urea storage building has a capacity of 30,000 metric tons and is equipped with four dehumidifiers.

Urea reclaiming is by portal scraper reclaimer discharging to a reclaim conveyor which directs reclaimed urea either to bagging or bulk load-out. For bulk load-out, three 100 ton load-out bins are provided each equipped with load cells for weighing pre-set loads into rail cars or trucks. The bagging plant which is capable of bagging the entire urea output if required, consists of four bagging lines each equipped with 50 ton feed bins, 40-50 ton per hour four-spout bagging machines, and conveying equipment for bagged product. A dehumidifying unit provides dehumidified air to all feed bins and dust collection equipment serves all necessary locations. Bags are 50 kg capacity valve type polyethylene. Filled bags are conveyed to semi-automatic palletising station from which the palletised loads are taken by fork lift to storage (3000 ton capacity) or loading stations. The palletising, load-out and storage areas are contained in the bagging building. Liquid ammonia is stored in a 10,000 ton refrigerated storage tank located close to the ammonia unit battery limits and operated at - 33° C under a slight positive pressure using the battery limits ammonia refrigeration system but with a 50 ton standby refrigeration unit provided. Load-out facilities to handle 400 metric tons per 8 hour shift are provided consisting of six rail car and two tank truck loading arms with pumping equipment, as well as one loading scale each for rail and road tankers.

6. In addition to the facilities for raw water supply (described in para 10) and the effluent treatment provisions (described in paras 7-8), the following ancillary facilities are provided as part of the project to support the materials processing operations. Incoming raw water to the plant site is stored in a raw water storage basin having a capacity of 6 million gallons, sufficient for 4 hours fire water and 24 hours raw water supply. Water from the storage basin is pretreated in a clarifier by addition of chlorine, alum, coagulant aid and lime before being filtered and stored in a 920 $M^3$ pretreated water storage tank. A three train 650 GPM water demineralisation plant is provided to produce boiler feedwater suitable for use in a 1500 psig steam system. An 1800 $M^3$ demineralised water storage tank is included. The plant cooling system is based on a closed circuit cooling water system complete with multi cell induced draft cooling tower, cooling water pumps and chemical treatment system. A complete fire protection system is provided including firewater loop with cross-overs and hydrants, fixed water spray system to protect major machinery, foam protection system for fuel storage, foam truck, standby pumps and controlls. Primary electric power distribution within the plant site is at 13.8 KV to transformers at the ammonia unit, utilities area and urea unit. The plant steam system is based on 1500 psig within the ammonia unit (self generated) and 650 psig elsewhere generated by two 120,000 lb./hr. service boilers each normally operating at 50% capacity. Condensates from the two systems are treated in separate systems. Centralised plant air and instrument air systems normally supplied from the ammonia unit air compressor are provided to serve the ammonia, urea and offsite facilities.

A 500 CFM inert gas generator acts as backup to the instrument air system and is used to supply inert blanket and purge gas. Storage tanks for vacuum gas oil and Bunker C of capacities 10,000 barrels and 5,000 barrels respectively are included. One steam turbine driven emergency power generator is provided to supply all lighting and instrumentation requirements, sustain continuous operation of the ammonia unit, and provide enough power to the urea unit to permit orderly shut-down. The project will also be complete with maintenance, administration, warehousing, and other necessary facilities to allow self contained operation.

C. Ecology

7. Discharge of noxious materials into the atmosphere and inland waters is presently controlled by the Pollution Control Agency (PCA) acting under the authority of the Minister of the Interior through the Environmental Special Secretary (SEMA). Under decrees issued in 1973 and 1975 inland waters within the national territory may be classified into four groups according to their main uses, with maximum concentrations of contaminants for each being fixed. Discharge of effluent is permitted into waters of all classes except that intended for household supply without previous treatment, provided the effluent conforms to set standards relating to acidity, temperature, insoluble matter and concentration of noxious substances and providing that after discharge, the limits of contaminants for the particular classification are not exceeded. Maximum allowable quantity of effluent discharged is determined by the PCA. Order No. 231 published by the Ministry of the Interior in May 1976 established standards for air quality. Both of these regulations covering air and water quality standards, which will be applied to the operations of the project, have been adjudged as satisfactory.

8. Modern ammonia/urea plants are not significant polluters of the environment. Major atmospheric pollutants are sulfur dioxide in the flue gas from the primary reforming unit and auxiliary boilers, and carbon dioxide extracted from the crude ammonia synthesis gas. For the Sergipe plant flue gas stacks for both the primary reformer and auxiliary boilers will be of sufficient height to maintain ground level $SO_2$ concentration within acceptable levels while about 70% of the carbon dioxide produced will be converted to urea. Other potential atmospheric pollutants are small leakages of ammonia from pressure relief valves and compressor seal pots, and urea dust from the top of the Prilling Tower, but these are expected to be minimal. Sources of liquid effluent pollutants are process condensates from the ammonia unit, oily waste waters, cooling tower blowdown, demineralization plant wastes, losses of urea from urea evaporator condenser, spillage from the urea unit, and sanitary effluent. The Sergipe plant will include facilities for removal of contaminants from the condensates from the ammonia unit and urea evaporator before discharge, and for collection and removal of oil from waste waters. Additionally, cooling tower blow down will be treated for removal of chromates and demineralization plant waste neutralized. A sewerage treatment plant will be provided for sanitary waste. The overall effluent treatment system inclusive of these facilities will be based on the above-mentioned Brazilian water and air quality standards.

D. Site Description and Justification

9. The company has purchased a 100 hectare grass roots site at Laranjeiras about 20 km northwest of Aracaju in the state of Sergipe for construction of the plant. The site is situated on the Sergipe River and has good road and rail connections being served by the existing road from Aracaju and by the Salvador-Recife railway passing nearby. A 5-km line linking this railway with the plant will be constructed by Brazilian railways but financed by the company. This rail link will permit shipment to the north and south of bulk liquid ammonia and urea in special rail tankers and box cars to be purchased by the company, and delivery of heavy fuel oil and vacuum gas oil to a fuel storage depot to be constructed beside the site by PETROBRAS which will serve the entire Aracaju area in addition to the plant itself. Electric power for the project will be supplied at 69 KV from the Guajara substation (to be completed in 1977) some 12 km distant via an exclusive transmission line, and via a second normal line from the same substation. These transmission lines will be built by ENERGIPE, the local power authority, independently of the project.

10. Water requirements of the plant will be met via a new 90 km long, 900-1,200 mm diameter water pipeline and 4,500 HP pumping station to be constructed by PETROBRAS to draw water at the rate of 5,040 cubic meters/hour from the Sao Francisco River for supply to the town of Aracaju and to Petrobras Potash Works about 25 km northeast of Laranjeiras. A branch line from this main will supply the project's normal requirements of 900 cubic meters/hour and maximum demand of 1,800 cubic meters/hour. The whole scheme has been studied by a Brazilian consulting firm (HIDSANIT - Engenharia Hidraulica e Sanitaria Ltda.) who has estimated its total cost at Cr$375 million. This cost will be shared 17% by the company, 17% by PETROBRAS and 66% by the National Housing Bank for the state of Sergipe.

11. Prior to selecting the Laranjeiras site, the company examined five potential sites in the general area of Aracaju pursuant to an instruction from the Government consistent with its policy of decentralizing industrial development from the Salvador area. In considering each of these locations, the company took into account the following factors: topographical, geological, air and water pollution, security, power supply, railway and highway access, prevailing wind direction, limitation on expansion, land acquisition constraints and shipping and receiving of materials. An economic comparison of site development costs was also prepared on the basis of costs of land acquisition, site preparation, and provision of water, power and gas supplies, and construction of rail and road connections. Within the constraint of the restrictions on building high structures within 20 km of the Aracaju airport, the Laranjeiras site was identified as the economic optimum.

E. Manpower Needs and Training Plan

12. The project will provide direct employment for 384 people as below, most of whom will be professional, skilled, or semi-skilled.

| | |
|---|---|
| Management | |
| Directors | 3 |
| Administrative Support | |
| Personnel | 15 |
| Finance | 25 |
| Administration | 97 |
| Sales | 19 |
| Technical Support[1/] | |
| Laboratory Control | 32 |
| Maintenance | 80 |
| Production | |
| Ammonia Plant | 81 |
| Urea Plant | 21 |
| Bagging and Handling | 11 |
| TOTAL | 384 |

The staff will be recruited from the Aracaju area or transferred from PETROBRAS refinery or Petroquisa's fertilizer plant operations. It is expected the local university will provide many of the staff required to fill the professional positions.

13. PETROBRAS has an excellent training program to supply the large number of skilled staff required for its expanding refinery and petrochemical operations, and its subsidiaries operate two ammonia/urea complexes that can provide in-plant training. These facilities will be available to help the company train the required number of staff to fill skilled positions. Additionally, the ammonia plant contractor (Pullman Kellogg, USA) will arrange for a two-month training program for six of the company's engineers (process, operation and maintenance) in his own offices and in a similar operational ammonia plant involving the participation of his own expert technicians. The urea plant contractor (Toyo Engineering Corporation, Japan) will provide a similar training program for six of the company's engineers. These key personnel will, therefore, receive intensive instruction abroad in the latest ammonia and urea process technology and plant operational techniques.

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1/ In the table on page 2, Annex 4-6, most technical support personnel have been assigned to manufacturing units for purposes of computing manufacturing costs.

F. Description of Project Organization

The project will be executed on behalf of FERTILIZANTES by PETROBRAS' Fertilizer Project Implementation Unit (COFEN). This unit is organized into technical, contracts, and procurement divisions with the technical division being split into three groups each under a project manager with responsibility for the Sergipe, Araucaria, and Campos projects, respectively. COFEN supported by PETROBRAS' Engineering Services department will assume overall responsibility for project management and technical supervision, co-ordinate the work of the foreign and local engineering companies, and contract directly with local firms (yet to be selected) for construction of the facilities. The unit is administratively responsible through PETROBRAS Engineering Services department to PETROBRAS executive directors, but for matters relating to the project it will be directly responsible to the executive directors of FERTILIZANTES. FERTILIZANTES' own procurement department will be responsible for procurement of all equipment and materials required for the project other than critical items which will be procured by the foreign engineering companies.

G. Implementation Plan

15. Contracts have been signed with Pullman Kellogg (USA) for provision of process license, basic engineering design, procurement assistance, and technical advisory services relating to the ammonia unit and offsites facilities, and with the Toyo Engineering Company (Japan) for provision of process license and similar services for the urea unit. Detailed engineering of the ammonia unit and general plant facilities will be undertaken by a Brazilian firm, Promon Engenharia S.A. (PROMON), acting as nominated sub-contractor and under the supervision of Kellogg. Another local engineering firm, Montreal Engenharia S.A. (MONTREAL), will undertake detailed engineering of the urea unit as nominated subcontractor and under the supervision of Toyo. The project is scheduled for commencement of commercial operation by January 1, 1981, as shown in Annex 4-6.

# BRAZIL - SERGIPE FERTILIZER PROJECT

## CONSUMPTION OF RAW MATERIALS AND UTILITIES AT FULL CAPACITY

| | | UNIT CONSUMPTION | |
|---|---|---|---|
| 1. | BATTERY LIMITS AMMONIA UNIT | (Per Metric Ton Ammonia) | |
| | Natural Gas | 24,450 | Scf |
| | Vacuum Gas Oil | 0.365 | Ton |
| | Condensate | 0.23 | Cu.Met. |
| | Boiler Feed Water | 2.56 | Cu.Met. |
| | Electric Power | 27 | KWH |
| | CW Make-up | 7.6 | Cu.Met. |
| | Chemicals | 1.6 | $ |
| | Steam (Produced) | 0.27 | Ton |
| 2. | BATTERY LIMITS UREA UNIT | (Per Metric Ton Urea) | |
| | Ammonia | 0.585 | Ton |
| | Carbon Dioxide | 0.76 | Ton |
| | Steam | 1.13 | Ton |
| | CW Make-up | 4.8 | Cu.Met. |
| | Electric Power | 102 | KWH |
| | Condensate (Produced) | (0.83) | Cu.Met. |
| 3. | UREA PRODUCT HANDLING | (Per Metric Ton Bagged Urea) | |
| | Urea | 1.01 | Ton |
| | Bags | 20 | |
| | Electric Power | 20 | KWH |
| | Miscellaneous | 1.0 | $ |
| 4. | RAW WATER | (Per Cubic Meter Water) | |
| | Purchased Water | 0.07 | $ |
| 5. | CW MAKE-UP | (Per Cubic Meter CW) | |
| | Raw Water | 1.0 | Cu.Met. |
| | Chemicals | 0.3 | $ |
| 6. | DEMINERALIZED WATER (BFW) | (Per Cubic Meter DM Water) | |
| | Raw Water | 1.10 | Cu.Met. |
| | Electric Power | 2.5 | KWH |
| | Chemicals | 0.5 | $ |

| 7. STEAM | (Per Ton Steam) | |
|---|---|---|
| Demineralized Water | 1.05 | Cu.Met. |
| Bunker C | 0.12 | Ton |
| Electric Power | 0.8 | KWH |

| 8. GENERAL WORKS FACILITIES | (Per Day) | |
|---|---|---|
| Natural Gas | 800,000 | Scf |
| Steam | 150 | Ton |
| Raw Water | 2,000 | Cu.Met. |
| Electric Power | 20,000 | KWH |

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## NATURAL GAS RESERVES - SERGIPE AND ALAGOAS STATES

1. Gas reserves in Sergipe and Alagoas States available for use by the project are located in four different areas, most of which are still in the exploratory and development plan. These areas and the producing fields within each are as below:

| | | |
|---|---|---|
| 1. | Sergipe Onshore | Carmopolis<br>Siririzinho |
| 2. | Sergipe Offshore | Guaricema<br>Caioba<br>Camorim<br>Dourado<br>Robalo<br>Tainha |
| 3. | Alagoas Onshore | Furado<br>Cidade de Sao Miguel dos Campos<br>Sao Miguel dos Campos |
| 4. | Alagoas Offshore | Mero<br>Cavala |

2. Table 1 shows the reserves of gas in these four areas as estimated by PETROBRAS in November 1976 from basic geological, engineering and production data collected by the company. A firm of petroleum consultants hired by the Bank (Lee Keeling and Associates, Tulsa, USA) reviewed the company's evaluation techniques and procedures, random checked electric logs, reservoir data, PVT analysis, fluid characteristics, performance data, test information and studied structure and isopachous maps made available. All of the offshore fields are still in the stage of development and exploration so estimates of reserves of these fields are subject to considerable variation. However, prospects for further increasing the reserves estimates are claimed to be excellent due to the expectation of developing several dry gas wells presently "shut-in" for which no reserves are currently assigned and the geological potential of the presently unexplored area which PETROBRAS estimates may amount to over 10 billion cubic meters.

3. During 1976 six fields were producing gas at a total rate of approximately 30 million cubic meters per month. Three of the onshore fields (Furado, Carmopolis and Siririzinho) have been producing oil and associated gas since prior to 1973, and most of the excess gas produced in these areas has been flared. However, PETROBRAS has tentative plans to reinject and

store some of the Furado and Carmopolis gas during the years 1977-79. Five presently drilling offshore and six additional platforms have recently been approved for construction. The rate of gas production is continuing to increase in all fields as new wells are drilled.

4. The cluster of four fields lying directly offshore from the plant site are being developed at this time. Caioba and Guaricema fields have been connected to shore installations since 1973/74 while Dourado and Camorim fields were connected in June 1976. Oil and associated gas are processed in the gas/liquid separation installation onshore. Oil is then shipped to PETROBRAS refinery in Bahia and gas transported to Bahia through a 14-inch transmission line. For complete utilization of gas to be produced in the Northeast region, PETROBRAS will construct a new 170 km long, 10-inch diameter transmission line from the Furado field to Carmopolis passing through the intermediate gas field areas. At Carmopolis new gas gathering and compression facilities will be built to recover gas presently being flared. A new 50 km long, 14-inch pipeline will then transport this gas and gas from the Northeast to the Aracaju treatment plant which will also be expanded. Dry gas from the expanded treatment facilities will be supplied to the plant site through a new pipeline to be built by PETROBRAS.

5. Table 2 shows projected production and consumption of gas up to 1995 with remaining reserves based on present estimated proven and total reserves.

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BRAZIL - SERGIPE FERTILIZER PROJECT

NATURAL GAS RESERVES - SERGIPE AND ALAGOAS STATES
(Millions of Normal Cubic Meters)

| | Total Proven | Recoverable Proven | Total Probable | Total Possible | Total Recoverable |
|---|---|---|---|---|---|
| 1. Sergipe Onshore | 3,824.9 | 2,010.5 | 4.4 | 670.6 | 2,331.5 |
| 2. Sergipe Offshore | 8,971.0 | 5,898.5 | 1,591.8 | 14,002.1 | 13,102.4 |
| 3. Alagoas Onshore | 2,712.4 | 1,955.5 | 1,698.8 | 1,295.8 | 3,588.3 |
| 4. Alagoas Offshore 1/ | - | - | - | - | - |
| TOTAL | 15,508.3 | 9,864.5 | 3,295.0 | 15,968.5 | 19,022.2 |

1/ Not considered.

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ANNEX 4-4
Table 1

BRAZIL - SERGIPE FERTILIZER PROJECT

PROJECTED GAS RESERVES - SERGIPE AND ALAGOAS STATES
(In Cubic Meters)

| | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Daily Production[1] ($x10^6$) | 1,650 | 1,589 | 2,109 | 2,774 | 2,842 | 2,956 | 2,685 | 2,518 | 2,561 | 2,525 | 2,481 | 2,507 | 2,459 | 2,450 | 2,450 | 2,450 | 2,450 | 2,450 | 2,450 |
| Annual Production ($x10^9$) | 0.602 | 0.580 | 0.770 | 1.013 | 1.037 | 1.079 | 0.980 | 0.919 | 0.935 | 0.922 | 0.906 | 0.915 | 0.898 | 0.894 | 0.894 | 0.894 | 0.894 | 0.894 | 0.894 |
| Cumulative Prod. ($x10^9$) | 0.60 | 1.18 | 1.95 | 2.97 | 4.00 | 5.08 | 6.06 | 6.98 | 7.91 | 8.84 | 9.74 | 10.65 | 11.55 | 12.45 | 13.34 | 14.23 | 15.12 | 16.02 | 16.91 |
| Balance Proven ($x10^9$) | 9.26 | 8.68 | 7.91 | 6.90 | 5.86 | 4.78 | 3.80 | 2.88 | 1.95 | 1.03 | 0.12 | - | - | - | - | - | - | - | - |
| Balance Total ($x10^9$) | 18.40 | 17.82 | 17.05 | 16.04 | 15.00 | 13.92 | 12.94 | 12.02 | 11.09 | 10.16 | 9.26 | 8.34 | 7.45 | 6.55 | 5.66 | 4.76 | 3.87 | 2.98 | 2.08 |
| Daily Consumption[2] ($x10^6$) | 1,285 | 1,525 | 1,525 | 1,560 | 1,585 | 1,535 | 1,535 | 1,535 | 1,535 | 1,535 | 1,535 | 1,525 | 1,525 | 1,515 | 1,505 | 1,505 | 1,505 | 1,505 | 1,405 |
| Annual Consumption ($x10^9$) | 0.469 | 0.557 | 0.557 | 0.569 | 0.579 | 0.560 | 0.560 | 0.560 | 0.560 | 0.560 | 0.560 | 0.557 | 0.557 | 0.553 | 0.549 | 0.549 | 0.549 | 0.549 | 0.513 |
| Available for Fert. ($x10^9$) | 0.133 | 0.023 | 0.213 | 0.444 | 0.458 | 0.519 | 0.420 | 0.359 | 0.375 | 0.362 | 0.346 | 0.358 | 0.341 | 0.341 | 0.345 | 0.345 | 0.345 | 0.345 | 0.381 |
| Required by Fert. ($x10^9$) | - | - | - | - | 0.151 | 0.172 | 0.215 | 0.215 | 0.215 | 0.215 | 0.215 | 0.215 | 0.215 | 0.215 | 0.215 | 0.215 | 0.215 | 0.215 | 0.215 |
| Surplus ($x10^9$) | 0.133 | 0.023 | 0.213 | 0.444 | 0.307 | 0.347 | 0.205 | 0.144 | 0.160 | 0.147 | 0.131 | 0.143 | 0.126 | 0.126 | 0.130 | 0.130 | 0.130 | 0.130 | 0.166 |
| Cumulative Surplus ($x10^9$) | 0.133 | 0.156 | 0.369 | 0.813 | 1.120 | 1.467 | 1.672 | 1.816 | 1.976 | 2.123 | 2.254 | 2.397 | 2.523 | 2.649 | 2.779 | 2.909 | 3.039 | 3.169 | 3.335 |

1/ Assuming gas conservation measures taken.

2/ Assuming zero growth in demand and Bahia fertilizer project converted.

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## SPECIFICATIONS FOR GAS OIL, BUNKER C, AND NATURAL GAS

| Specification | Gas Oil | Bunker C | Dry Gas | Wet Gas |
|---|---|---|---|---|
| API Gravity | 22.2 | | | |
| S.G. (60° F) | | 0.979 | | |
| Viscosity (Cps.) | 57 @ 100° F<br>26.5 @ 130° F<br>7 @ 210° F | | | |
| Pour Point (°C) | 30 | | | |
| Sulphur (Wt. %) | 2.5 | 5.0 | 20 ppm | 20 ppm |
| Vanadium ppm wt. | Max. 0.2 | 150 | | |
| Nickel ppm wt. | Max. 0.1 | 25 | | |
| Sodium ppm wt. | | 50 | | |
| MW | | | 18.532 | 21.18 |
| LCV - BTU/lb. | 17,870 | 17,600 | 19,823 | |
| **Composition by Volume** | | | | |
| Oxygen | | | 0.1 | 0.1 |
| Nitrogen | | | 0.9 | 0.8 |
| Carbon Dioxide | | | 2.2 | 2.0 |
| Methane | | | 84.5 | 78.0 |
| Ethane | | | 11.8 | 11.0 |
| Propane | | | 0.5 | 5.0 |
| Isobutane | | | - | 1.0 |
| n-Butane | | | - | 1.0 |
| Isopentane | | | - | 0.5 |
| n-Pentane | | | - | 0.2 |
| Hexane plus | | | - | 0.4 |
| | | | 100.0 | 100.0 |

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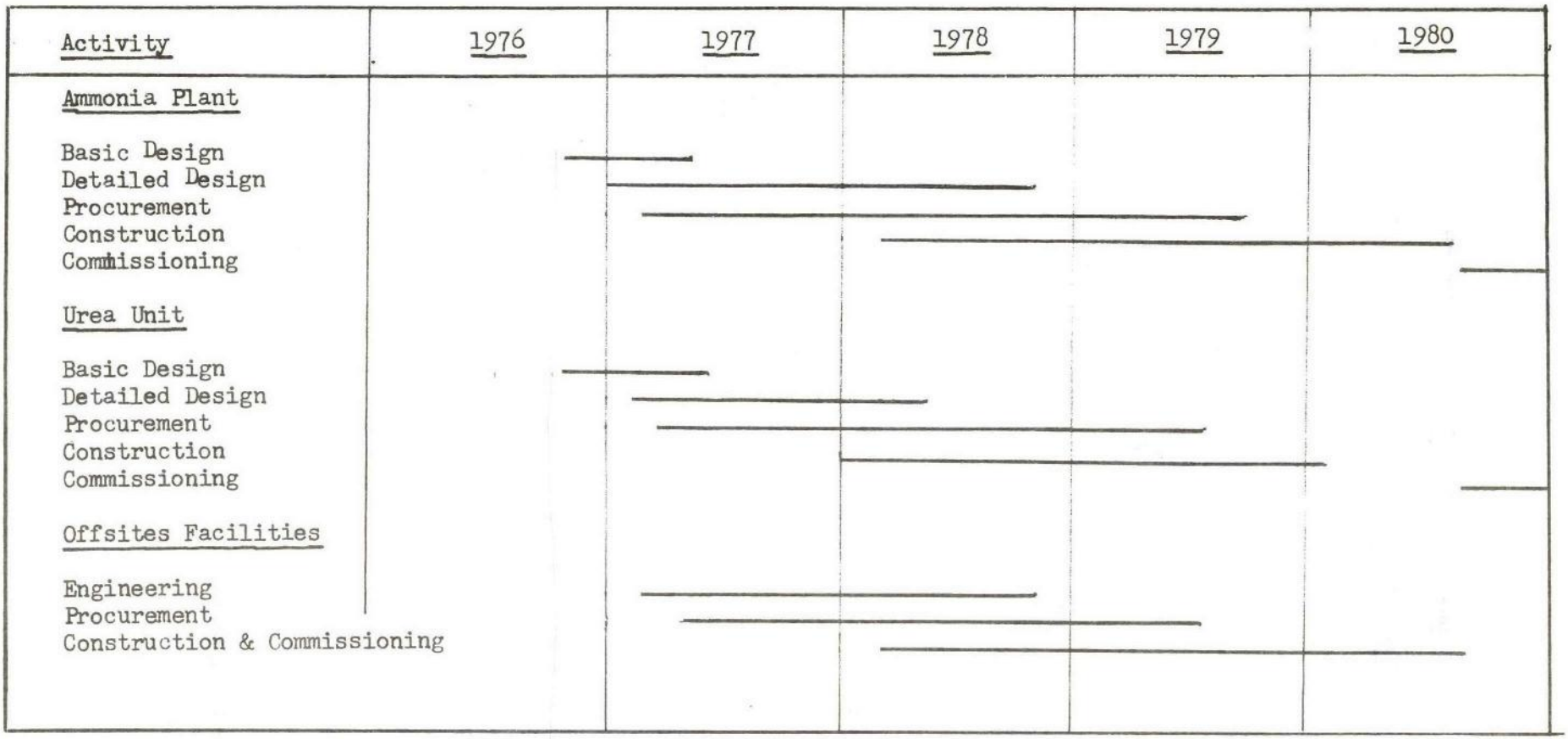
BRAZIL - SERGIPE FERTILIZER PROJECT

CONSTRUCTION SCHEDULE

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about 48 months

ANNEX I-6

# BRAZIL - SERGIPE FERTILIZER PROJECT

## CAPITAL COST ESTIMATES AND ASSUMPTIONS

1. The Base Cost Estimate reflects estimated prices as of December 1976. Local expenditures have been estimated in Cruzeiros and foreign expenditures in US dollars. Estimates were made by PETROBRAS' engineering department using data supplied by the foreign engineering firms and prices for similar equipment purchased by PETROBRAS and escalated to December 1976. The exchange rate used is Cr$12.35 = US$1.00 which was the official rate as of December 31, 1976. Below is a summary of the main assumptions made.

2. Land requirements are about 600,000 $m^2$ at a unit cost of Cr$2.0 per $m^2$.

3. The water pipeline which will serve the project is estimated to cost a total of Cr$375 million of which 17% would have to be borne by the project. Civil works for this are shown under infrastructure and are estimated at Cr$27 million, while materials are shown under production equipment and materials and are estimated to be Cr$37 million.

4. The 5-km raillink between the main line Salvador-Recife and the project site and the railway yard has been estimated by the Bank's consultant to cost about Cr$56 million (or Cr$47 million in mid-1976 prices). Of the expected traffic, about 35% would be used by PETROBRAS' distribution company to service its storage facilities to be built adjacent to the project site. Therefore, only 65% or Cr$37 million are shown as a cost to the project of which Cr$18 million are shown for civil works under infrastructure and Cr$19 million for materials under production equipment and materials.

5. Unit costs for general civil works including all offsite buildings such as administration, restaurant, laboratories, security, maintenance workshops, etc., are as listed below:

| | | | |
|---|---|---|---|
| Administration | (1,000 sq.m.) | - | US$430/sq.m. |
| Guard House | (80 sq.m.) | - | US$595/sq.m. |
| Restaurant, etc. | (800 sq.m.) | - | US$595/sq.m. |
| Maintenance | (3,000 sq.m.) | - | US$265/sq.m. |
| Laboratory | (400 sq.m.) | - | US$570/sq.m. |
| Industrial Safety | (200 sq.m.) | - | US$570/sq.m. |
| Warehouse | (1,500 sq.m.) | - | US$220/sq.m. |
| Urea Store | (9,000 sq.m.) | - | US$240/sq.m. |

6. Plant civil works have been estimated by using PETROFERTIL's actual and estimated costs of the Camacari expansion as a basis and by escalating these to December 1976. The Camacari expansion is expected to be commissioned during the latter half of 1977.

7. The production and miscellaneous equipment and material costs have been estimated by using PETROFERTIL's actual costs and PETROBRAS' and the

engineering firms' estimates. The split between international and local procurement has been made in a way that the overall amount of equipment reserved for Brazilian suppliers would be 60% on an FOB basis. The number of railway cars required for the project has been estimated by PETROBRAS in detail in cooperation with the federal railways. As a result it is estimated that 45 bulk urea cars (50 tons net) and 65 ammonia tank cars (40 tons net) to be owned by FERTILIZANTES would be required at a unit cost of Cr$630,000 and Cr$840,000, respectively.

8. Plant construction costs have also been estimated by using PETROFERTIL's actual costs as a basis.

9. Cost of engineering services is based on actual contract obligations and estimated reimbursable costs.

10. Freight and insurance for items internationally procured is estimated at 15% of the FOB value. For locally procured items, 5% of the FOB value is used for this. These estimates are based on average actual costs incurred in PETROFERTIL's project in Camacari.

11. Physical contingencies are calculated according to Table 3 of this Annex. Contingencies for price escalation have been determined by estimating commitment dates for equipment orders and mid-disbursement dates for civil works, as shown in Table 4, and by using the following escalation rates:

| | 1977 | 1978 | 1979 |
|---|---|---|---|
| For Equipment and Materials | 8% | 8% | 8% |
| For Civil Works and Plant Construction | 12% | 12% | 12% |

12. Interest during construction calculations are based on a Bank loan of US$64 million at 10% interest (8.5% foreign, 1.5% local), a cofinancing arrangement of US$25 million at 10% interest in foreign currency and a BNDE loan of US$81.2 million at a real interest of 4% in local currency. The assumed disbursements are as follows:

| | 1977 | 1978 | 1979 | 1980 |
|---|---|---|---|---|
| Bank, BNDE | 7% | 30% | 43% | 20% |
| Cofinancing | - | 100% | - | - |

13. Table 1 of this Annex gives the capital cost estimate by type of currency requirement, i.e. foreign and local. Table 2 shows the capital costs by type of procurement, i.e. ICB and local and also showing in the second column the amounts for equipment and materials expected to be won by Brazilian suppliers participating in international competitive bidding. To calculate Table 1, it has been assumed that the indirect foreign exchange content of Brazilian equipment and materials would be 25% and 15% for civil works and plant construction.

14. Detailed working capital calculations are given in Annex 5-2.

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BRAZIL - SERGIPE FERTILIZER PROJECT

CAPITAL COST SUMMARY - LOCAL/FOREIGN

| | (MILLION US $) | | | (MILLION CRUZEIROS) | | | |
|---|---|---|---|---|---|---|---|
| | FOREIGN | LOCAL | TOTAL | FOREIGN | LOCAL | TOTAL | % |
| 1.LAND, SITE PREPARATION | 0.00 | 5.57 | 5.57 | 0.00 | 68.79 | 68.79 | 2.83 |
| 2.INFRASTRUCTURE | | | | | | | |
| WATER PIPELINE | 0.32 | 1.83 | 2.15 | 3.98 | 22.57 | 26.55 | 1.09 |
| RAILLINK | 0.22 | 1.24 | 1.46 | 2.70 | 15.33 | 18.03 | 0.74 |
| SUB - TOTAL | 0.54 | 3.07 | 3.61 | 6.69 | 37.90 | 44.58 | 1.83 |
| 3.GENERAL CIVIL WORKS | 0.72 | 4.11 | 4.83 | 8.95 | 50.70 | 59.65 | 2.45 |
| 4.PLANT CIVIL WORKS | | | | | | | |
| AMMONIA UNIT | 0.41 | 2.31 | 2.72 | 5.04 | 28.55 | 33.59 | 1.38 |
| UREA UNIT | 0.24 | 1.38 | 1.62 | 3.00 | 17.01 | 20.01 | 0.82 |
| GENERAL UTILITIES | 0.37 | 2.10 | 2.47 | 4.58 | 25.93 | 30.50 | 1.26 |
| OTHERS | 0.30 | 1.72 | 2.02 | 3.74 | 21.20 | 24.95 | 1.03 |
| SUB - TOTAL | 1.32 | 7.51 | 8.83 | 16.36 | 92.69 | 109.05 | 4.49 |
| 5.PRODUCTION EQUIPMENT AND MATERIALS | | | | | | | |
| AMMONIA UNIT | 17.42 | 13.77 | 31.19 | 215.14 | 170.06 | 385.20 | 15.85 |
| UREA UNIT | 7.74 | 8.64 | 16.38 | 95.59 | 106.70 | 202.29 | 8.32 |
| UTILITIES & OFFSITES | 12.75 | 13.12 | 25.87 | 157.49 | 162.00 | 319.49 | 13.14 |
| CATAL.& CHEMICALS | 1.69 | 0.36 | 2.05 | 20.87 | 4.45 | 25.32 | 1.04 |
| INFRASTRUCTURE | 1.11 | 3.34 | 4.45 | 13.74 | 41.22 | 54.96 | 2.26 |
| RADIO & TELEPHONE | 0.18 | 0.40 | 0.59 | 2.28 | 5.00 | 7.29 | 0.30 |
| MISC. FOR CONSTRUCTION | 1.22 | 3.66 | 4.88 | 15.07 | 45.20 | 60.27 | 2.48 |
| SUB - TOTAL | 42.12 | 43.29 | 85.41 | 520.18 | 534.63 | 1054.81 | 43.40 |
| 6.MISCELLANEOUS EQUIP. AND SPARES! | | | | | | | |
| MAINTENANCE EQUIP. | 0.64 | 0.71 | 1.34 | 7.84 | 8.71 | 16.55 | 0.68 |
| LABORATORY | 0.08 | 0.23 | 0.31 | 0.96 | 2.87 | 3.83 | 0.16 |
| SPARES | 4.32 | 3.00 | 7.32 | 53.35 | 37.05 | 90.40 | 3.72 |
| OFFICE EQUIP. | 0.04 | 0.12 | 0.16 | 0.49 | 1.48 | 1.98 | 0.08 |
| VEHICLES | 0.07 | 0.21 | 0.28 | 0.86 | 2.59 | 3.46 | 0.14 |
| AMMONIA TANK CARS | 1.10 | 3.31 | 4.41 | 13.62 | 40.85 | 54.46 | 2.24 |
| UREA RAIL CARS | 0.58 | 1.72 | 2.30 | 7.10 | 21.30 | 28.40 | 1.17 |
| SUB - TOTAL | 6.82 | 9.30 | 16.12 | 84.23 | 114.85 | 199.08 | 8.19 |
| 7.PLANT CONSTRUCTION | 4.17 | 23.66 | 27.83 | 51.56 | 292.15 | 343.70 | 14.14 |
| 8.SERVICES | | | | | | | |
| PRELIMINARY STUDIES | 0.00 | 0.28 | 0.28 | 0.00 | 3.46 | 3.46 | 0.14 |
| ENG. & LICENSES | 7.40 | 5.75 | 13.15 | 91.39 | 71.01 | 162.40 | 6.68 |
| TECHNICAL ASSIST. | 1.70 | 4.89 | 6.59 | 20.99 | 60.39 | 81.39 | 3.35 |
| SUB - TOTAL | 9.10 | 10.92 | 20.02 | 112.38 | 134.86 | 247.25 | 10.17 |
| 9.FREIGHT & INSURANCE | 5.58 | 2.63 | 8.21 | 68.88 | 32.51 | 101.39 | 4.17 |
| 10.ADMIN. SUPPORT | 0.00 | 13.49 | 13.49 | 0.00 | 166.60 | 166.60 | 6.85 |
| 11.PREOPERATING EXP. | 0.00 | 2.89 | 2.89 | 0.00 | 35.69 | 35.69 | 1.47 |
| BASIC COST EST. (BCE) | 70.38 | 126.43 | 196.81 | 869.22 | 1561.38 | 2430.60 | 100.00 |
| PHYSICAL CONTINGENCIES | 6.14 | 10.98 | 17.12 | 75.83 | 135.55 | 211.38 | 8.70 |
| PRICE ESCALATION | 7.79 | 21.40 | 29.19 | 96.26 | 264.23 | 360.49 | 13.64 |
| SUB - TOTAL | 84.32 | 158.80 | 243.11 | 1041.31 | 1961.16 | 3002.46 | 0.00 |
| INTEREST DURING CONSTR. | 17.59 | 7.76 | 25.35 | 217.20 | 95.89 | 313.09 | 0.00 |
| WORKING CAPITAL | 0.00 | 14.95 | 14.95 | 0.00 | 184.63 | 184.63 | 0.00 |
| TOTAL FINANCING REQUIRED | 101.90 | 181.51 | 283.42 | 1258.51 | 2241.68 | 3500.18 | 0.00 |

INDUSTRIAL PROJECTS DEPARTMENT
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BRAZIL - SERGIPE FERTILIZER PROJECT

CAPITAL COST SUMMARY

| | (MILLION US $) IMPORTS | ICB LOC. | LOCAL | TOTAL | (MILLION CRUZEIROS) IMPORTS | ICB LOC. | LOCAL | TOTAL | % |
|---|---|---|---|---|---|---|---|---|---|
| 1.LAND,SITE PREPARATION | 0.00 | 0.00 | 5.57 | 5.57 | 0.00 | 0.00 | 68.79 | 68.79 | 2.83 |
| 2.INFRASTRUCTURE | | | | | | | | | |
| WATER PIPELINE | 0.00 | 0.00 | 2.15 | 2.15 | 0.00 | 0.00 | 26.55 | 26.55 | 1.09 |
| RAILLINK | 0.00 | 0.00 | 1.46 | 1.46 | 0.00 | 0.00 | 18.03 | 18.03 | 0.74 |
| SUB - TOTAL | 0.00 | 0.00 | 3.61 | 3.61 | 0.00 | 0.00 | 44.58 | 44.58 | 1.83 |
| 3.GENERAL CIVIL WORKS | 0.00 | 0.00 | 4.83 | 4.83 | 0.00 | 0.00 | 59.65 | 59.65 | 2.45 |
| 4.PLANT CIVIL WORKS | | | | | | | | | |
| AMMONIA UNIT | 0.00 | 0.00 | 2.72 | 2.72 | 0.00 | 0.00 | 33.59 | 33.59 | 1.38 |
| UREA UNIT | 0.00 | 0.00 | 1.62 | 1.62 | 0.00 | 0.00 | 20.01 | 20.01 | 0.82 |
| GENERAL UTILITIES | 0.00 | 0.00 | 2.47 | 2.47 | 0.00 | 0.00 | 30.50 | 30.50 | 1.26 |
| OTHERS | 0.00 | 0.00 | 2.02 | 2.02 | 0.00 | 0.00 | 24.95 | 24.95 | 1.03 |
| SUB - TOTAL | 0.00 | 0.00 | 8.83 | 8.83 | 0.00 | 0.00 | 109.05 | 109.05 | 4.49 |
| 5.PRODUCTION EQUIPMENT AND MATERIALS | | | | | | | | | |
| AMMONIA UNIT | 12.83 | 1.05 | 17.31 | 31.19 | 158.45 | 12.97 | 213.78 | 385.20 | 15.85 |
| UREA UNIT | 4.86 | 0.63 | 10.89 | 16.38 | 60.02 | 7.78 | 134.49 | 202.29 | 8.32 |
| UTILITIES & OFFSITES | 8.38 | 0.21 | 17.28 | 25.87 | 103.49 | 2.59 | 213.41 | 319.49 | 13.14 |
| CATAL.& CHEMICALS | 1.57 | 0.00 | 0.48 | 2.05 | 19.39 | 0.00 | 5.93 | 25.32 | 1.04 |
| INFRASTRUCTURE | 0.00 | 0.00 | 4.45 | 4.45 | 0.00 | 0.00 | 54.96 | 54.96 | 2.26 |
| RADIO & TELEPHONE | 0.05 | 0.00 | 0.54 | 0.59 | 0.62 | 0.00 | 6.67 | 7.29 | 0.30 |
| MISC. FOR CONSTRUCTION | 0.00 | 0.00 | 4.88 | 4.88 | 0.00 | 0.00 | 60.27 | 60.27 | 2.48 |
| SUB - TOTAL | 27.69 | 1.89 | 55.83 | 85.41 | 341.97 | 23.34 | 689.50 | 1054.81 | 43.40 |
| 6.MISCELLANEOUS EQUIP. AND SPARES: | | | | | | | | | |
| MAINTENANCE EQUIP. | 0.40 | 0.00 | 0.94 | 1.34 | 4.94 | 0.00 | 11.61 | 16.55 | 0.68 |
| LABORATORY | 0.00 | 0.00 | 0.31 | 0.31 | 0.00 | 0.00 | 3.83 | 3.83 | 0.16 |
| SPARES | 3.32 | 0.60 | 3.40 | 7.32 | 41.00 | 7.41 | 41.99 | 90.40 | 3.72 |
| OFFICE EQUIP. | 0.00 | 0.00 | 0.16 | 0.16 | 0.00 | 0.00 | 1.98 | 1.98 | 0.08 |
| VEHICLES | 0.00 | 0.00 | 0.28 | 0.28 | 0.00 | 0.00 | 3.46 | 3.46 | 0.14 |
| AMMONIA TANK CARS | 0.00 | 4.41 | 0.00 | 4.41 | 0.00 | 54.46 | 0.00 | 54.46 | 2.24 |
| UREA RAIL CARS | 0.00 | 2.30 | 0.00 | 2.30 | 0.00 | 28.40 | 0.00 | 28.40 | 1.17 |
| SUB - TOTAL | 3.72 | 7.31 | 5.09 | 16.12 | 45.94 | 90.28 | 62.86 | 199.08 | 8.19 |
| 7.PLANT CONSTRUCTION | 0.00 | 0.00 | 27.83 | 27.83 | 0.00 | 0.00 | 343.70 | 343.70 | 14.14 |
| 8.SERVICES | | | | | | | | | |
| PRELIMINARY STUDIES | 0.00 | 0.00 | 0.28 | 0.28 | 0.00 | 0.00 | 3.46 | 3.46 | 0.14 |
| ENG. & LICENSES | 7.40 | 0.00 | 5.75 | 13.15 | 91.39 | 0.00 | 71.01 | 162.40 | 6.68 |
| TECHNICAL ASSIST. | 1.70 | 0.00 | 4.89 | 6.59 | 20.99 | 0.00 | 60.39 | 81.39 | 3.35 |
| SUB - TOTAL | 9.10 | 0.00 | 10.92 | 20.02 | 112.38 | 0.00 | 134.86 | 247.25 | 10.17 |
| 9.FREIGHT & INSURANCE | 4.70 | 0.46 | 3.05 | 8.21 | 58.04 | 5.68 | 37.67 | 101.39 | 4.17 |
| 10.ADMIN. SUPPORT | 0.00 | 0.00 | 13.49 | 13.49 | 0.00 | 0.00 | 166.60 | 166.60 | 6.85 |
| 11.PREOPERATING EXP. | 0.00 | 0.00 | 2.89 | 2.89 | 0.00 | 0.00 | 35.69 | 35.69 | 1.47 |
| BASIC COST EST. (BCE) | 45.21 | 9.66 | 141.94 | 196.81 | 558.34 | 119.30 | 1752.96 | 2430.60 | 100.00 |
| PHYSICAL CONTINGENCIES | 3.61 | 0.97 | 12.54 | 17.12 | 44.60 | 11.93 | 154.85 | 211.38 | 8.70 |
| PRICE ESCALATION | 3.95 | 0.93 | 24.31 | 29.19 | 48.74 | 11.50 | 300.25 | 360.49 | 13.64 |
| SUB - TOTAL | 52.77 | 11.56 | 178.79 | 243.11 | 651.68 | 142.73 | 2208.06 | 3002.46 | 0.00 |
| INTEREST DURING CONSTR. | 17.59 | 0.00 | 7.76 | 25.35 | 217.20 | 0.00 | 95.89 | 313.09 | 0.00 |
| WORKING CAPITAL | 0.00 | 0.00 | 14.95 | 14.95 | 0.00 | 0.00 | 184.63 | 184.63 | 0.00 |
| TOTAL FINANCING REQUIRED | 70.35 | 11.56 | 201.50 | 283.42 | 868.88 | 142.73 | 2488.58 | 3500.18 | 0.00 |

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BRAZIL - SERGIPE FERTIL. ..R PROJECT

PHYSICAL CONTINGENCY SCHEDULE

(MILLION US $)

| | PERCENTAGES | | | AMOUNTS | | | |
|---|---|---|---|---|---|---|---|
| | IMPORTS | ICB LOC. | LOCAL | IMPORTS | ICB LOC. | LOCAL | TOTAL |
| 1.LAND,SITE PREPARATION | 5.00 | 5.00 | 5.00 | 0.00 | 0.00 | 0.28 | 0.28 |
| WATER PIPELINE | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.21 | 0.21 |
| RAILLINK | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.15 | 0.15 |
| 3.GENERAL CIVIL WORKS | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.48 | 0.48 |
| AMMONIA UNIT | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.27 | 0.27 |
| UREA UNIT | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.16 | 0.16 |
| GENERAL UTILITIES | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.25 | 0.25 |
| OTHERS | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.20 | 0.20 |
| AMMONIA UNIT | 10.00 | 10.00 | 10.00 | 1.28 | 0.11 | 1.73 | 3.12 |
| UREA UNIT | 10.00 | 10.00 | 10.00 | 0.49 | 0.06 | 1.09 | 1.64 |
| UTILITIES & OFFSITES | 10.00 | 10.00 | 10.00 | 0.84 | 0.02 | 1.73 | 2.59 |
| CATAL.& CHEMICALS | 10.00 | 10.00 | 10.00 | 0.16 | 0.00 | 0.05 | 0.21 |
| INFRASTRUCTURE | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.45 | 0.45 |
| RADIO & TELEPHONE | 10.00 | 10.00 | 10.00 | 0.01 | 0.00 | 0.05 | 0.06 |
| MISC. FOR CONSTRUCTION | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.49 | 0.49 |
| MAINTENANCE EQUIP. | 10.00 | 10.00 | 10.00 | 0.04 | 0.00 | 0.09 | 0.13 |
| LABORATORY | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.03 | 0.03 |
| SPARES | 10.00 | 10.00 | 10.00 | 0.33 | 0.06 | 0.34 | 0.73 |
| OFFICE EQUIP. | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.02 | 0.02 |
| VEHICLES | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.03 | 0.03 |
| AMMONIA TANK CARS | 10.00 | 10.00 | 10.00 | 0.00 | 0.44 | 0.00 | 0.44 |
| UREA RAIL CARS | 10.00 | 10.00 | 10.00 | 0.00 | 0.23 | 0.00 | 0.23 |
| 7.PLANT CONSTRUCTION | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 2.78 | 2.78 |
| PRELIMINARY STUDIES | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ENG. & LICENSES | 0.00 | 0.00 | 10.00 | 0.00 | 0.00 | 0.58 | 0.58 |
| TECHNICAL ASSIST. | 0.00 | 0.00 | 10.00 | 0.00 | 0.00 | 0.49 | 0.49 |
| 9.FREIGHT & INSURANCE | 10.00 | 10.00 | 10.00 | 0.47 | 0.05 | 0.31 | 0.82 |
| 10.ADMIN. SUPPORT | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 11.PREOPERATING EXP. | 10.00 | 10.00 | 10.00 | 0.00 | 0.00 | 0.29 | 0.29 |
| TOTAL PHYS. CONTINGENCY | 0.00 | 0.00 | 0.00 | 3.61 | 0.97 | 12.54 | 17.12 |

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ANNEX 5-1
Table 3

BRAZIL - SERGIPE FERTILIZER PROJECT

PRICE ESCALATION SCHEDULE

| | ESCALATION TYPE | | | NUMBER OF MONTHS | | | MULTIPLIER | | | ESCALATION AMOUNTS (MILLION US $) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | IMPORTS | ICB LOC. | LOCAL | TOTAL |
| 1.LAND,SITE PREPARATION | 2 | 2 | 2 | 2 | 2 | 2 | 1.02 | 1.02 | 1.02 | 0.00 | 0.00 | 0.11 | 0.11 |
| WATER PIPELINE | 2 | 2 | 2 | 19 | 19 | 19 | 1.20 | 1.20 | 1.20 | 0.00 | 0.00 | 0.46 | 0.46 |
| RAILLINK | 2 | 2 | 2 | 19 | 19 | 19 | 1.20 | 1.20 | 1.20 | 0.00 | 0.00 | 0.32 | 0.32 |
| 3.GENERAL CIVIL WORKS | 2 | 2 | 2 | 19 | 19 | 19 | 1.20 | 1.20 | 1.20 | 0.00 | 0.00 | 1.04 | 1.04 |
| AMMONIA UNIT | 2 | 2 | 2 | 19 | 19 | 19 | 1.20 | 1.20 | 1.20 | 0.00 | 0.00 | 0.59 | 0.59 |
| UREA UNIT | 2 | 2 | 2 | 19 | 19 | 19 | 1.20 | 1.20 | 1.20 | 0.00 | 0.00 | 0.35 | 0.35 |
| GENERAL UTILITIES | 2 | 2 | 2 | 19 | 19 | 19 | 1.20 | 1.20 | 1.20 | 0.00 | 0.00 | 0.53 | 0.53 |
| OTHERS | 2 | 2 | 2 | 19 | 19 | 19 | 1.20 | 1.20 | 1.20 | 0.00 | 0.00 | 0.44 | 0.44 |
| AMMONIA UNIT | 1 | 1 | 1 | 12 | 12 | 12 | 1.08 | 1.08 | 1.08 | 1.13 | 0.09 | 1.52 | 2.74 |
| UREA UNIT | 1 | 1 | 1 | 12 | 12 | 12 | 1.08 | 1.08 | 1.08 | 0.43 | 0.06 | 0.96 | 1.45 |
| UTILITIES & OFFSITES | 1 | 1 | 1 | 12 | 12 | 12 | 1.08 | 1.08 | 1.08 | 0.74 | 0.02 | 1.52 | 2.28 |
| CATAL.& CHEMICALS | 1 | 1 | 1 | 12 | 12 | 12 | 1.08 | 1.08 | 1.08 | 0.14 | 0.00 | 0.04 | 0.18 |
| INFRASTRUCTURE | 1 | 1 | 1 | 12 | 12 | 12 | 1.08 | 1.08 | 1.08 | 0.00 | 0.00 | 0.39 | 0.39 |
| RADIO & TELEPHONE | 1 | 1 | 1 | 12 | 12 | 12 | 1.08 | 1.08 | 1.08 | 0.00 | 0.00 | 0.05 | 0.05 |
| MISC. FOR CONSTRUCTION | 1 | 1 | 1 | 12 | 12 | 12 | 1.08 | 1.08 | 1.08 | 0.00 | 0.00 | 0.43 | 0.43 |
| MAINTENANCE EQUIP. | 1 | 1 | 1 | 15 | 15 | 15 | 1.10 | 1.10 | 1.10 | 0.04 | 0.00 | 0.10 | 0.14 |
| LABORATORY | 1 | 1 | 1 | 15 | 15 | 15 | 1.10 | 1.10 | 1.10 | 0.00 | 0.00 | 0.03 | 0.03 |
| SPARES | 1 | 1 | 1 | 15 | 15 | 15 | 1.10 | 1.10 | 1.10 | 0.37 | 0.07 | 0.38 | 0.82 |
| OFFICE EQUIP. | 1 | 1 | 1 | 15 | 15 | 15 | 1.10 | 1.10 | 1.10 | 0.00 | 0.00 | 0.02 | 0.02 |
| VEHICLES | 1 | 1 | 1 | 15 | 15 | 15 | 1.10 | 1.10 | 1.10 | 0.00 | 0.00 | 0.03 | 0.03 |
| AMMONIA TANK CARS | 1 | 1 | 1 | 12 | 12 | 12 | 1.08 | 1.08 | 1.08 | 0.00 | 0.39 | 0.00 | 0.39 |
| UREA RAIL CARS | 1 | 1 | 1 | 12 | 12 | 12 | 1.08 | 1.08 | 1.08 | 0.00 | 0.20 | 0.00 | 0.20 |
| 7.PLANT CONSTRUCTION | 2 | 2 | 2 | 30 | 30 | 30 | 1.33 | 1.33 | 1.33 | 0.00 | 0.00 | 10.03 | 10.03 |
| PRELIMINARY STUDIES | 1 | 1 | 1 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ENG. & LICENSES | 1 | 1 | 1 | 0 | 0 | 22 | 0.00 | 0.00 | 1.15 | 0.00 | 0.00 | 0.96 | 0.96 |
| TECHNICAL ASSIST. | 1 | 1 | 1 | 0 | 0 | 22 | 0.00 | 0.00 | 1.15 | 0.00 | 0.00 | 0.82 | 0.82 |
| 9.FREIGHT & INSURANCE | 1 | 1 | 1 | 30 | 30 | 30 | 1.21 | 1.21 | 1.21 | 1.10 | 0.11 | 0.71 | 1.92 |
| 10.ADMIN. SUPPORT | 1 | 1 | 1 | 18 | 18 | 18 | 1.12 | 1.12 | 1.12 | 0.00 | 0.00 | 1.65 | 1.65 |
| 11.PREOPERATING EXP. | 1 | 1 | 1 | 36 | 36 | 36 | 1.26 | 1.26 | 1.26 | 0.00 | 0.00 | 0.83 | 0.83 |
| TOTAL PRICE ESCALATION | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00 | 0.00 | 3.95 | 0.93 | 24.31 | 29.19 |

| | NUMBER OF PERIODS | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| MONTHS PER PERIOD | 12.0000 | 12.0000 | 12.0000 | 12.0000 | 12.0000 |
| YEARLY ESCALATION FACTOR BY TYPE: | | | | | |
| 1 | 8.0000 | 8.0000 | 8.0000 | 8.0000 | 8.0000 |
| 2 | 12.0000 | 12.0000 | 12.0000 | 12.0000 | 12.0000 |

INDUSTRIAL PROJECTS DEPARTMENT
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# BRAZIL - SERGIPE FERTILIZER PROJECT

## INITIAL WORKING CAPITAL

| | | | Million US $ |
|---|---|---|---|
| A. | **Accounts Receivable (30 Day's Output)** | | |
| | Urea : 33,000 Tons at US$205/Ton | | 6.77 |
| | Ammonia : 8,070 Tons at US$205/Ton | | 1.65 |
| | | Sub-total | 8.42 |
| B. | **Finished Goods and Ammonia Inventory At Production Cost, Excluding Depreciation** | | |
| | Urea : 66,000 Tons (60 Day's Output) at US$ 76.4/Ton | | 5.04 |
| | Ammonia : 8,070 Tons (30 Days's Output) at US$74.1/Ton | | 0.60 |
| | | Sub-total | 5.64 |
| C. | **Raw Material Inventory (30 Day's Consumption)** | | |
| | Vacuum Gas Oil 10,000 Tons at US$58.4/$M^3$ | | 0.58 |
| | Bunker C 5,000 Tons at US$49.2/Ton | | 0.25 |
| | Catalyst & Chemicals | | 0.21 |
| | Bags 462,000 at US$0.37/Bag | | 0.17 |
| | | Sub-total | 1.21 |
| D. | **Minimum Cash (1/12 of Annual Fixed Cost Excluding Depreciation)** | | 1.67 |
| E. | **Accounts Payable (30 Day's Raw Materials)** | | |
| | Vacuum Gas Oil 10,000 Tons at US$58.4/$M^3$ | | 0.58 |
| | Bunker C 5,400 Tons at US$49.2/Ton | | 0.27 |
| | Natural Gas 18.84 MM $M^3$ at US$29.6/1000 $M^3$ | | 0.56 |
| | Electricity 5.5 MM Kwh at US$0.02/Kwh | | 0.11 |
| | Catalyst/Chemicals | | 0.21 |
| | Bags 462,000 at US$0.37/Bag | | 0.17 |
| | | Sub-Total | 1.34 |
| F. | **Short-Term Loans (60% of Accounts Receivables)** | | 5.00 |
| G. | Initial Working Capital (in 1976 Constant Dollars) | | 10.60 |
| H. | Escalated initial Working Capital to 1981 Dollars (Plus 41%) | | 14.95 |

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## ESTIMATED QUARTERLY DISBURSEMENT OF BANK LOAN

| Calendar Year/Quarter | | Disbursed During Period (US$ Million) | Cumulative Disbursement (US$ Million) | % |
|---|---|---|---|---|
| 1977 | I | - | - | |
| | II | - | - | |
| | III | 2.5 | 2.5 | 3.9 |
| | IV | 1.2 | 3.7 | 5.8 |
| 1978 | I | 4.3 | 8.0 | 12.5 |
| | II | 6.0 | 14.0 | 21.9 |
| | III | 7.0 | 21.0 | 32.8 |
| | IV | 8.0 | 29.0 | 45.3 |
| 1979 | I | 8.0 | 37.0 | 57.8 |
| | II | 8.0 | 45.0 | 70.3 |
| | III | 6.0 | 51.0 | 79.7 |
| | IV | 4.0 | 55.0 | 85.9 |
| 1980 | I | 4.0 | 59.0 | 92.2 |
| | II | 3.0 | 62.0 | 96.9 |
| | III | 1.0 | 63.0 | 98.4 |
| | IV | 1.0 | 64.0 | 100.0 |
| | | 64.0 | | |

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# BRAZIL - SERGIPE FERTILIZER ALLOCATION

## PROPOSED ALLOCATION OF BANK LOAN

| | Category | Amount of Loan Allocated (US$ Millions) | % of Expenditures to be Financed |
|---|---|---|---|
| I. | Equipment, Materials, Railcars and Spare Parts | 50.0 | 100% of foreign expenditures or 100% of the ex-factory cost of goods manufactured in Brazil |
| II. | Foreign Engineering Services | 9.1 | 100% of foreign expenditures |
| III. | Unallocated | 4.9 | |
| | TOTAL | 64.0 | |

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# BRAZIL - SERGIPE FERTILIZER PROJECT

## ASSUMPTIONS USED IN THE FINANCIAL ANALYSIS OF THE PROJECT

### A. Inflation Accounting

1. Brazil has been forced to cope with considerable rates of inflation over the past two decades. In 1964 it promulgated a system of 'monetary corrections and flexible exchange rates' to obtain better control over rising inflation rates. The 'Brazilian Model' worked satisfactory until the oil crisis provoked a sudden push of imported inflation in early 1974 which let inflation rates rise up to a level of about 40% p.a.

2. To avoid unnecessary distortions as a result of an uncertain development of Brazil's inflation and to facilitate comparisons with other similar projects it was decided to express all financial projections in current US Dollars. Assuming that the policy of the Government taken in the past to adjusting the foreign exchange value of the Cruzeiro according to the difference of domestic and international inflation rates will continue, the following inflation rates were applied within the financial analysis:

| Year | International Price Inflation % | Inflation Rate % Mid Year | Inflation Rate % End of Year |
|---|---|---|---|
| 1976 | 9 | 0 | 4.5 |
| 1977 | 8 | 8.5 | 8.0 |
| 78 | 8 | 8.0 | 8.0 |
| 79 | 8 | 8.0 | 8.0 |
| 80 | 7 | 7.5 | 7.0 |
| 81-93 | 7 | 7.0 | 7.0 |

3. Since the formulation of the monetary correction system in 1964 a series of laws and decrees were introduced regulating the use of the monetary correction factors within the financial statements of companies. These regulations - especially in respect of income tax purposes - change from time to time, as the federal authorities wish to stimulate or to depress internal expansion and savings. For the purpose of the financial projections the latest accounting rules were applied, with the difference that instead of the domestic 'monetary correction factor' the international inflation rate as 'indexing factor' was used.

4. According to Brazil's accounting principles, fixed assets as well as local long-term loans are subject to monetary adjustments and are indexed respectively. The difference between the reevaluation 1/

1/ For reasons of simplification, a reevaluation of total fixed assets at every year's end is assumed whereas Brazil's accounting rules allow only the application of indexation starting with the year following the acquisition.

of fixed assets and of the local long-term loans is added to equity to restore the balance between the asset and liability side. Since the financial projections are expressed in current US$ there is no need to consider adjustments reflecting increases of principle repayments for foreign loans due to changes in the exchange rate. In accordance with the present accounting procedures applied by Petrobras, no provisions for indexation of working capital are made.

5. The computation of the indexed values in the fixed assets schedule (Annex 6-3 Table1) and debt service schedule (Annex 6-3 Table 2) is done in the following way: All expenses and incoming funds were discounted into terms of constant Dollars of mid-1976 and afterwards inflated to current US Dollars. For assets, the end-of-year index is used whereas for outstanding debts, the mid-year index is applied.

B. Revenues

6. So far, FERTILIZANTES has not developed a detailed pricing policy for its fertilizer products. However, in principle the company is committed to two main considerations. First, since FERTILIZANTES intends to sell shares to the private sector, prices have to be high enough to generate sufficient profits and dividends to make the company attractive for private investors. Second, FERTILIZANTES has a mandate from the Government to produce and sell fertilizer materials at stable prices comparable to those prevailing in the international market. The Bank's long-range international price forecast shows in constant terms of 1976 an FOB price range between US$165 and US$171 per ton of bagged urea 1/ for the years 1980 and 1985 respectively. From an international FOB price of US$171 per ton of bagged urea an ex-factory price for bulk urea of US$205 per ton in constant 1976 dollars can be determined which would gratify both requirements mentioned above and which is deduced as follows:

| Urea (46% N) | Constant 1976 US$/Ton |
|---|---|
| FOB Price (bagged) | 171 |
| Freight & Insurance | 25 |
| CIF Price | 196 |
| Port Handling & Other Charges | 20 |
| Landed Price | 216 |
| Less: Bagging Cost | 11 |
| Bulk Price ex-Factory | 205 |
| Shipping Cost to Center Region | 30 |
| Ex-Factory Price, for bulk urea shipments to the Center Region | 175 |

1/ Price Forecasts for Major Primary Commodities, Bank Report No. 814/76, June, 1976

7. Ammonia is assumed to have a 1:1 price relationship to urea (bulk) reflecting that the production costs of N in ammonia are about 55% of the production cost of N in urea. Consequently, a sales price for surplus ammonia of US$205 and US$175 is estimated for deliveries to the Northeast and Center Region, respectively.

C. Operating Costs

8. It is assumed that the plant will start commercial operations by January 1981. During the first twelve months a 70% utilization of capacity is assumed which will increase to 80 and 90% in the second and third twelve months period respectively and will stay constant thereafter. A 90% utilization corresponds to the following production volumes if 330 operating days/year are considered at 100% capacity utilization (leaving 35 days per year for scheduled maintenance):

| | Daily Capacity in tons | Yearly Production at a 90% Capacity Utilization in Thousand Tons |
|---|---|---|
| Ammonia | 907 | 296.4 |
| Surplus Ammonia to be sold | 269 | 79.9 |
| Urea | 1,100 | 326.7 |

9. All the operating costs as shown in Annex 6-2 are calculated on the basis of 1976 prices. The resulting operating cost estimated for ammonia and urea are then escalated with the international inflation index to the respective year when they enter the projected income statement (Annex 6-3 Table 3)

10. The prices for feedstock and fuel ex-pipeline or ex-distribution terminal used in the financial analysis are based on the information given by the 'Consejo Nacional de Petroleo' taking into account the most recent price increase which took place July 1, 1976.

| | Up to June 30 | Beginning with July 1 | |
|---|---|---|---|
| | CR$ | CR$ | US$ |
| Natural Gas/MSCF | 7.42 | 9.06 | 0.84 |
| Natural Gas/$Mm^3$ | 262 | 319 | 29.65 |
| Vacuum Gas Oil/Ton | 440 | 630 | 58.4 |
| Bunker C/Ton | 364 | 530 | 49.2 |

11. The price for electrical power varies slightly with the amount of consumption, since part of the power costs are charged on a fixed monthly basis independently of the amount of consumed KWHs. Based on the demand forecasts of electrical power at a 90% capacity utilization, the price per KWH amounts to US$0.02.

12. The water will be supplied from the Sao Francisco River through a water pipeline which will provide the town of Aracaju as well as the project with sufficient quantities. Most likely FERTILIZANTES will participate in the financing of the pipeline cost with an amount of US$8.6 million and will receive in return the required water quantities at the preferential rate of US$0.17 per cubic meter.

13. To bag its urea output, the Sergipe plant will use domestically produced 50 kg polyethelene bags. The mid-1976 price for this kind of bag was Cr$ 4.0. In spite of the plant being equipped with facilities which allow the bagging of 100% of the urea output, it is assumed that only 70% of urea will be delivered in bags. During the first four years of operation approximately 30% of the urea output will be sent to the Center as bulk. In 1985 practically no shipments from the Sergipe plant to the Center will take place. However, by that time a considerable part of the urea customers (bulkblenders, mixers, cooperatives and wholesalers) should have installed facilities to handle bulk urea.

14. At present 85% of all fertilizers are carried by road transport in the Northeast. But it is the explicit plan of the Government to shift as much traffic as possible to rail transport. Since it is the policy of RFFSA (the federal railroad company) to provide only rolling stock which can be used for multi-purposes (locomotives and box cars for bagged urea) FERTILIZANTES has to acquire its own rail cars for ammonia/urea (bulk) transport. The project includes some 110 wagons at an estimated cost of US$8 million. These cars will be financed by FERTILIZANTES, which will recover its investment by reduced tariffs.

15. The annual depreciation 1/ in terms of 1976 prices is calculated as per the table below:

| | In Constant 1976 US$ | At Acquisition Cost |
|---|---|---|
| | - in US$ Million - | |
| Total Financing Required | 217.7 | 283.4 |
| Non Depreciable Assets: | | |
| - Land and Improvements | 5.3 | 6.0 |
| - Spare Parts | 7.1 | 8.9 |
| - Permanent Working Capital | 10.6 | 15.0 |
| Sub-total | 23.0 | 29.9 |
| Depreciable Assets | 194.7 | 253.5 |
| - Water Pipeline | 7.1 | 8.6 |
| - Rail Cars | 6.5 | 8.0 |
| Depreciable Assets without Water Pipeline and Rail Cars | 181.1 | 236.9 |
| Annual Depreciation: | | |
| - Straight Line, 12 years | 15.1 | 19.7 |

1/ For the purpose of financial projections the annual depreciations are also subject to monetary adjustments.

16. The project is expected to have the following structure of employment:

| | Number of Employees |
|---|---|
| a) Operating Directors | 3 |
| b) Administrative Staff | 156 |
| c) Technical Staff | 112 |
| d) Factory Staff | 113 |
| Total | 384 |

17. At an average salary of US$1,000 per month, the estimated yearly payroll is US$4.6 million.

18. Cost of maintenance is assumed to be about 2.6% of the capitalized value of the plant.

19. To estimate product costs for ammonia and urea, operating costs have been estimated for each cost center including the production units for ammonia and urea and all utilities. The variable and fixed costs (except for general overhead) of utilities have been allocated to the production units according to the demand for the services provided by the utilities to the production units. The costs of general overhead facilities were allocated to the ammonia and urea unit on the basis of their capital cost ratio (60/40).

20. Projections of FERTILIZANTES' debt (Annex 6-3, Table 2) include a local loan of US$78.3 million equivalent of which US$71 million is expected to come from BNDE and the remaining US$7.3 million from PETROBRAS.

D. Financial Return

21. Annex 6-4 gives a breakdown of the project's revenue and cost streams and summarizes the results of the sensitivity tests: the financial return is 18.6% before and 15% after taxes.

Industrial Project Department
March 1977

BRAZIL - SERGIPE FERTILIZER PROJECT
PRODUCTION COST ESTIMATE AT 90% CAPACITY UTILIZATION
(IN CONSTANT 1976 US$)

| | UNITS/TONS OF PRODUCT | FINANCIAL COSTS US$/UNIT | ECONOMIC COSTS US$/UNIT | FINANCIAL COSTS US$/TONS | FINANCIAL COSTS MM US$/YEAR | ECONOMIC COSTS US$/TON | ECONOMIC COSTS MM US$/YEAR |
|---|---|---|---|---|---|---|---|
| A. A M M O N I A | | | | | | | |
| 1.VARIABLE COSTS | | | | | | | |
| NATURAL GAS (CU. METERS) | 692.60 | 0.03 | 0.04 | 20.50 | 5.52 | 28.40 | 7.65 |
| VACUUM GAS OIL (TONS) | 0.37 | 58.40 | 86.00 | 21.32 | 5.74 | 31.39 | 8.46 |
| RAW WATER (CU. METERS) | 10.40 | 0.07 | 0.06 | 0.73 | 0.20 | 0.58 | 0.16 |
| POWER - (KWH) | 33.40 | 0.02 | 0.02 | 0.67 | 0.18 | 0.53 | 0.14 |
| CHEMICALS | - | - | - | 5.31 | 1.43 | 4.53 | 1.22 |
| SUB-TOTAL | - | - | - | 48.53 | 13.07 | 65.43 | 17.63 |
| 2.FIXED COSTS | | | | | | | |
| SALARIES | - | - | - | 9.65 | 2.60 | 7.80 | 2.10 |
| MAINTENANCE MATERIALS | - | - | - | 13.36 | 3.60 | 8.91 | 2.40 |
| DEPRECIATION | - | - | - | 30.81 | 8.30 | - | - |
| OTHERS | - | - | - | 2.60 | 0.70 | 2.08 | 0.56 |
| SUB-TOTAL | - | - | - | 56.42 | 15.20 | 18.79 | 5.06 |
| 3.TOTAL AMMONIA COSTS | - | - | - | 104.95 | 28.27 | 84.22 | 22.69 |
| B. U R E A | | | | | | | |
| 1.VARIABLE COSTS | | | | | | | |
| AMMONIA--(VARIABLE COSTS TONS) | 0.58 | 48.53 | 65.43 | 28.15 | 9.20 | 37.95 | 12.40 |
| BUNKER C (TONS) | 0.14 | 49.20 | 73.00 | 6.69 | 2.19 | 9.93 | 3.24 |
| RAW WATER (CU. METERS) | 5.80 | 0.07 | 0.06 | 0.41 | 0.13 | 0.32 | 0.10 |
| POWER -(KWH) | 125.00 | 0.02 | 0.02 | 2.50 | 0.82 | 2.00 | 0.65 |
| BAGS | 14.00 | 0.37 | - | 5.18 | 1.69 | - | - |
| CHEMICALS | - | - | - | 2.05 | 0.67 | 1.74 | 0.57 |
| OTHERS | - | - | - | 0.70 | 0.23 | 0.55 | 0.18 |
| SUB-TOTAL | - | - | - | 45.68 | 14.93 | 52.49 | 17.14 |
| 2.FIXED COSTS | | | | | | | |
| SALARIES | - | - | - | 6.12 | 2.00 | 4.90 | 1.60 |
| MAINTENANCE MATERIALS | - | - | - | 8.26 | 2.70 | 7.44 | 2.43 |
| DEPRECIATION | - | - | - | 20.81 | 6.80 | - | - |
| OTHERS | - | - | - | 1.53 | 0.50 | 1.22 | 0.40 |
| FIXED PORTION OF: | | | | | | | |
| AMMONIA COSTS | - | - | - | 32.72 | 10.69 | 10.90 | 3.56 |
| SUB-TOTAL | - | - | - | 69.44 | 22.69 | 24.46 | 7.99 |
| 3.TOTAL UREA COSTS | - | - | - | 115.12 | 37.62 | 76.95 | 25.13 |
| C. A M M O N I A / U R E A | | | | | | | |
| TOTAL PRODUCTION COSTS | - | - | - | - | 46.01 | - | 31.86 |
| TOTAL VARIABLE COSTS | - | - | - | - | 18.81 | - | 22.37 |
| TOTAL FIXED COST | - | - | - | - | 27.20 | - | 9.49 |

INDUSTRIAL PROJECTS DEPARTMENT
DATE PREPARED:03/14/77

ANNEX 6-2

BRAZIL -SERGIPE FERTILIZER PROJECT
FIXED ASSETS SCHEDULE
(IN MILLION CURRENT US$)

| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|
| TOTAL FINANCING REQUIRED | 14.0 | 85.0 | 212.4 | 283.4 | 283.4 | 283.4 | 283.4 | 283.4 | 283.4 |
| LESS WORKING CAPITAL | - | - | - | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| TOTAL FIXED ASSETS | 14.0 | 85.0 | 212.4 | 268.4 | 268.4 | 268.4 | 268.4 | 268.4 | 268.4 |
| LAND AND IMPROVEMENTS | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 | 6.0 |
| SPARE PARTS | - | 3.0 | 6.0 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 | 8.9 |
| TOTAL NON-DEPRECIABLE ASSETS | 6.0 | 9.0 | 12.0 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 | 14.9 |
| DEPRECIABLE ASSETS | 8.0 | 76.0 | 200.4 | 253.5 | 253.5 | 253.5 | 253.5 | 253.5 | 253.5 |
| REVALUED GROSS ASSETS | 14.5 | 89.4 | 228.8 | 302.9 | 324.0 | 346.7 | 371.0 | 397.1 | 425.0 |
| DEPRECIABLE ASSETS | 8.3 | 79.6 | 215.0 | 285.2 | 305.1 | 326.5 | 349.3 | 373.9 | 400.1 |
| NON-DEPRECIABLE ASSETS | 6.2 | 9.8 | 13.8 | 17.7 | 18.9 | 20.2 | 21.7 | 23.2 | 24.9 |
| ACCUM. REVALUATION SURPLUS | 0.5 | 4.4 | 16.4 | 34.5 | 55.6 | 78.3 | 102.6 | 128.7 | 156.6 |
| DEPRECIABLE ASSETS | 0.3 | 3.6 | 14.6 | 31.7 | 51.6 | 73.0 | 95.8 | 120.4 | 146.6 |
| NON-DEPRECIABLE ASSETS | 0.2 | 0.8 | 1.8 | 2.8 | 4.0 | 5.3 | 6.8 | 8.3 | 10.0 |
| YEARLY REVALUATION SURPLUS | 0.5 | 3.9 | 12.0 | 18.1 | 21.1 | 22.7 | 24.3 | 26.1 | 27.9 |
| DEPRECIABLE ASSETS | 0.3 | 3.3 | 11.0 | 17.1 | 19.9 | 21.4 | 22.8 | 24.6 | 26.2 |
| NON-DEPRECIABLE ASSETS | 0.2 | 0.6 | 1.0 | 1.0 | 1.2 | 1.3 | 1.5 | 1.5 | 1.7 |
| REVALUAED ACCUM.. DEPRECIATION | - | - | - | - | 25.4 | 54.4 | 87.3 | 124.6 | 166.7 |
| REVALUED YEARLY DEPRECIATION | - | - | - | - | 25.4 | 29.0 | 32.9 | 37.3 | 42.1 |
| NET DEPRECIABLE FIXED ASSETS | 8.3 | 79.6 | 215.0 | 285.2 | 279.7 | 272.1 | 262.0 | 249.3 | 233.4 |
| TOTAL NET FIXED ASSETS | 14.5 | 89.4 | 228.8 | 302.9 | 298.6 | 292.3 | 283.7 | 272.5 | 258.3 |

INDUSTRIAL PROJECTS DEPARTMENT
DATE PREPARED:03/15/77

BRAZIL - SERGIPE FERTILIZER PROJECT
DEBT SERVICE SCHEDULE
(IN MILLION CURRENT US$)

| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|
| IBRD-LOAN | | | | | | | | | |
| ANNUAL BORROWINGS | 3.7 | 25.3 | 26.0 | 9.0 | - | - | - | - | - |
| PRINCIPAL REPAYMENT | - | - | - | - | 2.9 | 5.8 | 5.8 | 5.8 | 5.8 |
| ACC. PRINCIPAL REPAYMENT | - | - | - | - | 2.9 | 8.7 | 14.5 | 20.3 | 26.1 |
| AMOUNT OUTSTANDING | 3.7 | 29.0 | 55.0 | 64.0 | 61.1 | 55.3 | 49.5 | 43.7 | 37.9 |
| INTEREST DUE | - | - | - | - | 6.3 | 5.8 | 5.2 | 4.7 | 4.1 |
| DEBT SERVICE | - | - | - | - | 9.2 | 11.6 | 11.0 | 10.5 | 9.9 |
| COFINANCING | | | | | | | | | |
| ANNUAL BORROWINGS | - | 25.0 | - | - | - | - | - | - | - |
| PRINCIPAL REPAYMENT | - | - | - | - | 4.2 | 4.2 | 4.2 | 4.2 | 4.2 |
| ACC. PRINCIPAL REPAYMENT | - | - | - | - | 4.2 | 8.4 | 12.6 | 16.8 | 21.0 |
| AMOUNT OUTSTANDING | - | 25.0 | 25.0 | 25.0 | 20.8 | 16.6 | 12.4 | 8.2 | 4.0 |
| INTEREST DUE | - | - | - | - | 2.3 | 1.9 | 1.5 | 1.0 | 0.6 |
| DEBT SERVICE | - | - | - | - | 6.5 | 6.1 | 5.7 | 5.2 | 4.8 |
| LOCAL LOAN | | | | | | | | | |
| CURRENT ANNUAL BORROWINGS | 4.5 | 34.2 | 38.0 | 1.6 | | | | | |
| CURRENT AMOUNT OUTSTANDING | 4.5 | 38.7 | 76.7 | 78.3 | | | | | |
| IN CONSTANT US$ | | | | | | | | | |
| ANNUAL BORROWINGS | 4.3 | 30.4 | 31.3 | 1.2 | - | - | - | - | - |
| AMOUNT OUTSTANDING START OF YEAR | - | 4.3 | 34.7 | 66.0 | 67.2 | 64.1 | 58.0 | 51.9 | 45.8 |
| PRINCIPAL REPAYMENT | - | - | - | - | 3.1 | 6.1 | 6.1 | 6.1 | 6.1 |
| AMOUNT OUTSTANDING END OF YEAR | 4.3 | 34.7 | 66.0 | 67.2 | 64.1 | 58.0 | 51.9 | 45.8 | 39.7 |
| INTEREST DUE | - | - | - | - | 2.6 | 2.4 | 2.2 | 2.0 | 1.7 |
| DEBT SERVICE | - | - | - | - | 5.7 | 8.5 | 8.3 | 8.1 | 7.8 |
| REVALUED LOCAL | | | | | | | | | |
| AMOUNT OUTSTANDING START OF YEAR | - | 4.6 | 40.5 | 83.1 | 90.6 | 92.4 | 89.5 | 85.7 | 80.9 |
| PRINCIPAL REPAYMENT | - | - | - | - | 4.5 | 9.4 | 10.1 | 10.8 | 11.5 |
| AMOUNT OUTSTANDING END OF YEAR | 4.6 | 40.5 | 83.1 | 90.6 | 92.4 | 89.5 | 85.7 | 80.9 | 75.1 |
| INTEREST DUE | - | - | - | - | 3.7 | 3.7 | 3.6 | 3.5 | 3.2 |
| DEBT SERVICE | - | - | - | - | 8.2 | 13.1 | 13.7 | 14.3 | 14.7 |
| ACCUM. REVALUATION SURPLUS | 0.1 | 1.8 | 6.4 | 12.3 | 18.6 | 25.1 | 31.4 | 37.4 | 43.1 |
| ANNUAL REVALUATION SURPLUS | 0.1 | 1.7 | 4.6 | 5.9 | 6.3 | 6.5 | 6.3 | 6.0 | 5.7 |
| TOTAL PRINCIPAL REPAYMENT | - | - | - | - | 11.6 | 19.4 | 20.1 | 20.8 | 21.5 |
| TOTAL INTEREST DUE | - | - | - | - | 12.3 | 11.4 | 10.3 | 9.2 | 7.9 |
| TOTAL DEBT SERVICE | - | - | - | - | 23.9 | 30.8 | 30.4 | 30.0 | 29.4 |
| TOTAL AMOUNT OUTSTANDING | 8.3 | 94.5 | 163.1 | 179.6 | 174.3 | 161.4 | 147.6 | 132.8 | 117.0 |
| CURRENT PORTION | - | - | - | 11.6 | 19.4 | 20.1 | 20.8 | 21.5 | 22.3 |
| LONG-TERM PORTION | 8.3 | 94.5 | 163.1 | 168.0 | 154.9 | 141.3 | 126.8 | 111.3 | 94.7 |

INDUSTRIAL PROJECTS DEPARTMENT
DATE PREPARED:03/14/77

BRAZIL - SERGIPE FERTILIZER PROJECT
PROJECTED INCOME STATEMENTS
(IN MILLION OF CURRENT US$)

| | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|
| CAPACITY UTILIZATION % | 70.00 | 80.00 | 90.00 | 90.00 | 90.00 |
| PRODUCTION (TONS) | | | | | |
| AMMONIA | 62.1 | 71.0 | 79.9 | 79.9 | 79.9 |
| UREA | 254.1 | 290.4 | 326.7 | 326.7 | 326.7 |
| TOTAL | 316.2 | 361.4 | 406.6 | 406.6 | 406.6 |
| NITROGEN PRODUCED (TONS) | | | | | |
| AMMONIA | 51.2 | 58.6 | 65.9 | 65.9 | 65.9 |
| UREA | 116.9 | 133.6 | 150.3 | 150.3 | 150.3 |
| TOTAL | 168.1 | 192.2 | 216.2 | 216.2 | 216.2 |
| INCREASE IN FINISHED GOODS INVENTORY (TONS) | | | | | |
| AMMONIA | 2.6 | 0.4 | 0.4 | - | - |
| UREA | 21.2 | 3.0 | 3.0 | - | - |
| TOTAL | 23.8 | 3.4 | 3.4 | - | - |
| SALES VOLUME (TONS) | | | | | |
| AMMONIA | 59.5 | 70.6 | 79.5 | 79.9 | 79.9 |
| UREA | 232.9 | 287.4 | 323.7 | 326.7 | 326.7 |
| TOTAL | 292.4 | 358.0 | 403.2 | 406.6 | 406.6 |
| SALES PRICES (US$/TON) | | | | | |
| AMMONIA | 290.00 | 304.19 | 320.57 | 342.96 | 366.89 |
| UREA | 297.25 | 318.16 | 340.51 | 373.17 | 404.91 |
| SALES VALUE (MILLION US$) | | | | | |
| AMMONIA | 17.3 | 21.5 | 25.5 | 27.4 | 29.3 |
| UREA | 69.2 | 91.4 | 110.2 | 121.9 | 132.3 |
| TOTAL | 86.5 | 112.9 | 135.7 | 149.3 | 161.6 |
| PRODUCTION COSTS (MILLION US$) | | | | | |
| AMMONIA | 10.9 | 12.3 | 13.9 | 14.9 | 15.9 |
| UREA | 49.7 | 55.8 | 62.5 | 66.8 | 71.5 |
| TOTAL | 60.6 | 68.1 | 76.4 | 81.7 | 87.4 |
| COST OF INCR.IN FIN.GOODS INVENTORY (MILLION US$) | | | | | |
| AMONIA | 0.4 | 0.1 | - | - | - |
| UREA | 2.9 | 0.4 | 0.4 | - | - |
| TOTAL | 3.3 | 0.5 | 0.4 | - | - |
| OPERATING PROFIT | 29.2 | 45.3 | 59.7 | 67.6 | 74.2 |
| INTEREST | 12.3 | 11.4 | 10.3 | 9.2 | 7.9 |
| OTHERS | 0.4 | - | - | - | - |
| PROFIT (LOSS) BEFORE TAX | 16.5 | 33.9 | 49.4 | 58.4 | 66.3 |
| INCOME TAX | 5.0 | 10.2 | 14.8 | 17.5 | 19.9 |
| NET PROFIT (LOSS) | 11.5 | 23.7 | 34.6 | 40.9 | 46.4 |
| R A T I O S | | | | | |
| OPERATING PROFIT AS % OF SALES | 33.8 | 40.1 | 44.0 | 45.3 | 45.9 |
| PROFIT BEFORE TAX AS % OF SALES | 19.1 | 30.0 | 36.4 | 39.1 | 41.0 |
| NET PROFIT AS % OF SALES | 13.3 | 21.0 | 25.5 | 27.4 | 28.7 |
| TIMES INTEREST EARNED | 2.3 | 4.0 | 5.8 | 7.3 | 9.4 |
| CASH FLOW | | | | | |
| BEFORE INTEREST AFTER TAX | 49.2 | 62.3 | 74.0 | 81.3 | 87.6 |
| AFTER INTEREST AFTER TAX | 36.9 | 50.9 | 63.7 | 72.1 | 79.7 |
| PROFIT BREAK-EVEN | | | | | |
| UTILIZATION | 77.4 | 59.9 | 51.6 | 48.3 | 46.1 |
| PRICE | 82.3 | 68.2 | 61.6 | 58.7 | 56.8 |
| CASH BREAK-EVEN | | | | | |
| UTILIZATION | 56.8 | 51.2 | 43.2 | 39.6 | 36.9 |
| PRICE | 66.4 | 61.3 | 55.0 | 51.7 | 49.5 |

INDUSTRIAL PROJECTS DEPARTMENT
DATE PREPARED:03/15/77

BRAZIL SERGIPE FERTILIZER PROJECT
PROJECTED FUND FLOW STATEMENTS
(IN MILLIONS OF CURRENT US$)

| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|
| SOURCES | | | | | | | | | |
| NET PROFIT | - | - | - | - | 11.50 | 23.70 | 34.60 | 40.90 | 46.40 |
| DEPRECIATION | - | - | - | - | 25.42 | 27.20 | 29.11 | 31.16 | 33.34 |
| INTERNAL CASH GENERATION | - | - | - | - | 36.92 | 50.90 | 63.71 | 72.06 | 79.74 |
| INCREASE CURRENT LIABILITIES | - | - | - | - | 9.56 | (7.40) | 0.15 | 0.16 | 0.17 |
| INTEREST | - | - | - | - | 12.30 | 11.40 | 10.30 | 9.20 | 7.90 |
| INCREASE IN LONG-TERM DEBT | 8.20 | 84.50 | 64.00 | 10.60 | - | - | - | - | - |
| INCREASE IN EQUITY | 5.80 | - | 49.90 | 60.40 | - | - | - | - | - |
| TOTAL SOURCES | 14.00 | 84.50 | 113.90 | 71.00 | 58.78 | 54.90 | 74.16 | 81.42 | 87.81 |
| APPLICATIONS | | | | | | | | | |
| DEBT SERVICE | - | - | - | - | 23.90 | 30.80 | 30.40 | 30.00 | 29.40 |
| INCREASE CURRENT ASSETS | - | - | - | - | 43.44 | (10.05) | 1.28 | 1.29 | 1.46 |
| INCREASE IN FIXED ASSETS | 14.00 | 71.00 | 127.40 | 56.00 | - | - | - | - | - |
| YEARLY CASH SURPLUS/DEFICIT | - | 13.50 | (13.50) | 15.00 | (8.56) | 22.54 | 30.87 | 38.52 | 45.34 |
| DIVIDENDS | - | - | - | - | - | 11.61 | 11.61 | 11.61 | 11.61 |
| TOTAL APPLICATIONS | 14.00 | 84.50 | 113.90 | 71.00 | 58.78 | 54.90 | 74.16 | 81.42 | 87.81 |
| DEBT SERVICE COVERAGE RATIO | - | - | - | - | 2.06 | 2.02 | 2.43 | 2.71 | 2.98 |

INDUSTRIAL PROJECTS DEPARTMENT
DATE PREPARED:03/15/77

ANNEX 6-3
Table 4

BRAZIL - SERGIPE FERTILIZER PROJECT
PROJECTED BALANCE SHEETS
(IN MILLIONS OF CURRENT US$)

| | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|---|---|---|
| ASSETS | | | | | | | | | |
| MINIMUM CASH BALANCE | - | - | - | - | 20.41 | 8.75 | 8.30 | 7.75 | 7.24 |
| ACCOUNTS RECEIVABLES | - | - | - | - | 12.70 | 13.59 | 14.54 | 15.56 | 16.65 |
| FINISHED GOODS INVENTORY | - | - | - | - | 8.51 | 9.10 | 9.74 | 10.42 | 11.15 |
| RAW MATERIAL INVENTORY | - | - | - | - | 1.82 | 1.95 | 2.09 | 2.24 | 2.39 |
| TOTAL CURRENT ASSETS | - | - | - | - | 43.44 | 33.39 | 34.67 | 35.97 | 37.43 |
| SURPLUS CASH BALANCE | - | 13.50 | - | 15.00 | 6.44 | 28.99 | 59.86 | 98.37 | 143.71 |
| FIXED ASSETS | 14.00 | 85.00 | 212.40 | 268.40 | 268.40 | 268.40 | 268.40 | 268.40 | 268.40 |
| REVALUED ACCUM. DEPRECIATION | - | - | - | - | 25.40 | 54.40 | 87.30 | 124.60 | 166.70 |
| ACCUM. REVALUATION SURPLUS | 0.50 | 4.40 | 16.40 | 34.50 | 55.60 | 78.30 | 102.60 | 128.70 | 156.60 |
| NET FIXED ASSETS | 14.50 | 89.40 | 228.80 | 302.90 | 298.60 | 292.30 | 283.70 | 272.50 | 258.30 |
| TOTAL ASSETS | 14.50 | 102.90 | 228.80 | 317.90 | 348.48 | 354.68 | 378.23 | 406.84 | 439.44 |
| LIABILITIES AND EQUITY | | | | | | | | | |
| ACCOUNTS PAYABLE | - | - | - | - | 2.02 | 2.16 | 2.31 | 2.48 | 2.65 |
| SHORT-TERM LOANS | - | - | - | - | 7.54 | - | - | - | - |
| CURRENT PORTION OF LONG-TERM DEBT | - | - | - | 11.60 | 19.40 | 20.10 | 20.80 | 21.50 | 22.30 |
| TOTAL CURRENT LIABILITIES | - | - | - | 11.60 | 28.96 | 22.26 | 23.11 | 23.98 | 24.95 |
| LONG-TERM DEBT | 8.30 | 94.50 | 163.10 | 168.00 | 154.90 | 141.30 | 126.80 | 111.30 | 94.70 |
| TOTAL LIABILITIES | 8.30 | 94.50 | 163.10 | 179.60 | 183.86 | 163.56 | 149.91 | 135.28 | 119.65 |
| PAID-IN-CAPITAL | 5.80 | 5.80 | 55.70 | 116.10 | 116.10 | 116.10 | 116.10 | 116.10 | 116.10 |
| RETAINED EARNINGS | - | - | - | - | 11.50 | 23.59 | 46.58 | 75.87 | 110.66 |
| REVALUATION OF EQUITY | 0.40 | 2.60 | 10.00 | 22.20 | 37.02 | 51.43 | 65.64 | 79.59 | 93.03 |
| TOTAL EQUITY | 6.20 | 8.40 | 65.70 | 138.30 | 164.62 | 191.12 | 228.32 | 271.56 | 319.79 |
| TOTAL LIABILITIES AND EQUITY | 14.50 | 102.90 | 228.80 | 317.90 | 348.48 | 354.68 | 378.23 | 406.84 | 439.44 |
| R A T I O S: | | | | | | | | | |
| CURRENT RATIO | - | - | - | - | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 |
| QUICK RATIO | - | - | - | - | 1.14 | 1.00 | 0.99 | 0.97 | 0.96 |
| DEBT / EQUITY RATIO: | | | | | | | | | |
| DEBT % | 57 | 92 | 71 | 55 | 48 | 43 | 36 | 29 | 23 |
| EQUITY % | 43 | 8 | 29 | 45 | 52 | 57 | 64 | 71 | 77 |
| NET PROFIT AS OF %: | | | | | | | | | |
| EQUITY | - | - | - | - | 6.99 | 12.40 | 15.15 | 15.06 | 14.51 |
| INVESTED CAPITAL | - | - | - | - | 3.36 | 7.28 | 10.87 | 13.26 | 15.69 |

INDUSTRIAL PROJECTS DEPARTMENT
DATE PREPARED:03/15/77

BRAZIL - SERGIPE FERTILIZER PROJECT

CASH FLOW FOR FINANCIAL RETURN

| Year | Capital Costs[1] | Operating Costs | Income Taxes | Fertilizer Revenues | Net Cash Flow Before Taxes | Net Cash Flow After Taxes |
|---|---|---|---|---|---|---|
| | ----------In Millions of Constant 1976 $---------- | | | | | |
| 1 1977 | 12.2 | - | - | - | -12.2 | -12.2 |
| 2 | 47.8 | - | - | - | -47.8 | -47.8 |
| 3 | 90.1 | - | - | - | -90.1 | -90.1 |
| 4 | 41.4 | - | - | - | -41.1 | -41.4 |
| 5 1981 | - | 26.7 | 3.9 | 64.7 | 38.0 | 34.3 |
| 6 | - | 28.8 | 6.9 | 73.9 | 45.1 | 38.2 |
| 7 | - | 30.9 | 9.4 | 82.8 | 51.9 | 42.5 |
| 8 | - | 30.9 | 10.2 | 83.7 | 52.8 | 42.6 |
| 9 | - | 30.9 | 10.8 | 85.2 | 54.3 | 43.5 |
| 10-15 | - | 30.9 | 11.1 | 85.2 | 54.3 | 74.1 |
| 16 1992 | -24.1[2] | 30.9 | 13.2 | 85.2 | 78.4 | 65.2 |

Financial Rate of Return before Taxes: 18.6%
Financial Rate of Return after Taxes: 15.0%

SENSITIVITY TESTS ON FINANCIAL RATE OF RETURN

| Ex-Factory Prices | Financial Rate of Return Before Taxes in % -20% | -10% | Base Case | +10% | +20% |
|---|---|---|---|---|---|
| Costs | | | | | |
| a. Base Case | 12.1 | 15.5 | 18.6 | 21.5 | 24.1 |
| b. Capital Costs up 10% | 10.6 | 13.9 | 16.9 | 19.6 | 22.1 |
| c. Capital Costs down 10% | 13.8 | 17.4 | 20.6 | 23.6 | 26.3 |
| d. Operating Costs Up 10% | 10.7 | 14.3 | 17.5 | 20.4 | 23.1 |
| e. Operating Costs down 10% | 13.4 | 16.7 | 19.7 | 22.5 | 25.0 |
| f. After Income Taxes | 7.2 | 11.4 | 15.0 | 18.2 | 21.1 |
| g. Capacity Utilization Down 10% | 9.9 | 13.2 | 16.3 | 19.0 | 21.5 |
| h. Delay of Completion (½ year) | 11.3 | 14.4 | 17.2 | 19.8 | 22.3 |
| i. Growth Rate of Fertilizer Demand in the Northeast Down 50% | 11.1 | 14.5 | 17.6 | 20.4 | 23.0 |
| j. Operating Costs (Raw Material Prices at World Market Level) | 9.2 | 13.0 | 16.3 | 19.4 | 22.1 |

1/ Excluding from total financing required US$33.4 million for rail cars and interest during construction.

2/ Recovered value of non-depreciable assets and working capital.

Industrial Projects Department
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# BRAZIL - SERGIPE FERTILIZER PROJECT

## ASSUMPTIONS USED FOR CALCULATING THE ECONOMIC RATE OF RETURN

1. In comparison with the financial analysis, several adjustments had to be made in order to be able to reflect correctly the economic impact of the project's specific nature. The basic purpose of the Sergipe project is import substitution of fertilizer. The substitution effect will be of major importance for Brazil's Center region (states of Sao Paulo and Parana), which is presently together with the South, the principal importer of fertilizer. However, the location of plant will be in the state of Sergipe in the Northeast of Brazil. The basic rationale for such a decision is the objective of making maximum use of Brazil's natural gas resources. By locating the Sergipe plant directly in the neighborhood of its future market and feedstock sources in the Northeast, the output of another ammonia/urea plant located in Camacari, Bahia - close to the seaport of Aratu - will be freed and can be shipped to the Center region. As a result of the plant location in Sergipe, the following implications arise which penalize the project to a certain degree and which are explained in further detail in the upcoming paragraphs;

(a) The import substitution effect is slightly diluted in comparison with other projects insofar as no savings in port handling, and charges in land transportation cost will be realized;

(b) Comparative transportation situation (basically, shipping costs against savings in railway transport).

2. For the calculation of the economic rate of return, a shadow exchange rate (SER) of 25%[1] is applied to all the local components of the cost and benefit streams which are expressed in terms of 1976 US dollars.

A. Capital Costs

3. Due to the fact that the project is 100% exempt from import duties, the capital costs are the same as used in the financial analysis with the exception of the adjustments by the shadow exchange rate.

B. Economic Benefits

4. The economic price of urea is based on its CIF price in Brazil and derived as follows:

| | Constant 1976 US$/Ton |
|---|---|
| FOB Price (bagged)[2] | 171 |
| Freight & Insurance | 25 |
| CIF Price | 196 |
| Less: Bagging Costs | 11 |
| Economic Price (bulk) | 185 |

1/ See memo from Peter T. Knight, LAC II, 8/11/76.

2/ Price Forecasts for Major Primary Commodities, Bank Report No. 814/76, June 1976.

5. The economic price of US$185 per ton urea (bulk) is relatively low. The reason lies in the specific nature of the project. The practical impact of the project is - as indicated in paragraph 7.01 - the substitution of overseas imports of fertilizer by "imports" from the Northeast to the Central region. Since the surplus fertilizer of the Northeast will have to be moved by coastal shipping and land transport to the points of sale in the Center region, the costs for port handling and inland transportation will be incurred with or without the Sergipe project and thus cannot be added to the CIF price of urea.

6. As in the financial analysis, it is assumed that ammonia and urea (bulk) will have a long-term price relationship of 1:1.

C. Economic Price of Natural Gas

7. Since natural gas, which will be used as feedstock is not abundantly available in the Northeast, the use of gas is restricted to petrochemical users. Other potential users who could employ it for heating purposes will have to consume heavy fuel oil (HFO). Therefore, the economic price of natural gas is assumed to equal the price of heavy fuel oil on a calorific equivalent. Since Brazil is a net exporter of refined petroleum products, the economic price for heavy fuel oil as well as for bunker C and vacuum gas oil are derived by applying the FOB prices. There is no consideration of port handling charges and transportation cost from the refinery to the port, because they are minor charges in relation to the total costs and because the producing refinery of Mataripe is just adjacent to the Bunker Terminal of the port of Madre de Deus. Since the majority of the important natural gas consuming industries - which would eventually have to switch to HFO - are located in the vicinity of Salvador, Bahia, the transportation costs of HFO from refinery to the point of consumption can also be disregarded. The economic gas price is derived as follows:

| | Constant 1976 US$ |
|---|---|
| Heavy Fuel Oil, FOB Curacao per barrel | 10.25 |
| Heavy Fuel Oil, FOB per ton (10.25 x 6.4) | 65.00 |
| Discount for high sulfur content (5%) | 2.00 |
| Financial price of HFO | 63.00 |
| SER Adjustments[1] | 4.00 |
| Economic price of HFO | 59.00 |
| Economic Equivalent of natural gas in 1,000 cf[2] | 1.48 |

1/ On 20% of local crude oil production and local refinery costs.

2/ 1 Ton of HFO has a calorific equivalent of 39,942 standard cubic feet of natural gas.

D. Fuel Prices

(a) Bunker C Oil

Bunker C is a petroleum fraction with characteristics very similar to those of HFO. However, it is normally traded at a slightly higher price, since thanks to its higher content of hydrogen, the heating value is slightly better than the one of heavy fuel oil. An FOB price of US$65 per ton is assumed. After adjustments for refining and domestic transportation, the economic price of bunker C comes to US$73 per ton.

| | Constant 1976 US$/Ton |
|---|---|
| Bunker C, FOB per ton | 65.00 |
| SER Adjustments[1/] | - 4.00 |
| Transportation cost from Refinery to Project | + 12.00 |
| Economic price of Bunker C | 73.00 |

(b) Vacuum Gas Oil

9. Vacuum gas oil is a petroleum fraction, whose density lies between heavy fuel oil and naphtha. In the recent past, there has been a great demand in light refining products and due to time-lags in adjustment of refining capacity, the common price relationship between these three products has been distorted. Most likely the present bottleneck situation will be only of a temporary nature, so one can assume the old long-term price relationship will be restored by the end of the seventies. For the purpose of this analysis an FOB price of US$80 per ton of vacuum oil is applied which is the approximate mean between the heavy fuel and the naphtha price. After adjustments for refining and local transportation, the economic price of vacuum oil arrives at US$86 per ton.

| | Constant 1976 US$/Ton |
|---|---|
| Vacuum Gas Oil, FOB Curacao per ton | 80 |
| SER Adjustment for local refining cost | - 6 |
| Transporation cost from Refinery to Project | + 12 |
| Economic Price of Vacuum Gas Oil | 86 |

E. Incremental Transportation Costs

10. Without the project the fertilizer requirements of the Northeast would be met by the presently expanded ammonia/urea plant at Camacari (close to Salvador, Bahia). After completion of the Sergipe project in

1981, the Northeast will be supplied with fertilizer from Sergipe whereas the output of the Camacari plant will be shipped via the new port of Aratu to the Central region. For an estimate of the project's total economic benefits and costs, it is therefore necessary to compare the transportation costs by railway between Camacari and Sergipe with the coastal shipping costs from Camacari to Santos. The resulting comparative transportation costs/benefits have to be considered in the calculation of the total net benefit stream of the project.

11. The railway tariffs (Annex 7-2) which took effect in July 1976 are covering on average only the long-run variable costs of the railway operations in the Northeast. The variable costs are about 50% of the total costs. Consequently, the railway depends presently on subsidies from the Government since it is its the explicit goal to maintain the only major railway line in the Northeast. Without the project in Sergipe, the freight traffic between Camacari and Sergipe would increase by roughly 100% which would mean considerably higher maintenance costs. Hence, the assumption was made that the long-run incremental economic costs equal approximately the variable cost plus 50% of the fixed costs. The resulting rail transport costs are not significantly different to those for road. The project will also benefit from the inherent advantages of rail transportation such as reliable and relatively fast transport of goods and efficient product handling.

12. The incremental coastal shipping costs, which have to be considered in the case with the project, are assumed to be in constant terms of 1976 US$12 per ton of urea/ammonia in accordance with a study done by PETROBRAS. The table in Annex 7-3 shows that the project will have to bear a slight penalty since the coastal shipping costs are not completely compensated by savings in rail transportation. During the years of full production, about US$2.0 million per annum in additional transport costs will have to be absorbed by the economic benefit stream.

13. The projected annual growth rate of 12% for fertilizer demand in the Northeast implies that the consumption of urea will exceed the project's output by 1986. The balance will be supplied by the plant at Camacari. The corresponding quantities will not have to be sent anymore to the Center region and can be, consequently, regarded as import substitution. However, for the calculation of a new economic urea price not only port handling charges and inland freight but also additional transportation costs from the project's site to the market area have to be considered. The incremental transport costs are about the same as the port handling charges and, thus cancel each other out. Hence, no additional price adjustments had to be made to reflect the situation of import substitution during the later years of the project's operating life.

F. Economic Rate of Return

14. Annex 7-4 contains a summary of the economic costs and benefit streams indicating an economic return of 17% and also gives the results of the performed sensitivity tests.

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BRAZIL - SERGIPE FERTILIZER PROJECT

COMPARISON OF RAILWAY COSTS AND TARIFFS

| | Distance in km | Tariff | Total Cost | Long Run Variable Costs | Variable @ 50% of Fixed Costs |
|---|---|---|---|---|---|
| | | Cr$/ton | | | US$/ton[1] |
| Gas Oil | | | | | |
| From Mataripe to Plant Site | 450 | 107 | 217 | 109 | 12.0 |
| Liquid Ammonia | | | | | |
| From Plant Site to Camacari | 400 | 107 | 198 | 99 | 11.2 |
| From Plant Site to Recife | 700 | 171 | 328 | 164 | 18.0 |
| Bulk Urea | | | | | |
| From Plant Site to Aratu | 450 | 122 | 221 | 111 | 12.0 |
| Bagged Urea | | | | | |
| From Plant Site to Aracaju | 20 | 25 | 35 | 17 | 1.9 |
| From Plant Site to Recife | 700 | 140 | 328 | 164 | 18.0 |
| From Plant Site to nearby markets | 150 | 43 | 93 | 46 | 5.0 |

1/ Adjusted to Shadow Exchange Rate

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ANNEX 7-2

BRAZIL - SERGIPE FERTILIZER PROJECT

INCREMENTAL TRANSPORTATION COST ANALYSIS

| | Cost per ton of product[1] | 1981 | | 1982 | | 1983 | | 1984 | | 1985 & Thereafter | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MTons | MMUS$ | MTons | MMUS$ | MTons | MMUS$ | MTons | MMUS$ | MTons | MMUS$ |
| A. Without the Project | | | | | | | | | | | |
| Shipments from Camacari to Sergipe: | | | | | | | | | | | |
| Urea | 11.2 | 185 | 2.1 | 217 | 2.4 | 250 | 2.8 | 293 | 3.3 | 326 | 3.7 |
| Ammonia | 11.2 | 49 | .6 | 49 | .6 | 49 | .6 | 49 | .6 | 49 | .6 |
| Total Transport Cost | | | 2.7 | | 3.0 | | 3.4 | | 3.9 | | 4.3 |
| B. With the Project | | | | | | | | | | | |
| Shipments from Sergipe to Aratu: | | | | | | | | | | | |
| Urea | 12.0 | 70 | .8 | 74 | .9 | 76 | .9 | 33 | .4 | - | - |
| Ammonia | 12.0 | 13 | .2 | 22 | .3 | 31 | .4 | 31 | .4 | 31 | .4 |
| Coastal Shpmt. fr.Aratu to Center | | | | | | | | | | | |
| Urea and Ammonia | 12.0 | 83 | 1.0 | 96 | 1.2 | 109 | 1.3 | 66 | .8 | 33 | .4 |
| Total Shpmt.fr.Sergipe to Center | | | 2.0 | | 2.4 | | 2.6 | | 1.6 | | .8 |
| Shipments fr. Camacari to Center | | | | | | | | | | | |
| Urea | 14.4 | 185 | 2.7 | 217 | 3.1 | 250 | 3.6 | 293 | 4.2 | 326 | 4.7 |
| Ammonia | 14.4 | 49 | .7 | 49 | .7 | 49 | .7 | 49 | .7 | 49 | .7 |
| Total Shpmt.fr.Camacari to Center | | | 3.4 | | 3.8 | | 4.3 | | 4.9 | | 5.4 |
| Total with Project | | | 5.4 | | 6.2 | | 6.9 | | 6.5 | | 6.2 |
| C. Difference in Costs (A - B) | | | -2.7 | | -3.2 | | -3.5 | | -2.6 | | -1.9 |

1/ Economic transport costs are based on long-term variable cost estimates and are adjusted by a SER of 25%.

Industrial Projects Department
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ANNEX 7-3

# BRAZIL - SERGIPE FERTILIZER PROJECT

## ECONOMIC COST AND BENEFIT STREAMS

| Year | Capital Costs | Operating Costs | Incremental Transportation Costs | Economic Value of Output | Net Benefit |
|---|---|---|---|---|---|
| 1 1977 | 10.5 | - | - | - | -10.5 |
| 2 | 41.1 | - | - | - | -41.1 |
| 3 | 77.3 | - | - | - | -77.3 |
| 4 | 35.5 | - | - | - | -35.5 |
| 5 1981 | - | 26.9 | 1.8 | 58.5 | 29.8 |
| 6 | - | 29.4 | 2.0 | 66.9 | 35.5 |
| 7 | - | 31.9 | 2.0 | 75.2 | 41.3 |
| 8 | - | 31.9 | 1.4 | 75.2 | 41.9 |
| 9 | - | 31.9 | 1.0 | 75.2 | 42.3 |
| 10-15 | - | 31.9 | 1.0 | 75.2 | 42.3 |
| 16 1992 | -19.3 | 31.9 | 1.0 | 75.2 | 61.6 |

Economic Rate of Return: 17.0

## SENSITIVITY TESTS ON ECONOMIC RATE OF RETURN

| | Economic Rate of Return | | | | |
|---|---|---|---|---|---|
| Economic Product Prices | -20% | -10% | Base Case | +10% | +20% |
| Costs: | | | | | |
| a. Base Case | 9.7 | 13.5 | 17.0 | 20.1 | 22.9 |
| b. Capital Costs down 10% | 11.2 | 15.3 | 18.9 | 22.1 | 25.1 |
| c. Capital Costs up 10% | 8.3 | 12.0 | 15.3 | 18.3 | 21.0 |
| d. Operating Costs down 10% | 11.4 | 15.1 | 18.4 | 21.3 | 24.1 |
| e. Operating Costs up 10% | 7.8 | 11.9 | 15.5 | 18.8 | 21.7 |
| f. Capacity Utilization down 10% | 7.5 | 11.3 | 14.6 | 17.6 | 20.4 |
| g. Delay of Completion (½ year) | 9.1 | 12.6 | 15.8 | 18.6 | 21.1 |
| h. Base Case, but use of Natural Gas assumed instead of Vacuum Gas Oil | 11.2 | 14.9 | 18.2 | 21.2 | 24.0 |
| i. Base Case Without Shadow Exchange Rate | 5.0 | 8.7 | 12.2 | 15.3 | 18.1 |
| j. Growth Rate of Fertilizer Demand in the Northeast down 50% | 9.2 | 13.0 | 16.5 | 19.6 | 22.4 |

Industrial Projects Department
March 1977

IBRD-12054
MARCH 1976

# BRAZIL
## FERTILIZER MARKETING REGIONS

National capitals
Natural region boundaries
State boundaries
International boundaries
Rivers

0 100 200 300 400 500 600 700 800
KILOMETERS
0 100 200 300 400 500
MILES

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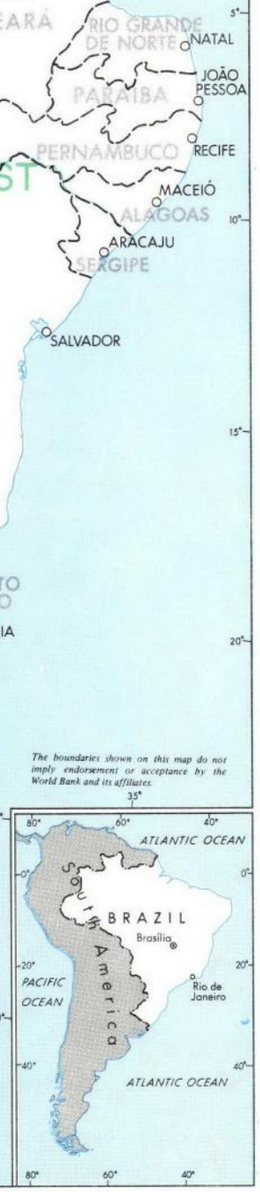
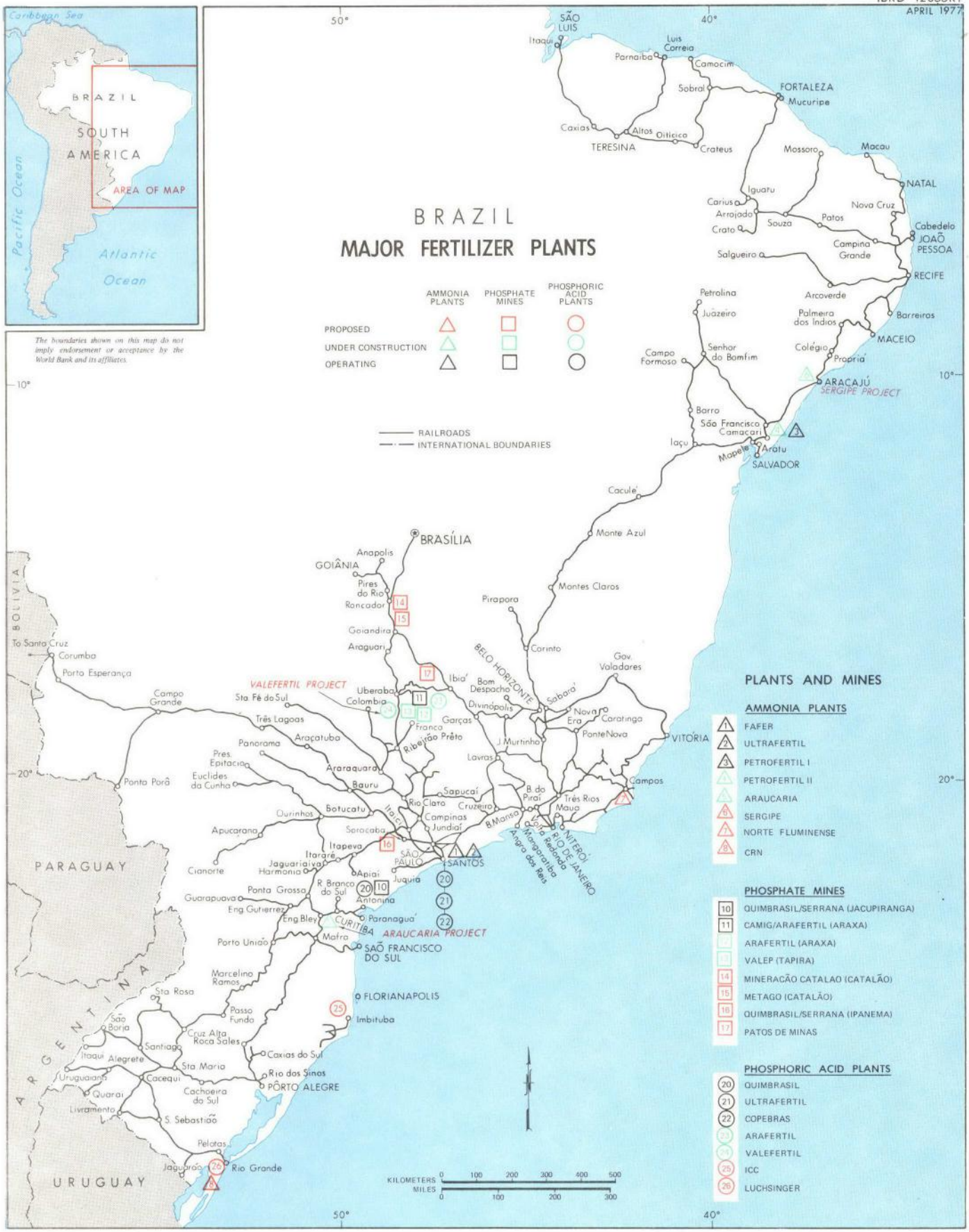


IBRD-12055R1
APRIL 1977



BRAZIL

# PHYSIOGRAPHIC ZONES AND FERTILIZER USE IN NORTHEAST REGION


*The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.*

PARÁ
MARANHÃO
PIAUÍ
CEARÁ
RIO GRANDE DO NORTE
PARAIBA
PERNAMBUCO
ALAGOAS
SERGIPE
BAHIA
GOIÁS
MINAS GERAIS
ESPIRITO SANTO
FEDERAL DISTRICT
BRASILIA

São Luis
Fortaleza
Natal
João Pessôa
Recife
Maceio'
Aracajú
Salvador

ATLANTIC OCEAN

TOCANTINS RIVER
ARAGUAYA RIVER
PARANAIBA RIVER
SÃO FRANCISCO RIVER
PARANAIBA RIVER

Fertilized Areas
- From 50 to 200 Hectares
- From 201 to 1000 Hectares
- More than 1000 Hectares

Physiographic Zones:
- Zona de Mata (Humid Littoral Zone)
- Agreste (Semi-Arid Transition Zones)
- Sertão (Semi-Arid Interior)
- Middle North (Transition to Amazon)
- Fertile Spots (Humid Valleys & Highlands
- Cerrado (Savanna Área)

- Rivers
- State Boundaries
- Disputed Boundaries between Ceara' & Piaui'
- International Boundaries

0 50 100 150 200 250 300
KILOMETERS

IBRD 12412
SEPTEMBER 1970

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**Report No. 1414a-BR**

BRAZIL

APPRAISAL OF THE SERGIPE

FERTILIZER PROJECT

(in two volumes)

VOLUME I

THE MAIN REPORT

January 31, 1977

Industrial Projects Department

## CURRENCY EQUIVALENTS

Except where otherwise indicated, all figures are quoted in Brazilian Cruzeiros (Cr$) and US $ (Exchange Rate as of December 31, 1976):

| | |
|---|---|
| Cr$1.0 | = US$0.0809 |
| Cr$12.35 | = US$1.00 |
| Cr$1,000,000 | = US$80,972 |

## WEIGHTS AND MEASURES

All weights and measures are in metric units except as noted:

| | |
|---|---|
| 1 Metric Ton (t) | = 1,000 Kilograms (kg) |
| 1 Metric Ton (t) | = 2,204 Pounds |
| 1 Kilometer (km) | = 0.62 Miles |
| 1 Hectare (ha) | = 2.47 Acres |
| 1 Cubic Meter($NM^3$) | = 6.19 Barrels |

## PRINCIPAL ABBREVIATIONS AND ACRONYMS USED

| | |
|---|---|
| ANDA | Associacao Nacional para Diffusao Adubos |
| BNDE | Banco Nacional do Desenvolvimento Economico |
| COFEN | Construccion de Fertilizantes Nitrogenados |
| DAP | Diammonium Phosphate |
| Fafer | Fabrica de Fertilizantes S.A. |
| FERTILIZANTES | Petrobras Fertilizantes S.A., the Company |
| K | Potash |
| $K_2O$ | Potassium Oxide Content in Fertilizers |
| MAP | Monoammonium Phosphate |
| N | Nitrogen |
| NFP | National Fertilizer Program |
| P | Phosphate |
| PETROBRAS | Petroleo Brasileiro S.A. |
| Petrofertil | Petrobras Quimica Fertilizantes S.A. |
| PETROQUISA | Petrobras Quimica S.A. |
| $P_2O_5$ | Phosphate Content in Fertilizers |
| RFFSA | Rede Ferroviaria Federal S.A. |
| TPD | Tons (Metric) Per Day |
| TPY | Tons (Metric) Per Year |
| Ultrafertil | Industria e Commercio de Fertilizantes S.A. |

## Brazilian Fiscal Year

January 1 - December 31

BRAZIL

APPRAISAL OF THE SERGIPE FERTILIZER PROJECT

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This report has been prepared by Messrs. Geoffrey Evans, Kurt Loos and Neithard Petry of the Industrial Projects Department.

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# BRAZIL

## APPRAISAL OF THE SERGIPE FERTILIZER PROJECT

## SUMMARY AND CONCLUSIONS

i. This report appraises a project to produce nitrogen fertilizers with a capacity of 907 tons per day of ammonia and 1,100 tons per day of urea. The gas-based plant will be built in Northeast Brazil on a new site at Laranjeiras, about 20 km northwest of Aracaju in the state of Sergipe not far from the Atlantic Ocean. The plant is expected to come on stream by the beginning of 1981 and will increase Brazil's nitrogen capacity by about one-fourth. The output from the plant will be primarily for the Northeastern market and will be handled as at present by the private sector, primarily existing bulkblending and mixing companies. The project is expected to require financing of US$288 million equivalent, including US$101 million in foreign exchange of which the proposed Bank loan would finance US$64 million.

ii. The project is sponsored by Petrobras Fertilizantes S.A. (FERTILIZANTES), a wholly owned subsidiary of Petroleo Brasileiro S.A. (PETROBRAS). FERTILIZANTES was established in early 1976 with the objective of consolidating PETROBRAS' existing and future fertilizer interests. Control over PETROBRAS' three existing fertilizer companies will be transferred to FERTILIZANTES during 1977. PETROBRAS is deeply involved in the production and distribution of nitrogen fertilizers and holds a virtual monopoly of ammonia and urea production in Brazil. Recent participation of the private sector in the production of new nitrogen fertilizer capacity did not occur (as hoped for) and cannot be expected at this time because of the very high capital requirements of new, large-scale plants, particularly when compared to the low capitalization of the existing private fertilizer industry in Brazil and the Government control of feedstock and fertilizer prices. However, PETROBRAS intends to offer shares of FERTILIZANTES to the private sector at a later stage.

iii. The proposed loan would be the second Bank loan to FERTILIZANTES and the Brazilian fertilizer sector. The first loan (US$50 million) was made in May 1976 for the Araucaria ammonia/urea project, which is in the early stages of implementation and is proceeding satisfactorily. Another project (Valefertil) in this sector, though for phosphatic fertilizers and with different project sponsors, is presently being appraised by the Bank and is scheduled for consideration by the Executive Directors soon.

iv. Brazil's agricultural sector is characterized by extensive agricultural practices and the country's rising output has resulted mainly from expansions of cultivated area. Although it is expected that the area under cultivation will continue to expand, agricultural growth will have to depend increasingly on raising the productivity of existing land. Growth of fertilizer consumption has been rapid but also erratic. Up to 1966 there was little growth reflecting the Government's neglect of the agricultural and fertilizer sector. Stimulating measures introduced in the mid-sixties

brought six years of very rapid growth with annual increments averaging 35% through 1972. Over the following three years (1973-75), fertilizer consumption grew modestly, primarily as a result of the sharp rise in international prices and the scarcity of fertilizer in the world market. For 1976 a significant recovery in fertilizer consumption is expected and total nutrient consumption is estimated to have reached 2.3 million tons. Phosphatic fertilizers account for nearly 50% of total nutrient consumption which is agronomically justified on account of Brazilian soil characteristics and cropping patterns. It is estimated that four crops (sugar, coffee, soybeans and wheat) account for over half of total fertilizer consumption.

v. On the supply side, domestic fertilizer production accounts for only about 35% of consumption. The low level of domestic production has been due to Brazil's lack or knowledge of easily exploitable natural resources, the rapidly rising capital requirements for the manufacture of chemical fertilizers and the absence of specific Government policies for the development of the fertilizer sector. As a consequence, the local fertilizer industry has concentrated on importing, mixing, blending and distribution while only a few companies have their own small-scale production facilities. To overcome the country's dependency on imports, the Government has embarked on a National Fertilizer Program establishing a target of self-sufficiency in nitrogenous and phosphatic fertilizers by 1980 which includes a program for large, basic production facilities of which the Araucaria, Sergipe and Valefertil projects form part. Production costs of local fertilizers have generally been higher than the cost of imports and the Government established an import quota system, which is regularly revised, to ensure that all domestic production is used. As the new, large-scale, efficient fertilizer plants enter into production, costs of domestic fertilizers are expected to move, in the longer run, in line with long-term international prices, thereby obviating the need for the import quota system. Concerned about the impact of the high international fertilizer prices during 1973-75 on its plans for increasing agricultural output, the Government introduced a 40% price subsidy to farmers in early 1975. However, with the rapid decline of these prices during 1975 and 1976, the purchasing power of agricultural products relative to fertilizer improved again and the subsidy was eliminated in late December 1976. Removal of the subsidy is not expected to affect demand beyond the first months in 1977 since the relationship between agricultural product and fertilizer prices is still favorable and is expected to remain so in the future.

vi. In the absence of detailed historical data for the fertilizer sector by region and crop, projections of future demand in Brazil are risky. Assuming an average annual growth rate of about 11%, which compares to one of 22% over the last ten years, total nutrient consumption can be expected to reach a level of 3.4 and 5.7 million nutrient tons by 1980 and 1985, respectively. The projected demand/supply balances indicate that the goal of self-sufficiency can probably be met in the early 1980s for nitrogen and phosphates; the domestic supply of potash is considerably more uncertain and supply will probably continue through imports for some time in the future.

vii. The location of the plant will be just south of the main fertilizer market of the Northeast, and it will be close to the onshore and offshore oil and gas fields from which natural gas, the principal raw material for the project, will be supplied. Reserves are adequate to allow for 15 years of operation of the project. PETROBRAS already operates some oil and gas transmission pipelines in this area, but will, outside the project, construct a gas gathering and conservation scheme which will reduce gas losses and boost supplies to users.

viii. The project is based on modern, commercially proven technology, and will be implemented for FERTILIZANTES by PETROBRAS' fertilizer project implementation unit supported by PETROBRAS' engineering and purchasing departments. Engineering contracts, acceptable to the Bank, with Pullman Kellogg (US) and Toyo Engineering Company (Japan) have already been signed, and these companies will provide process licenses, basic engineering, procurement assistance, and technical advisory services relating to the ammonia unit and general site facilities and the urea unit, respectively. Detailed engineering will be undertaken by two Brazilian engineering firms under the direct supervision of Kellogg and Toyo. In agreement with the Government's and PETROBRAS' policy to support and develop Brazilian industry, 60% of the equipment and materials required by the project are to be procured locally, which is estimated to increase the total financing requirements because of the higher Brazilian costs by a maximum of 5%. The remaining 40% will be procured in accordance with the Bank guidelines and will be financed by the proposed Bank loan.

ix. The project will be financed by 41% in equity from PETROBRAS (US$118 million) and 59% in long-term loans from: (i) the Bank (US$64 million); (ii) a cofinancing arrangement which will be either with a commercial bank or a direct placement of FERTILIZANTES' debt obligations with private investors in the US (US$25 million); and (iii) from the National Development Bank (BNDE) for the financing of local equipment, materials and services (US$81 million).

x. The project's financial rate of return is satisfactory at 19% before and 15% after tax. Financial projections for the project also show satisfactory results with adequate liquidity, debt service coverage and debt/equity ratio. To safeguard the financial position of the project and of FERTILIZANTES, certain financial covenants similar to the Araucaria project will be sought during negotiations. The project's economic rate of return is calculated at 17% and would remain satisfactory even under the most adverse forseeable circumstances. The project will contribute to the stabilization of the agricultural sector by reliably providing fertilizers to the farmers at stable prices. In addition, the positive spillover effects from the required infrastructure will benefit this region which is one of Brazil's poorest and least industrialized. The local engineering and manufacturing industry will also benefit, and the project's net annual foreign exchange savings are estimated at US$65 million.

xi. Few major risks are seen in the project. It is unlikely that the project will face major management problems since PETROBRAS has experience in executing similar projects. Engineering and technological risks are also minimal since proven processes are used and Kellogg and Toyo are internationally recognized. Financially, the project is largely dependent on Government controls regarding the input and output prices and an

assurance will be sought from the Government during negotiations that it will not take any action that would prevent FERTILIZANTES from operating on a sound financial basis. A marketing risk exists in so far as FERTILIZANTES has to rely on others, i.e. the bulkblending and mixing companies to market its products in the Northeast. However, the fertilizer distribution function has so far been attractive enough to the private sector to bring about the needed investments and sales efforts; this situation is expected to continue. Also, FERTILIZANTES intends to establish its own market analysis and marketing group to closely monitor the developments in the sector; both therefore should minimize the marketing risk.

xii. On the basis of the agreements which will be sought with the Government, PETROBRAS and FERTILIZANTES, the project is suitable for a Bank loan of US$64 million to FERTILIZANTES at 10% interest and for 15 years including 4 years of grace.

# I. INTRODUCTION

## A. Background

1.01 The Government of Brazil has requested a Bank loan of US$64 million equivalent to finance part of the estimated foreign exchange cost of an ammonia/urea plant1/ for the government-owned fertilizer company, Petrobras Fertilizantes (FERTILIZANTES)2/ to be built at Laranjeiras, 20 km northwest of Aracaju, the state capital of Sergipe in the northeast of Brazil (Map IBRD 12055R). The project will be located in an area of limited industrialization and will contribute to the Government's policy of decentralizing Brazil's industry while building up the economy of the poverty ridden Northeast. The plant will obtain natural gas which is the most advantageous feedstock for production of nitrogen fertilizer, from the offshore and onshore gas and oil fields of the states of Alagoas and Sergipe where some of the natural gas is flared at present.

1.02 Total financing required for the project is estimated at US$288 million of which about US$101 million or 35% is in direct and indirect foreign exchange. These financing requirements will be met by equity from PETROBRAS (41%), by a loan from BNDE, the National Development Bank (28%), by a cofinancing arrangement with foreign private lenders (9%) and the Bank loan (22%). The plant is expected to start commercial production in early 1981 and to produce an estimated 216,000 metric tons per year (TPY) of nitrogen (N) of which about 70% would be sold in the form of urea and the remainder as ammonia.

1.03 The project was appraised in July 1976 with a subsequent mission in September 1976 by Messrs. N. Petry (chief), G. Evans and K. Loos of the Industrial Projects Department. In addition, two consultants were employed for a brief survey of the Northeastern railways and for a study of the gas reserves in the Northeast3/.

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1/ A glossary of technical terms is given in Annex 1.

2/ The abbreviation for Petrobras Fertilizantes used in the Araucaria report was "BRASFERTIL." The new abbreviation conforms to Brazilian usage.

3/ The definition of regions in this report conforms to those used in the Brazilian fertilizer sector (Map IBRD 12054):

South: Rio Grande do Sul, Santa Catarina
Center: Parana, Sao Paulo, Rio de Janeiro, Minas Gerais, Mato Grosso, Goias, and Espirito Santo
North: Acre, Amazonas, Amapa, Para, Rondonia and Roraima
Northeast: Balance of States

Because of its negligible role in the fertilizer sector, the North is not referred to in this report.

B. Bank Group Involvement in the Brazilian Fertilizer Sector

1.04 The proposed loan would be the second loan to FERTILIZANTES. The first of US$50 million was made in May 1976 for the Araucaria ammonia/ urea project 1/. The implementation of the Araucaria project is proceeding satisfactorily. Procurement of time critical equipment is on schedule although the overall procurement activity is about two months delayed due to an initially slower pace of basic engineering work and extensive negotiations with the association of local manufacturers resulting in an increase in the proportion of local equipment from the appraisal estimate of about 50% to about 65% of total equipment cost. The expected project completion date still remains the same as estimated at appraisal, but the financing required has increased by about US$32 million or 14%, all in local currency. Adjustments in the financing plan have been made to cover the additional costs, and no difficulties are foreseen to provide the funds as required. Even with the higher capital cost, the economic rate of return remains satisfactory at about 20%.

1.05 Another project (Valefertil) in this sector, though for phosphatic fertilizers and with different project sponsors, is presently being appraised by the Bank and is scheduled for consideration by the Executive Directors soon.

## II. PROJECT SPONSORS

2.01 The project will be owned and operated by FERTILIZANTES, whose corporate ownership is described in detail in Annex 2.

A. Petrobras Fertilizantes S.A. (FERTILIZANTES)

2.02 FERTILIZANTES was established in early 1976 as a wholly owned subsidiary of the national oil company, PETROBRAS, with the objective of consolidating PETROBRAS' existing and future fertilizer interests. During 1977 FERTILIZANTES expects to take over Brazil's three existing ammonia based fertilizer plants (Fafer, Ultrafertil, Petrofertil). FERTILIZANTES also has responsibility for the country's three new ammonia/ urea projects Araucaria, Norte Fluminense 2/ and Sergipe, the project here under consideration. It has not been decided yet whether these three projects will be integrated into FERTILIZANTES as separate independent companies or whether they will be operating divisions of the existing companies. In addition, FERTILIZANTES will most likely be involved in the exploitation of

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1/ Report No. 1050-BR dated April 23, 1976.

2/ The Norte Fluminense project will use natural gas from the gas and oil fields offshore Campos (Rio de Janeiro). Brazil intends to request the Inter American Development Bank to finance this plant.

the potash deposit at Carmopolis (Sergipe) and of the phosphate rock deposit at Patos de Minas (Minas Gerais). PETROBRAS owns 100% of FERTILIZANTES' shares and will provide technical and management support to build and operate the Company's facilities. Initial authorized capitalization is Cr$1,200 (US$93) million of which Cr$10 (US$1) million is paid in. Once operations become adequately profitable, PETROBRAS plans to offer FERTILIZANTES' shares for sale, particularly to private sector fertilizer companies.

2.03 FERTILIZANTES' organization (Annex 2) is in the early stages of development with staff largely recruited from other PETROBRAS' operations. The vice-president and three directors (industrial, administrative and financial) have been appointed and transferred from PETROBRAS. In mid-1976 the Company had a head-office staff of about 40 to be built up to its full strength of 170-200 by early 1977. The Board of Directors are primarily from PETROBRAS plus representatives from BNDE and the Government. The Company's president is also PETROBRAS' president.

B. Petroleo Brasileiro S.A. (PETROBRAS)

2.04 As noted above, FERTILIZANTES' parent company, PETROBRAS, is the government oil company established in 1953. It owns eight existing refineries1/ and is responsible for the exploration, production and imports of petroleum and petroleum derivatives. PETROBRAS has three other wholly-owned subsidiaries, one for retailing its petroleum products, one for petroleum exploration outside Brazil and one which consolidates its interests in the chemical industry.

2.05 PETROBRAS' financial statements and the consolidated statements for PETROBRAS and its subsidiaries are shown in Annex 2. The consolidated statements are summarized below:

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1/ There are two small refineries not owned by PETROBRAS. However they cannot expand and must buy crude from PETROBRAS. There are some private oil distributors/retailers but they buy refined products from PETROBRAS and retail prices are controlled by the Government.

Brazil - PETROBRAS and Subsidiaries - Consolidated Statements
(in US$ million)

| For the Year Ending Dec. 31 | 1973 | 1974 | 1975 |
|---|---|---|---|
| Revenues (net of sales taxes) | 2,303 | 4,594 | 6,395 |
| Cost of Sales | 1,576 | 3,236 | 4,564 |
| Other Charges | 350 | 686 | 968 |
| Monetary Correction on Working Capital | 49 | 132 | 158 |
| Provision for Income Tax | 26 | 32 | 26 |
| Net Income | 302 | 508 | 679 |
| Current Assets | 1,474 | 2,642 | 3,810 |
| Long-Term Investment & Receivables | 51 | 47 | 43 |
| Fixed Assets (net) | 2,001 | 2,187 | 3,272 |
| Other Assets (net) | 77 | 116 | 99 |
| Current Liabilities | 776 | 1,270 | 2,345 |
| Long-Term Debt | 534 | 1,022 | 1,208 |
| Minority Investments | 82 | 34 | 81 |
| Equity | 2,211 | 2,666 | 3,590 |
| Total Assets or Liabilities | 3,603 | 4,992 | 7,224 |
| Long-Term Debt/Equity Ratio | 19:81 | 27:73 | 25:75 |
| Current Ratio | 1.9 | 2.1 | 1.6 |
| Net Incomes as % of Equity (at year end) | 13.7 | 19.1 | 18.9 |
| Exchange Rate Cr$/US$1.00 (at year end) | 6.22 | 7.44 | 8.60 |

PETROBRAS' consolidated statements indicate a sound financial situation with satisfactory earnings and liquidity and a conservative relationship between debt and equity. PETROBRAS' annual investment program was about US$1.4 billion equivalent during each of 1974 and 1975 and is expected to continue at about this level for the next four years. The annual equity requirements for PETROBRAS' three ammonia/urea projects estimated at less than US$100 million over a four-year period are thus small (7%) in comparison to its overall investment program.

C. Petrobras Quimica S.A. (PETROQUISA) and Present Fertilizer Operations

2.06 PETROBRAS is deeply involved in the production and distribution of petrochemicals and nitrogen fertilizers, through its wholly-owned subsidiary, Petrobras Quimica S.A. (PETROQUISA), which holds PETROBRAS' interests in the chemical and petrochmical industries. PETROQUISA has two operating divisions, seven subsidiaries and participates in 17 joint ventures (Annex 2). It is primarily for the reason of PETROQUISA's expanding involvement in the chemical sector that PETROBRAS removed its growing fertilizer interests from PETROQUISA and consolidated them under FERTILIZANTES. The three existing fertilizer companies, as described in detail in Annex 2, have had a good production record with capacity utilization exceeding 80%. The financial performance of two of these companies (Fafer and Petrofertil) has also been satisfactory, but Ultrafertil, which was privately owned until PETROQUISA's takeover in

1974 and in which IFC and the original Brazilian shareholder continue to hold about 15% of the equity, is financially weak with poor profitability and an inadequate debt service coverage of 0.5 or less for three out of the four last years. The integration of Ultrafertil into FERTILIZANTES might seriously endanger the financial viability of FERTILIZANTES unless concrete steps are taken to improve Ultrafertil's profitability and financial position. During negotiations the Bank will therefore ask FERTILIZANTES to prepare and submit to the Bank not later than June 30, 1977 a detailed report analyzing the reasons for Ultrafertil's poor financial performance and recommending specific measures which have to be taken to improve Ultrafertil's financial position.

2.07 With its existing operations, the PETROBRAS group has the monopoly of ammonia production for fertilizer use, and it is expected that this will continue. Participation of the private sector in the production of nitrogenous fertilizers cannot be expected at this time because of the very high capital requirements of new, large scale plants particularly when compared to the low capitalization of the existing private fertilizer industry in Brazil. The Government took over basic nitrogen production only because of the inability of the private sector to expand in this area. And, as mentioned, it is the Government's intention to offer shares of FERTILIZANTES to the private sector at a later stage.

## III. FERTILIZER MARKET AND MARKETING

### A. Agriculture in Brazil

3.01 Brazil's rising agricultural output has resulted mainly from expansions of cultivated area (Annex 3-1). Although it is expected that the area under cultivation will continue to expand, agricultural growth will have to depend increasingly on raising the productivity of existing land. The Government in its Second Development Plan (1975-1979) has established a goal of a 40% (7% annually) real increase in agricultural output which appears feasible, with the aim of making Brazil one of the world's foremost producers and exporters of foodstuffs. To achieve this, the Government has allocated substantial resources for incorporating new areas to production and for increasing agricultural productivity through a number of extension programs and through more use of fertilizer and improved seeds.

3.02 These programs reflect a shift in agricultural policy. While the orientation of the Government's investment for developing the agricultural sector had previously been toward the promotion and establishment of large and commercially oriented agricultural enterprises, the new policies are emphasizing increasingly the importance of raising the productivity of small farmers, especially in the Northeast.

3.03 No sudden eradication of rural poverty, which has been endemic in some regions of Brazil for decades, is likely to be forthcoming from these programs. Nevertheless, responsible efforts to improve the

productivity of Northeast agriculture and at the same time to increase industrial activity in the region have already resulted in a more rapid growth of per capita income in the Northeast than in Brazil as a whole; this process is expected to continue.

B. The Industry and Government Policies in the Fertilizer Sector

3.04 Brazil's fertilizer industry consists of about 50 relatively small private sector and three larger Government-owned companies with a total production capacity in 1976 of 270,000 tons of nitrogen and 690,000 tons of phosphate (Annex 3-2). The industry, especially the private sector, has concentrated on importing, mixing, blending and distributing rather than on establishing large scale, efficient production facilities. Most companies compete at the retail level largely with imported materials while only a few have their own, generally small, production facilities which have to be protected when world fertilizer prices are low (or restrained when world prices are high). The low level of domestic production has been due to Brazil's lack of easily exploitable natural resources, the rapidly rising capital requirements for the manufacture of chemical fertilizers and the absence of specific Government policies during the 1960's for the development of the petrochemical sector in general and the fertilizer sector in particular.

3.05 Large amounts of raw, intermediate and finished fertilizer materials, therefore, have been imported. To overcome this dependency on imports, the Government in 1974 embarked on a program whose objective was to attempt to assure self-sufficiency in fertilizers by 1980. For that purpose the Government has published a National Fertilizer Program (NFP), has established an interministerial Fertilizer Commission charged with ensuring the rational development of the sector and has developed a program for large, basic production facilities of which the Araucaria, Sergipe and Valefertil projects form part.

3.06 Production cost of local fertilizers have generally been higher than the cost of imports. To ensure that all domestic production is used, the Government established a quota system that requires retailers to purchase a given proportion of domestic fertilizer for each unit of imported fertilizer. The Government has changed this ratio periodically depending on consumption forecasts and local availability. As the new, large-scale efficient fertilizer plants enter into production, costs of domestic fertilizers are expected to move, in the longer run, in line with long-term international prices, thereby obviating the need for the import quota system.

3.07 International fertilizer prices were at a very high level in 1973-75 (Annex 3-2, Chart I) causing a decline in the purchasing power of agricultural products in relation to fertilizers and inducing a leveling off of fertilizer consumption in Brazil as in many other import dependent countries. Concerned about the impact of lower fertilizer consumption on its plans for expanding agricultural production, the Government introduced a 40% price subsidy to the farmers in April 1975. At the same time, the Government required banks to charge 15% interest on fertilizer credit, which had been previously interest-free. The net decrease in the cost of fertilizer to the farmer resulting from the subsidy and the interest charges was between 15 and

30% depending on the maturity of the credit. As a result of the rapid decline in international fertilizer prices during 1975 and 1976, the purchasing power of agricultural products in relation to fertilizers increased again and the subsidy could not any longer be justified. The Government therefore eliminated the subsidy in late December 1976. While this action is expected to adversely affect fertilizer demand during the first months of 1977, the prospects for continued significant growth of fertilizer demand are good since the relationship between agricultural products (including export products) and fertilizer prices is still favorable and the Government is expected to ensure that it will remain so in the future. The removal of the subsidy, when it was no longer economically justified, is an indication of the attention the Government is paying to fertilizer and of the Government's determination to follow rational policies in this sector.

C. Historical Consumption and Supply of Fertilizers

3.08 Growth of fertilizer consumption in Brazil has been rapid but also erratic as shown in the table below (Annex 3-2, Charts II and III):

Brazil - History of Apparent Fertilizer Consumption
(1,000 nutrient tons)

| | N | P | K | Total | % Yearly Change | N:P:K |
|---|---|---|---|---|---|---|
| 1960 | 65 | 128 | 106 | 299 | - | 1.0:2.0:1.6 |
| 1965 | 70 | 120 | 100 | 290 | - | 1.0:1.7:1.4 |
| 1970 | 276 | 416 | 307 | 999 | - | 1.0:1.5:1.1 |
| 1971 | 278 | 536 | 351 | 1,165 | 13 | 1.0:1.9:1.3 |
| 1972 | 412 | 875 | 460 | 1,747 | 55 | 1.0:2.1:1.1 |
| 1973 | 355 | 790 | 534 | 1,679 | -4 | 1.0:2.2:1.5 |
| 1974 | 389 | 914 | 521 | 1,825 | 9 | 1.0:2.7:1.6 |
| 1975 | 436 | 1,014 | 507 | 1,957 | 7 | 1.0:2.3:1.2 |
| 1976 a/ | 488 | 1,145 | 653 | 2,286 | 17 | 1.0:2.3:1.3 |

a/ As estimated by ANDA (National Association for the Promotion of Fertilizer Use).

Up to 1966 there was little growth reflecting the Government's neglect of the agricultural and fertilizer sector. Stimulating measures introduced in the mid-sixties brought six years of very rapid growth with annual increments averaging 35% through 1972. Over the past three years, fertilizer consumption increased only modestly, primarily as a result of the sharp rise in international prices and the scarcity of fertilizer in the world market. As shown above, a significant recovery in consumption was anticipated for 1976 caused by the Government's subsidy and declining international prices. The relatively high share of phosphate consumption is agronomically justifiable on account of soil characteristics in Brazil. Although detailed statistics of

fertilizer application rates per crop are not yet available, it is estimated that four crops, namely, sugar, coffee, soybeans and wheat account for 50% to 60% of total consumption.

3.09 On the supply side, domestic fertilizer production has grown at an average rate of 22% since 1965, but in 1975 supply from national sources still represented only about 35% of consumption. On a nutrient basis, 37% of nitrogen, 51% of phosphates and none of the potash comes from the domestic fertilizer industry. Most of the domstic phosphate production uses imported phosphate rock since Brazilian rock production accounts for only 10% of the country's requirements.

D. Projected Demand and Supply of Fertilizers

3.10 Given the erratic nature of past growth of fertilizer consumption in Brazil and the lack of detailed and consistent fertilizer statistics, demand projections carry a considerable amount of uncertainty. Of all the factors influencing fertilizer consumption, the most important is the presence or absence of strong Government support policies to promote the increased use of fertilizers. In view of the Government's interest in (i) higher agricultural production for which fertilizers are an essential input; (ii) its willingness to stabilize the ratio of agricultural product to fertilizer prices; and finally (iii) its declared goal of assuring a stable supply of fertilizers by sharply increasing the share of domestic production, it can be said that the Government is providing a favorable background for significant further growth in fertilizer consumption. The limiting factors appear to be bottlenecks in transportation, deficiencies in the extension services, lack of foreign exchange for the import of fertilizer materials and insufficient allocations of agricultural credit.

3.11 The upper limit for future demand can be estimated by normative analysis from necessary nutrient replacement and by projections of arable land and cropping patterns. Estimates of this nature result in a potential demand of about 12 million nutrient tons (NPK) in 1985, compared to the consumption of 2.3 million nutrient tons expected for 1976 (para 3.08), the average annual growth between 1976 and 1985 would, therefore, be around 23%. Actual growth rates through 1985 are expected to be much lower, however, ranging from 10-12% annually, considering the constraints mentioned in the preceeding paragraph. On this basis, fertilizer demand is projected as follows:

Brazil - Apparent Fertilizer Demand Projections
(Million nutrient tons)

| Year | N | $P_2O_5$ | $K_2O$ | Total | N:P:K |
|---|---|---|---|---|---|
| 1980 | | | | | |
| NFP a/ (1974) b/ | 1.4 | 1.6 | 1.0 | 4.0 | 1.0:1.14:0.7 |
| Bank (1976) | 0.8 | 1.7 | 1.0 | 3.4 | 1.0:2.1:1.2 |
| 1985 | | | | | |
| Bank (1976) | 1.4 | 2.6 | 1.7 | 5.7 | 1.0:1.8:1.2 |
| Assumed Average Annual Growth (Bank) (%) | | | | | |
| 1976-1980 | 13.0 | 10.0 | 11.0 | 11.0 | - |
| 1980-1985 | 12.0 | 9.0 | 11.0 | 10.0 | - |

a/ National Fertilizer Program.
b/ Years in which projections were prepared.

The above table also shows the 1980 consumption targets of the National Fertilizer Program (NFP); they are in line with the Bank's estimates for phosphates and potash but considerably higher than our estimates for nitrogen demand. While higher levels of agricultural productivity imply an increasingly larger proportion of N relative to $P_2O_5$ application, the evolving cropping pattern and the opening of new cultivated areas, which require relatively more $P_2O_5$ than N, are expected to result in only a minor change in the country's overall NPK ratio. The regional distribution of fertilizer consumption is assumed to follow the pattern of the last few years with about 10% of total consumption occurring in the Northeast, 60% in the Center and 30% in the South.

3.12 On the other hand, the pattern of future fertilizer supply is expected to differ dramatically from the present one; this is the direct result of the NFP. Although self-sufficiency by 1980 does not appear to be achievable, it is anticipated that during the early 1980s domestic fertilizer supply will have a share of 60%-70% of total NPK consumption as compared to about 35% at present. The table below shows that near self-sufficiency for N and $P_2O_5$ could be reached in the early 1980's, while no domestic production of $K_2O$ is expected until the mid-1980's at the earliest:

Brazil - Projected Nitrogen Demand/Supply Balance
(1,000 nutrient tons)

| | 1976 (est.) | 1980 | 1985 |
|---|---|---|---|
| Demand | | | |
| N | 488 | 800 | 1,400 |
| $P_2O_5$ | 1,145 | 1,680 | 2,580 |
| $K_2O$ | 653 | 1,000 | 1,700 |
| Total NPK | 2,286 | 3,480 | 5,680 |
| Domestic Production | | | |
| N | 160 | 570 | 980 /a |
| $P_2O_5$ | 786 | 1,555 | 2,026 |
| Total NPK | 946 | 2,125 | 3,006 |
| Self-Sufficiency (%) | | | |
| N | 33 | 71 | 70 |
| $P_2O_5$ | 69 | 93 | 78 |
| Total NPK | 41 | 61 | 53 |

a/ Assumes no further capacity addition beyond Araucaria, Sergipe and Norte Fluminense plants.

The above production estimate takes into account the three new ammonia/urea projects, Araucaria, Sergipe and Norte Fluminese. A fourth plant to be built in Rio Grande do Sul in cooperation with the State Government is presently being evaluated by FERTILIZANTES. From the above, the most appropriate start of production for this fourth project would seem to be in 1982/83. An earlier start-up might lead to a temporary excess production of nitrogen. To keep abreast of the investment plans in the fertilizer sector and to ensure that new plants are built in accordance with as realistic demand projections as possible, assurances will be sought during negotiations that the Government will exchange views with the Bank from time to time regarding the expansion and development of the fertilizer sector, including investment plans and import and pricing policies.

## E. Fertilizer Marketing and Distribution

3.13 About 90% of total fertilizer distribution is effected through blenders which are either owned by fertilizer manufacturers (25% of total), independent companies (65%) or cooperatives (10%). The Government intends private firms to continue handling the marketing and distribution functions in the sector. However, the rapid expansion of consumption expected in the next few years, and changing pattern of supply, might create a severe strain on the existing fertilizer marketing and distribution network.

To analyze potential bottlenecks, and their effect on future fertilizer consumption, the Government agreed, in connection with the Bank's loan for the Araucaria project, to undertake a marketing and distribution study under terms of reference satisfactory to the Bank. The study began in October 1976, and its results are expected to be available by late 1977.

F. The Market and Marketing for Sergipe's Fertilizer Production

3.14 The Sergipe plant will be located just south of the main fertilizer consumption center of the Northeast and will cater for that region's nitrogen requirements (Annex 3-3). Growth of fertilizer consumption in this region has averaged about 22% per year over the last decade, compared to rates of 34% and 20% for the South and Center, respectively. Because of the poor soils and the arid and semi-arid climate of the Northeast, fertilizer consumption is primarily restricted to those areas where rainfalls are high or where irrigation schemes provide the required water for efficient use of fertilizers. This is the case in the narrow humid belt along the coast (the Zona de Mata) and in a more limited way in the transition zone (the Agreste) between the humid coast and the arid interior (Map IBRD 12412).

3.15 Up to the late 1960s, the Northeast used fertilizer nearly exclusively for sugarcane, the predominant crop in the coastal belt. A detailed farm survey, however, which was done by a joint effort of SUDENE and the Bank in 1973, revealed that use of fertilizers has become much more diversified. According to the survey, fertilizer was used in 1973 as follows: 50% for sugarcane, 15% for cacao, 15% for beans, 10% for manioc and 10% for other crops. Unfortunately, no time series is available that would indicate how fertilizer applications have changed over time for each crop.

3.16 Also in 1973, the Government contracted ANDA for a three-year program to determine the bottlenecks preventing increased use of fertilizer and to conduct a large number of tests of fertilizer use in the various states and for all the major crops cultivated in the Northeast. The results of this program, which was actively supported by FAO and which is likely to be continued, are now available and are very encouraging; they clearly show that more fertilizer can significantly increase agricultural yields as well as gross revenues and net profits to the farmer at benefit cost ratios which indicate no undue increase in the risk to him.

3.17 Against this background, the prospects for continued growth of fertilizer consumption in the Northeast are good. However, there are no detailed studies of the underlying reasons for the past and future fertilizer demand in the Northeast so that projections have to be based on assumed growth rates. A normative analysis, similar to the one for the whole of Brazil (para 3.11), indicates a potential fertilizer demand of about 1 million nutrient tons by 1985. This would imply an average annual growth rate of about 19% for the period 1977-1985, against one of 22% for the last ten years. Because of the same constraints mentioned for the whole of Brazil (para 3.10) it is more likely that the actual growth rate will be lower and 12% per year are assumed here. The financial and economic risks of the project associated with an even lower than assumed

growth rate of fertilizer demand are discussed further below (paras. 6.10 and 7.07).

3.18 On the supply side, although reserves of natural gas, the ideal raw material for production of nitrogen, are limited in Brazil, they are concentrated in the Northeast and therefore this region is particularly well suited for the production of ammonia and urea. With an existing plant at Camacari in the State of Bahia which is presently being expanded and the Sergipe project, the Northeast will produce considerably more nitrogen than required by this region as shown below:

Northeast - Project Nitrogen Demand/Supply Balance
(1,000 nutrient tons)

| | 1976 (est.) | 1980 | 1982 | 1984 | 1986 |
|---|---|---|---|---|---|
| Demand | 66 | 110 | 140 | 175 | 225 |
| Supply | | | | | |
| Petrofertil (Camacari) | 30 | 225 | 225 | 225 | 225 |
| Sergipe | - | - | 200 | 225 | 225 |
| Total Supply | 30 | 225 | 425 | 450 | 450 |
| Surplus (Deficit) of N to be Shipped to (from) Other Regions | (36) | 115 | 285 | 275 | 225 |

Until 1981, the region's demand for nitrogen will be satisfied by the increasing production from the Camacari plant which will provide an important stimulus to fertilizer consumption in the Northeast. From 1981 onward, the Sergipe plant, because of its proximity to the market, will supply the Northeast with nitrogen while all of the output of the Camacari plant, located near the port of Aratu and some output of the Sergipe plant will have to be shipped to other regions in Brazil (primarily the Center), where it will substitute for imports. By 1986 demand in the Northeast is expected to exceed the production from the project, and in the following years, the Camacari plant will again increasingly supply the Northeastern market.

3.19 Of the total nitrogen consumption in the Northeast, it is estimated that in 1976, 65% was consumed in the form of urea and 35% as ammonium-sulfate. The completion of the Camacari expansion, the Sergipe project and the planned MAP/DAP plants will bring the share of urea consumption to about 70% with the remaining N requirements being satisfied by MAP, DAP and ammonium sulfate, this is not a significant change from the current compositon of N consumption. Urea has been accepted in the market as an efficient fertilizer, and from tests done by the extension services, the universities and the fertilizer companies, it can be concluded that urea is a fully suitable fertilizer.

3.20 The project's urea output will be sold to bulkblenders and mixers who have plants close to the ports of Recife and Maceio. Transportation of urea to Recife and Maceio is planned to be mostly by railway with most of it in bags. However, FERTILIZANTES intends to increase bulk shipments to large customers for which bulk unloading facilities would be economic. Exploitation of the potash deposit at Carmopolis, about 30 km to the northwest of the project site and expected to start by the mid-1980s, will make the area attractive for the location of new mixing and blending installations.

3.21 Of the project's saleable ammonia output of 80,000 TPY of ammonia, 48,000 TPY are expected to be consumed by ammonium phosphate plants planned for Recife and Maceio, and the remaining 32,000 TPY would be shipped to other regions in Brazil via the new chemical port of Aratu, which will include facilities for the storage and handling of ammonia and bulk fertilizer materials. PETROBRAS will be responsible for the coastal shipping of ammonia and will either buy or charter boats for that purpose. The ports of Santos (Center) and Rio Grande (South) to which ammonia can be shipped have adequate special storage and handling facilities for ammonia.

3.22 As a result of the Camacari expansion and this project, the railway transportation requirements in the Northeast will significantly increase. While the capacity of the lines is sufficient to handle the expected traffic up to about 1995, the operations of the Northeastern railways (they are part of the Federal Railway Authority (RFFSA) to which the Bank has made two loans) will have to be improved as described in Annex 3-4. The recommendations made by the Bank to this end have been agreed to in principle by RFFSA and their execution will be supervised by the Bank as part of its follow up of the existing loans to RFFSA. Special rail cars for the transport of liquid ammonia and bulk urea will be purchased by FERTILIZANTES as part of the project. Box cars for bagged urea, tank cars for gas and Bunker C oil and locomotives will be supplied by RFFSA.

3.23 The projected continued growth in fertilizer demand will require significant additional investments in the marketing and distribution system in the Northeast. In the past, the private sector has made these investments as required and as long as the Government support policies keep the marketing and distribution business profitable, the required future investments are expected to be forthcoming. For FERTILIZANTES it is most important to keep in close contact with the developments in the fertilizer sector in the Northeast and all of Brazil. For that purpose FERTILIZANTES will set up its own market analysis and marketing group. The main tasks of this group will be (i) to analyze the market in order to gain an understanding of the forces affecting demand (including Government policies); (ii) to make regional and overall fertilizer demand projections; and (iii) to closely monitor the development of the marketing and distribution system which is largely in the hands of the private sector. A plan for the establishment of such a group and its proposed work program will be presented to the Bank by FERTILIZANTES at negotiations.

## IV. THE PROJECT

### A. Project Scope

4.01 The project involves the construction of a 907 TPD (1,000 short tons per day) ammonia plant and an 1,100 TPD urea plant on a grass roots 100 hectare site at Laranjeiras, about 20 km northwest of Aracaju in the state of Sergipe. The site has good road and rail connections as it is served by the existing road from Aracaju and by the Salvador-Recife railway passing within about 5 km (Annex 4-1). The project will include all necessary production ancillaries, and both the ammonia and urea units will be single train of standard size capacities employing modern commercially proven technologies to ensure reliable operation. On the basis of 330 stream days per year and an assumed maximum capacity utilization of 90% projected for the third year of operations (1983) and thereafter, the plant will produce about 270,000 TPY ammonia and 327,000 TPY urea. Of the ammonia production 190,000 TPY will be used by the project as intermediate in the production of urea with the balance of about 80,000 TPY being sold directly (para 3.21). The plant will contain provision for bagging the entire urea output, but it is anticipated that a significant proportion will be shipped in bulk. A detailed description of the project is given in Annex 4-2.

### B. Raw Materials and Utilities

4.02 Principal raw materials to be consumed (Annex 4-3) by the project will be natural gas and vacuum gas oil at an annual rate of 215 million $NM^3$ and 109,000 tons, respectively. Additionally, about 50,000 TPY Bunker C fuel oil will be required for steam generation. Natural gas will be supplied by PETROBRAS from its own onshore and offshore deposits in the states of Sergipe and Alagoas. PETROBRAS has determined the total reserves in these areas currently as 19 billion $NM^3$ including 10 billion $NM^3$ proven. Out of these reserves the project will require, and is being allocated, a quantity of 3.1 billion $NM^3$ sufficient for 15 years operation at full capacity; this is considered adequate. Details of these reserves and their projected consumption are given in Annex 4-4 and specifications for the gas, vacuum gas oil and Bunker C fuel oil in Annex 4-5. The gas is especially suitable for ammonia production containing about 97% hydrocarbons and only a very small quantity of sulfur.

4.03 PETROBRAS currently operates a gas transmission pipeline supplying the state of Bahia with gas from its gas compression and distribution center 9 km south of Aracaju. PETROBRAS will construct a new gas liquid separation plant adjacent to this center and a new dry gas supply pipeline to the project site. Additionally, PETROBRAS is constructing a gas gathering and conservation scheme in the states of Sergipe and Alagoas to reduce gas losses and boost supplies to the Aracaju terminal. These facilities are not part of the project but are essential for its operation and are planned for completion well in advance of completion of the project. During negotiations, an assurance will be sought from PETROBRAS to dedicate a minimum of 3.1 billion $NM^3$ of gas from its offshore and onshore gas reserves in the states of

Alagoas and Sergipe to the exclusive use of the project and to build and maintain any facilities (including the construction of pipelines and compressor stations) that are required to provide the project with adequate supplies of gas. The Bank will also ask FERTILIZANTES to conclude a long-term gas supply contract with PETROBRAS before loan effectiveness.

4.04 Vacuum gas and Bunker C fuel oil requirements will be met from PETROBRAS' Mataripe refinery (near Salvador, Bahia) and will be shipped in rail tank cars via the existing railway service over some 450 km to a storage terminal to be constructed by PETROBRAS adjacent to the project site (Annex 3-4). To supply the project with water and electricity, a water pipeline and additional electrical transmission lines will be built, as described in Annex 4-2. The electrical supply facilities will be constructed by the local authorities independently of the project, but approximately 17% of the cost of the water pipeline will be financed by FERTILIZANTES as part of the project. To ensure that these raw materials and facilities will be available to the project as required, satisfactory arrangements for the supply of vacuum gas oil and Bunker C fuel oil and for construction of the water and electricity supply facilities will be conditions of loan effectiveness.

C. Project Administration and Implementation

4.05 PETROBRAS' fertilizer project implementation unit (COFEN) 1/ supported by PETROBRAS' engineering and purchasing departments will supervise project execution on behalf of FERTILIZANTES, coordinate the work of the foreign and local contractors, undertake procurement of all but critical items and contract directly with local firms (yet to be selected) for civil works and erection. PETROBRAS has already signed contracts with Pullman Kellogg (USA) for provision of process license, basic engineering design, procurement assistance, and technical advisory services relating to the ammonia unit and general site facilities, and with the Toyo Engineering Company (Japan) for provision of similar services and process license relating to the urea unit. Selection of Kellogg and Toyo as the foreign engineering contractors was based on the results of competitive offers received by PETROBRAS in 1972 for the Petrofertil ammonia/urea project. On the basis of that result, an assessment of these companies' charges for the Sergipe project and the benefits to be gained from standardization of technology and better prospects for technology transfer, FERTILIZANTES' appointment of Kellogg and Toyo for the Sergipe project is acceptable.

4.06 Detailed engineering of the ammonia unit and general plant facilities will be undertaken by a Brazilian firm, Promon Engenharia S.A. (PROMON), acting as a nominated subcontractor and under the supervision of Kellogg. Another local engineering firm, Montreal Engenharia S.A. (MONTREAL), will undertake detailed engineering of the urea unit as nominated subcon-

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1/ Construcao de Fertilizantes Nitrogenados (Construction of Nitrogen Fertilizer Facilities).

tractor and under the supervision of Toyo 1/. Given the wide experience of PETROBRAS and the availability of technical advisory services from Kellogg and Toyo through the detailed engineering, procurement, construction, and start-up periods, this arrangement is considered satisfactory. The project schedule shown in Annex 4-6 provides for commencement of commercial operations by January 1, 1981. With four years to commercial production, the implementation schedule is somewhat longer than what has been estimated for similar Bank-financed fertilizer projects. Taking into account, however, the low level of industrialization in the Northeast, the somewhat complicated coordination procedures between FERTILIZANTES and PETROBRAS and the engineering companies, and the actual implementation schedule of projects now being constructed, the above estimate appears realistic.

D. Ecology

4.07 The Sergipe plant will include facilities for removal of contaminants from the condensates of the ammonia unit and urea evaporator before discharge, and for collection and removal of oil from waste waters (Annex 4-2). Additionally, cooling tower blow down will be treated for removal of chromates and demineralization plant waste neutralized. A sewerage treatment plant will be provided for sanitary waste. The overall effluent treatment system inclusive of these facilities will be based on existing US standards.

E. Employment and Training

4.08 The project will provide direct employment for about 384 people, most of whom will be professional, skilled or semi-skilled (Annex 4-2). It is expected that most of the staff will be recruited from the Aracaju area or transferred from PETROBRAS refinery or PETROQUISA's existing fertilizer plants. Except for an initial period during commissioning when expatriate supervisors will be present, the project will be staffed entirely by Brazilian personnel. It will be the responsibility of FERTILIZANTES to acquire the necessary personnel and have them trained to ensure smooth start-up and operation of the project. FERTILIZANTES will be able to benefit from the excellent facilities that PETROBRAS has for the purpose of training the large number of skilled staff required for its major refinery and petrochemical expansion programs. Additionally, the ammonia/urea complex of Petrofertil will be used for "in-plant" training, and the project's process licensors and contractors will provide special training in the process technology involved and some practical training in similar operational ammonia and urea units for selected personnel. During negotiations an agreement will be sought from FERTILIZANTES to provide the Bank not later than December 31, 1977, with a detailed plan, acceptable to the Bank, for recruitment, training and staffing of the project.

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1/ The employment of local engineering firms and the concomitant transfer of technology is an important contribution to the development of Brazil's engineering industry which will facilitate implementation of future projects.

## V. CAPITAL COST, FINANCING PLAN, PROCUREMENT AND ALLOCATION OF BANK LOAN

### A. Capital Cost

5.01 The total financing required for the project is estimated at US$288.4 million equivalent (Cr$3,561 million) of which US$100.9 million (Cr$1,245 million) is in foreign exchange. The capital cost estimate is based on December 1976 prices and already reflects the high rate of equipment price increases experienced in 1975/76. The estimate is summarized in the following table and shown in more detail in Annex 5-1 together with the assumptions made:

Summary of Capital Cost Estimate a/

| | Cr$ Million | | | US$ Million | | | |
|---|---|---|---|---|---|---|---|
| | Foreign b/ Exchange | Local Currency | Total | Foreign b/ Exchange | Local Currency | Total | % |
| Land & Civil Works | 32 | 251 | 283 | 2.6 | 20.2 | 22.8 | 11 |
| Equipment & Materials | 662 | 691 | 1,353 | 53.6 | 56.0 | 109.6 | 55 |
| Engineering & Licenses | 112 | 135 | 247 | 9.1 | 10.8 | 19.9 | 10 |
| Erection | 52 | 292 | 344 | 4.2 | 23.7 | 27.9 | 14 |
| Pre-Operating Expenses | - | 258 | 258 | - | 20.9 | 20.9 | 10 |
| Base Cost Estimate (BCE) | 858 | 1,627 | 2,485 | 69.5 | 131.6 | 201.1 | 100 |
| Physical Contingency (8.5% of BCE) | 75 | 136 | 211 | 6.1 | 11.1 | 17.2 | |
| Price Escalation (13.6% of BCE + Phys. Cont.) | 95 | 272 | 367 | 7.7 | 22.1 | 29.8 | |
| Installed Cost | 1,028 | 2,035 | 3,063 | 83.3 | 164.8 | 248.1 | |
| Working Capital | - | 185 | 185 | - | 15.0 | 15.0 | |
| Interest During Construction | 217 | 96 | 313 | 17.6 | 7.7 | 25.3 | |
| Total Financing Req'd | 1,245 | 2,316 | 3,561 | 100.9 | 187.5 | 288.4 | |

a/ On basis of exchange rate of Cr$12.35 = US$1.0

b/ Including US$32 (Cr$395) million equivalent in indirect foreign exchange based on an estimated average indirect foreign exchange content of 25% for equipment and materials and 15% for civil works and erection.

5.02 The above costs are based on estimates prepared by the foreign contractors and PETROBRAS' engineering department in June 1976 and updated in January 1977, and take into account prices for equipment and materials presently being procured by PETROBRAS on other similar projects. In comparison with capital costs estimates for similar fertilizer projects financed by the Bank, the above estimate appears somewhat high; for this a number of reasons exist: First, the project includes relatively large amounts for

infrastructure for water supply and the railway extension and special railcars totalling US$21 million equivalent. Second, charges for price escalation and interest during construction are high because of the somewhat longer implementation period (para 4.06). Third, Brazilian costs for equipment and services are high when expressed in US dollars. This can at least partially be explained by the use of the official rate of exchange which is estimated to overvalue the Cruzeiro by about 25%. And fourth, as a result of the Government's and PETROBRAS' policy to support and develop Brazilian industry, 60% of the equipment and materials required by the project are to be procured locally. This, because of the higher Brazilian costs, is estimated to increase the total financing requirements at the official exchange rate by a maximum of 5%. The capital cost estimate is presently being reviewed and the engineering companies' definitive estimate will be available to the Bank before loan presentation to the Executive Directors.

5.03 All imported equipment and materials for the project will be exempt from import duty. The cost of foreign engineering services and licenses included are the estimated values of the contracts which were signed in November 1976. Physical contingencies equivalent to about 9% of the base cost estimate have been added. Price escalation for equipment 1/ is calculated on the basis of projected price increases of 8% per year in 1977 and thereafter in major equipment supplying countries because of worldwide inflation. On civil works, escalation rates of 12% per year in 1977 and thereafter have been assumed based on the estimate, as in the recent past, that the cost of civil works in Brazil will rise faster than the general price level. The above cost estimates, including physical and price contingencies, are considered adequate.

5.04 Initial working capital requirements for the project (excluding spare parts and initial supplies of chemicals which are already included elsewhere in the above cost estimate) are detailed in Annex 5-2 and estimated at US$15.0 million equivalent. Interest during construction is estimated at US$25.3 million based on the disbursement as shown in the debt service schedule (Annex 6-3, Page 2) and on interest rates of 10% and 4% for foreign and local loans 2/, respectively.

B. Financing Plan

5.05 The financing plan for the project will be as follows:

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1/ The international price inflation rate is also used for estimating price escalation of local purchases (expressed in US dollars) on the assumption that differences in the domestic and international inflation rates will be accounted for by continuing adjustments in the exchange rate as is the Government's policy.

2/ These interest rates are not directly comparable since interest on foreign loans is expressed in current terms while the interest on local loans is given in real terms, i.e., with the interest and principal subject to regular adjustments in line with domestic inflation.

Proposed Financing Plan

| | (in Cr$ Million) | (in US$ Million) | % |
|---|---|---|---|
| Equity (PETROBRAS) | 1,460 | 118.2 | 41 |
| Debt | | | |
| World Bank | 790 | 64.0 | 22 |
| Cofinancing | 310 | 25.0 | 9 |
| Local Loan (BNDE) | 1,001 | 81.2 | 28 |
| Total Debt | 2,101 | 170.2 | 59 |
| Total Financing | 3,561 | 288.4 | 100 |

The project will be financed with about 41% equity and 59% debt. PETROBRAS will provide the entire equity funds for local currency expenditures. An analysis of PETROBRAS' cash flow projections indicates that PETROBRAS will be able to provide these funds as well as cost overrun financing should this be necessary. The remainder of the local currency financing will come from the National Economic Development Bank (BNDE) which has in principle agreed to provide these funds; nevertheless, BNDE was to make a final evaluation of the project in early 1977 and loan approval is expected by mid-1977. Repayment terms for the BNDE loan are expected to be about the same as those of the Bank, i.e. 15 years including 4-1/2 years of grace. While the loan will be expressed in constant terms with an interest of 4% per year, loan disbursements and debt service payments will be in current terms using a monetary correction factor tied to the domestic inflation rate.

5.06 The foreign exchange financing will come from the proposed Bank loan and from cofinancing arrangements with foreign private investors. Although untied as to purpose, the cofinancing is intended primarily to cover the foreign component of interest during construction (US$17.6 million) and some equipment and materials not financed by the Bank loan. At this time, FERTILIZANTES has not decided whether the cofinancing will come from a foreign commercial bank or through a private placement of its debt obligations with institutional investors in the US. This will be determined by market conditions prevailing at the time FERTILIZANTES will seek such an arrangement. The terms for this type of financing will probably be seven-nine years maturity including three years of grace with an interest rate of about 10% per year1/. During negotiations, the Bank will seek an assurance from FERTILIZANTES that it will make its best efforts to obtain about US$25 million in untied foreign exchange through a cofinancing arrangement not later than six months after Bank approval of the proposed loan.

5.07 A bank loan of US$64 million is proposed for 15 years including four years of grace at the standard Bank rate (currently 8.5% annual interest) plus a guarantee fee to the Government to bring total annual

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1/ The financial projections in this report assume maturity of eight years including a grace period of three years and annual interest of 10%.

interest to FERTILIZANTES to 10%. The Bank loan will be made directly to FERTILIZANTES which will also carry the foreign exchange risk.

5.08 As in the Araucaria project, during negotiations a number of assurances will be sought from PETROBRAS and the Government regarding the financing plan of the project; these are as follows. Should any shortfall occur in the financing plan or should the project require additional funds, PETROBRAS will assure the provision of all necessary funds in the form of equity and/or loans to complete 1/ the project in such a way that its (the project's) debt/equity ratio will not exceed 60/40 and its current ratio be at least 1.2. PETROBRAS will also be asked to assist FERTILIZANTES in its efforts of obtaining financing through the proposed cofinancing arrangements and from BNDE. In the event that some loan repayments will be due before project completion, an assurance will be required that PETROBRAS will refinance or arrange financing for such repayments. In addition, the Government will be asked to take all necessary steps to assure that all funds, including foreign exchange are provided as required to complete the project without delay and in a form satisfactory to the Bank and that all approvals for implementation of the project, and all necessary imports are timely provided.

C. Procurement

5.09 All procurement for the project will be undertaken for FERTILIZANTES by PETROBRAS's purchasing department with the exception of some critical items which will be procured by the foreign engineering contractors (Kellogg and Toyo). Prequalification of suppliers to participate in ICB following placement of international notices will be undertaken by PETROBRAS' engineering department utilizing, as appropriate, advisory services from Kellogg and Toyo; the list of prequalified firms will be subject to the Bank's approval. Except for a reserve list of equipment for local manufacture which was jointly prepared by FERTILIZANTES and the Ministry of Finance in consultation with the domestic manufacturers' association and which will also be subject to Bank approval (estimated at US$73 million equivalent ex-factory), all remaining equipment and materials for the project (estimated at US$48 million equivalent f.o.b.) will be purchased in accordance with the Bank's procurement guidelines. Of the equipment and materials so procured, it is estimated that Brazilian suppliers will be able to compete with offshore suppliers for items totalling about US$20 million of which Brazilian suppliers are expected to win equipment and materials totalling US$12 million equivalent. For the purpose of bid comparison, Brazilian suppliers participating in ICB will be granted a preference of 15%.

D. Allocation and Disbursement of Bank Funds

5.10 The proceeds of the Bank loan would be used to finance 100% of foreign expenditures or 100% of the ex-factory price for products manufactured in Brazil for (i) equipment and materials procured through ICB (US$29.9

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1/ The project is considered complete when the plant has operated during a period of 60 consecutive days at 80% of its capacity.

million); (ii) imported critical and highly specialized items with restricted bidders lists approved by the Bank (US$13.0 million); (iii) imported items and packages costing less than US$100,000 each procured through international shopping (US$12.0 million); and (iv) foreign engineering and advisory services (US$9.1 million). It is anticipated that prior to loan signature advance contracting will amount to US$9.1 million for foreign engineering services with consequent retroactive Bank financing of such expenditures not exceeding US$1.5 million. No advance contracting and retroactive financing for equipment and materials will be necessary. The anticipated Bank loan disbursement and allocation schedules are shown in Annex 5-3 and Annex 5-4. Any surplus funds remaining in the loan account after completion of the project will be cancelled.

## VI. FINANCIAL ANALYSIS

### A. General

6.01 The medium and long-term financial outlook for FERTILIZANTES is difficult to assess accurately at this time since it is not yet clear in which manner and when the existing companies and the presently planned future undertakings will be integrated under FERTILIZANTES. For the next 3 - 4 years, the Company's strength will be dependent on the three existing operations (Fafer, Ultrafertil, Petrofertil) of which only Ultrafertil will need to be significantly strengthened (para. 2.06), the other two being financially sound. From 1980 onwards, however, the financial position of FERTILIZANTES will be increasingly determined by the new large-scale ammonia/urea plants to be built in Araucaria, Sergipe and Norte Fluminense and the Company's likely participation in the exploitation of the phosphate and potash deposits at Patos de Minas and Carmopolis respectively. Because of its newness, FERTILIZANTES has so far not prepared any long-term financial projections for all its operations combined. However, FERTILIZANTES should soon be sufficiently well established to prepare a 5-year financial forecast. The Bank will, during negotiations, seek an assurance that such projections will be prepared and made available to the Bank by July 1, 1977 and be updated annually as part of the Company's reporting to the Bank. In the absence of such projections at this time the financial analysis is carried out here by treating the project as an independent financial entity and assessing its strength.

6.02 All money values in the financial projections are expressed in current US dollars using an assumed annual inflation rate of 8% until 1979 and 7% thereafter up to 1985. Using US dollars instead of Brazilian Cruzeiros has the advantage that no estimate of Brazilian future inflation is required. This approach assumes that the difference between domestic and international inflation is taken care of by appropriate exchange rate adjustments which has generally been the case in the past. The assumptions made in the financial analysis of the project are given in detail in Annex 6-1 and summarized below.

B. Production, Sales Prices and Operating Costs

6.03 It is assumed that the project will start commercial production in January 1981 and that capacity utilization will increase from 70% during the first year of operations to 90% during the third year (1983) and thereafter. At 90% capacity utilization the project would produce for sale 327,000 TPY of urea and 80,000 TPY of ammonia. It is estimated that about 70% of the urea output would be sold in bags at an estimated bag and bagging cost of US$11 per ton urea.

6.04 So far, FERTILIZANTES has not developed a detailed pricing policy for its fertilizer products. However, it is committed to two main objectives. First, since FERTILIZANTES intends to sell shares to the private sector, prices have to be high enough to generate sufficient profits and dividends to make the Company's shares attractive to private investors. Second, FERTILIZANTES has a mandate from the Government to produce and sell fertilizer materials at stable prices comparable to those prevailing over time in the international market. The Bank's long-term international price forecast indicates, in 1976 terms, a range between US$165 and 171 per ton urea (f.o.b., bagged) from which an ex-factory price for the Sergipe project of about US$205 per ton urea (bulk) destined for the Northeast market, can be determined satisfying both considerations mentioned above. For the urea which will be shipped to other regions, primarily the Center, a lower ex-factory price of US$175 per ton is assumed, reflecting the additional transport costs between the plant and the Center. These prices compare to Petrofertil's mid-1976 ex-factory price for urea of about US$180 per ton and a maximum Government controlled retail price of US$280 per ton. On average, ammonia is assumed to have a 1:1 price relationship to urea (bulk), which reflects the production cost relationship of N in ammonia to N in urea. These pricing principles will again be discussed with the Government and FERTILIZANTES during negotiations.

6.05 The prices of the principal raw materials for the plant (natural gas, vacuum gas and Bunker C oil) are all price controlled by the Government. On July 1, 1976 the Government increased the prices for these materials by about 40% but leaving them still clearly below world market levels. The revised prices are: US$0.84 per MSCF 1/ natural gas, US$58.4 per ton vacuum gas oil and US$49.2 per ton Bunker C oil. It is assumed that, except for adjustments for domestic inflation, the above prices will prevail during the planning period. The sensitivity analysis on the financial rate of return (para 6.10) indicates how the project would be affected if economic raw material prices were to be charged instead of the financial ones.

C. Production Costs and Financial Forecasts

6.06 Under the price assumptions made above and at a capacity utilization of 90%, the production cost (excluding financial charges) per ton of ammonia and urea will be US$105 and US$115 respectively in constant 1976 terms (Annex 6-2). Feedstock and fuel, depreciation and others (including labor) each account for about one-third of the estimated total annual operating costs.

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1/ MSCF = 1,000 standard cubic feet.

6.07 The financial projections as shown in Annex 6-3 and as summarized below indicate a sound financial situation for the project entity:

Sergipe - Summary of Financial Projections
(in current million US$)

| | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|
| Capacity Utilization | 70% | 80% | 90% | 90% | 90% |
| Sales | 89.2 | 116.5 | 140.1 | 154.2 | 166.9 |
| Profit Before Tax | 18.7 | 37.0 | 53.3 | 63.0 | 71.1 |
| Profit After Tax | 13.1 | 25.9 | 37.3 | 44.1 | 49.8 |
| As % of Sales | 35.4 | 41.7 | 45.5 | 46.8 | 47.5 |
| As % of Equity | 7.7 | 13.0 | 15.6 | 15.4 | 14.8 |
| As % of Invested Capital a/ | 3.8 | 7.8 | 11.5 | 14.0 | 16.4 |
| Internal Cash Generation | 38.9 | 53.6 | 66.9 | 75.8 | 83.7 |
| Net Fixed Assets | 305.3 | 299.1 | 290.5 | 279.1 | 264.8 |
| Long-Term Debt | 157.2 | 143.5 | 128.8 | 112.1 | 96.2 |
| Current Ratio | 1.5 | 1.5 | 1.5 | 1.5 | 1.5 |
| Debt Equity Ratio | 48/52 | 42/58 | 35/65 | 28/72 | 22/78 |
| Debt Service Coverage | 2.1 | 2.1 | 2.5 | 2.8 | 3.1 |

a/ Total assets minus cash surplus

6.08 The sales value is expected to increase from US$89 million in 1981 to US$140 million in 1983 when the target capacity utilization (i.e. 90%) is expected to be reached for the first full year. The operating ratio (operating profit as % of sales) will improve from 35 to 45% over the same period. The project's profitability is demonstrated by a steady growth of profit after taxes from US$13.1 million in 1981 to US$37.3 in 1983 and profitability will further increase thereafter with declining interest payments. By 1983, the profit and cash breakeven capacity utilization is about 50 and 42% respectively.

6.09 The project's cash generating ability together with the assumed loan terms is expected to maintain a debt service ratio of 2.1 or better during the forecast period. In spite of heavy debt service payments which will reach some US$30 million (about 36% of sales value) in 1982 the enterprise can still accumulate sufficient funds for reinvestments. After the first year of operation, the project will be able to make an annual contribution to FERTILIZANTES's dividend payments at a rate of 10% of its equity. It is projected that the Company will have no difficulty of maintaining a current ratio of 1.2 or better from the first year of operations. The debt/equity ratio is 48/52 at the end of 1981; it also will steadily improve and benefit from the revaluation of equity over the subsequent years.

D. Financial Rate of Return

6.10 The financial rates of return of the project are 15% after income taxes and 19% before income taxes; these are satisfactory. Sensitivity

tests are presented in Annex 6-4 and summarized in the table below indicating the relative effect on the above returns resulting from various ± changes in costs or benefit streams:

Sergipe - Sensitivity Tests

| Change in: | ± Relative Change in Financial Rate of Return (before tax) |
|---|---|
| Ammonia/urea prices (± 10%) | 3.0 |
| Capital Costs (± 10%) | 1.9 |
| Operating Costs (± 10%) | 1.1 |
| Operating Costs (Economic Instead of Financial Raw Material Prices) | 2.3 |
| Capacity Utilization (± 10%) | 2.3 |
| Delay in Completion (1/2 year) | 1.4 |
| Capital Costs & Delay in Completion (± 10%, 1/2 year) | 3.3 |

Similar to other fertilizer projects, the return is most sensitive to a change in sales prices and least sensitive to changing operating costs. As the sensitivity tests in Annex 6-4 indicate, even under the unlikely adverse condition of a 20% decrease in the assumed sales prices the project's rate of return before taxes of 12.5% would still remain acceptable. If prices for raw materials were to increase to economic or world market levels, the return would drop to 12%. In the event that the annual growth rate of fertilizer demand in the Northeast would, from 1980 onwards, be only half of the projected 12%, thus requiring larger quantities of the plant's output to be shipped to other regions, the project's before tax return would only decrease by about 1% to 18%.

E. Major Risks

6.11 It is unlikely that the project will face major management problems since PETROBRAS has previous experience in executing similar projects such as the ammonia/urea plant at Camacari. Neither does it appear likely that major engineering and technological risks will arise as the engineering contractors are internationally recognized and are using proven technology and processes. The same foreign contractors are being used in the presently implemented expansion of the Camacari plant. The employment of less experienced local engineering firms, more complicated coordination and procurement arrangements than in PETROBRAS' most other projects, are taken into account by giving a 6-month longer period for project execution than in similar cases.

6.12 Financial risks exist because the prices for raw materials, the retail prices of fertilizers and the agricultural product prices are all subject to Government regulations and thus outside FERTILIZANTES' control. Since demand for the Company's products and the profitability of FERTILIZANTES

are governed by these prices, an assurance will be sought from the Government during negotiations that it will not take any pricing measures which would prevent the Company from covering its costs, servicing its debts and earning a reasonable return on its investment under conditions of efficient operations.

6.13 The demand for the project's ammonia and urea output is a derived demand originating at the farm level with the bulkblenders and mixers being the intermediary between the farmer and FERTILIZANTES. For the marketing of its products, the Company, therefore, has to rely on the bulkblending and mixing companies without being able to directly influence demand. As mentioned, FERTILIZANTES also has to rely on these companies to meet the investment requirements of the distribution system stemming from a fast growing demand in fertilizers in the Northeast. This constitutes a marketing risk. It will be reduced by FERTILIZANTES' agreement to establish its own market analysis and marketing group (para 3.23) and by the actions taken on the recommendations of the Fertilizer Market and Marketing Study (para 3.13) which will indicate the measures that have to be taken by the Government and the other entities involved in the sector.

F. Financial Covenants

6.14 Following project completion, FERTILIZANTES will be required to follow prudent financial practices and will be asked during negotiations to agree to observe, both as a Company and for the project, the following financial covenants, which are essentially the same as agreed to for the Araucaria project:

i) maintain a debt/equity ratio of 60:40 or better;

ii) maintain a current ratio of at least 1.2:1.0;

iii) not incur any long-term debt if its debt service coverage will fall below 1.5;

and FERTILIZANTES will:

iv) limit its dividend distribution (except for dividends on preferred shares), or prepayment of any debt if such action would cause its current ratio to fall below 1.5;

v) provide the Bank with yearly updated 5-year financial projections beginning from July 1, 1977;

vi) operate the project as a separate profit center with its own income, cash flow and balance sheet accounts for control purposes; and

vii) have its accounts audited by independent auditors acceptable to the Bank.

# VII. ECONOMIC ANALYSIS

## A. General

7.01 In economic terms, the project substitutes temporarily for imports into other regions, primarily the Center as dicussed in para 3.18. For the valuation of the economic benefits, this means that the output of the project has to be valued at c.i.f. prices, since port handling charges and inland transportation to the consumption centers would take place in any case. In addition, the transport patterns with and without the project and their associated costs have been analyzed to determine the incremental transport costs and benefits accruing to the economy as a result of the project.

7.02 For the economic analysis of the project, costs and benefits are divided into tradeable and non-tradeable items and are valued at their respective world market and domestic prices. Most significant in the economic analysis is the valuation of the raw material and fertilizer prices. For calculation of the economic rate of return, the costs and benefits during the project's operating life are expressed in constant 1976 US dollars. An estimated mid-1976 shadow foreign exchange rate of Cr$13.48 = US$ 1 is used throughout the analysis, which is 25% above the official exchange rate. The assumptions for the economic analysis of this project are detailed in Annex 7-1.

7.03 After the increases in 1973/74, international fertilizer prices started to fall in 1975 and reached their low point during the first half of 1976. Bagged urea has been selling at about US$120 per ton f.o.b. during the latter half of 1976 and it is expected that real price increases will bring the price level in constant 1976 terms to about US$165 and US$171 per ton in 1979/1985 respectively 1/. Using the price forecast for 1985 as an average f.o.b. price during the project's operating life, a c.i.f. price of US$185 per ton bulk urea is derived after taking into account ocean freight (US$25 per ton) and bagging charges (US$11 per ton). For ammonia, the same price of US$185 per ton is used assuming - as in the financial analysis - an ammonia/urea price relationship of 1:1.

## B. Prices of Raw Materials and Economic Product Costs

7.04 The limited natural gas resources of the Northeast make it necessary to restrict the use of gas to purposes where it can be used as a feedstock for the petro-chemical industries. Other consumers, who would have used the gas for heating purposes, will have to use other fuels, mainly heavy fuel oil, which is readily available. Therefore, the opportunity cost of gas has been established on a calorific equivalent basis with heavy fuel oil. Assuming an f.o.b. crude oil price of about US$11.5 per barrel and an f.o.b. heavy fuel oil price of about US$63 per ton, the oppor-

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1/ Price Prospects for Major Primary Commodities, June 1976, WB Rep. No. 814/76.

tunity cost of the gas consumed by the project is estimated at US$1.48 per MCSF. As fuel, the project requires Bunker C and vacuum gas oil, both traded commodities, with estimated long-term economic f.o.b. prices of US$65 and US$80 per ton respectively. The economic product costs deducted from these price assumptions for raw materials are shown in Annex 6-2.

C. Transportation

7.05 As a result of the project, rail transportation costs of moving fertilizer from the Camacari plant to the market in the Northeast are saved, while additional coastal shipping costs are incurred for moving the Camacari output to other regions, primarily the Center. Economic rail transport costs between Camacari and Sergipe have been estimated at about US$11 per ton of urea which covers all of the railway's variable costs and a portion of total fixed costs attributable to the fertilizer traffic. Costs of coastal shipping between the Northeast and the Center have been estimated by PETROBRAS at about US$12 per ton of ammonia/urea. With these rather conservative cost assumptions it is estimated that the project will add about US$2.0 million per year to the overall transportation costs of the economy (Annex 7-2 and 7-3). These costs are added to the cost streams for calculation of the economic rate of return.

D. Economic Rate of Return

7.06 Under the assumptions outlined above, the project's economic rate of return is 17% (Annex 7-4). This return is slightly lower than the financial return before taxes, mainly because of higher economic costs for feedstock (75%) and fuel (50%) and slightly lower economic revenues. The same sensitivity tests were carried out for the economic analysis as for the financial analysis and are summarized below:

Sergipe - Sensitivity Tests

| ± 10% Change in: | ± Relative Change in Economic Rate of Return |
|---|---|
| Ammonia/urea prices | 3.2 |
| Capital Costs | 1.8 |
| Operating Costs | 1.4 |
| Capacity Utilization | 2.4 |
| Delay in Completion (1/2 year) | 1.2 |
| Capital Costs & Completion Delay | 3.0 |

7.07 The economic rate of return, as the financial return, shows a high sensitivity to changes in product prices and to a lesser degree to changes in capital and operating costs. If gas were abundantly available, and it could be economically justified to use it not only for feestock but also as fuel, the economic rate of return would improve by about 1.2%. If demand for fertilizer in the Northeast from 1980 onwards would grow at only half the

projected growth rate, requiring substantially larger quantities of the project's output to be sent to other regions, the economic rate of return would drop by only about 0.5%. Using the official instead of the shadow rate of exchange the return would be 12%.

E. Other Benefits

7.08 The project, by increasing Brazil's nitrogen capacity by about one-fourth, will contribute to the stabilization of the agricultural sector by reliably poviding fertilizers to the farmers at stable prices. Also, the plant will be located in one of the poorest and least industrialized regions of Brazil and there will be positive spillover effects from the required infrastructure and training. The project will also provide support of the Government's policy of industrial decentralization.

7.09 The local engineering firms involved in the project implementation will gain valuable experience (transfer of technology) which will be significant for the execution of future chemical undertakings in Brazil. Out of a total amount for equipment of US$121 million, US$73 million or some 60% of the total will be supplied by local manufacturers; this constitutes an important contribution to the development of the Brazilian industry. Of the engineering and erection services, about 85% or some US$64 million will be provided domestically. The project's net annual foreign exchange savings before provision for principal and interest payments on foreign loans at 90% capacity utilization are estimated at US$65 million (in 1976 terms).

## VIII. RECOMMENDATIONS

8.01 During negotiations assurances will be sought as follows:

1. From the Government that it will:

   (a) Exchange views with the Bank on the development of the fertilizer sector (para 3.12);

   (b) Take all necessary steps to assure that all funds, including foreign exchange, are provided as required to complete the project and that all approvals for implementation of the project, and all necessary imports are timely provided (para 5.08);

   (c) Not take any action with regard to the prices of raw materials required by the project, of urea and ammonia, and of agricultural products that would prevent FERTILIZANTES from making a reasonable return on investment under conditions of efficient operations (para 6.12);

2. From PETROBRAS that it will:

   (a) Submit to the Bank not later than June 30, 1977, a detailed report on Ultrafertil's poor financial

performance recommending specific measures that will be taken to improve Ultrafertil's financial position (para. 2.06);

(b) Dedicate a minimum quantity of 3.1 billion $NM^3$ of natural gas to the exclusive use of the project (para 4.03);

(c) Assist FERTILIZANTES in obtaining untied foreign exchange financing of about US$25 million equivalent and a loan from BNDE of about US$81 million equivalent (para 5.08);

(d) Refinance, as necessary, any loan repayments due before project completion (para 5.08);

(e) Supply both foreign exchange and local funds, as necessary, to complete the project, on terms and conditions such that at project completion the project entity will have a debt/equity ratio of 60/40 or better, and a current ratio of at least 1.2 (para 5.08);

3. From FERTILIZANTES that it will:

(a) Provide the Bank not later than December 31, 1977, with a detailed plan for recruitment, training and staffing of the project (para 4.08);

(b) Take all necessary steps to obtain a loan from BNDE of about US$81 million equivalent with a grace period and maturity similar to the proposed Bank loan (para 5.05);

(c) Obtain untied foreign exchange financing through a commercial bank loan or private placement of its debt obligations of about US$25 million equivalent not later than six months after the Bank's approval of the project (para 5.06);

(d) Provide the Bank with yearly updated 5-year financial projections for the company as a whole and for each of its units, the first such projections to be submitted to the Bank by July 1, 1977 (paras 6.01 and 6.14);

(e) Observe the financial covenants as described in para 6.14.

8.02 In addition, as a condition of effectiveness, satisfactory arrangements will have to be made for the supply of gas, vacuum gas oil, Bunker C fuel oil, and for the construction of water and electricity supply facilities (para 4.04).

8.03 During negotiations, the Government's and FERTILIZANTES' views regarding the principles of pricing the project's output will also be discussed (para 6.04).

8.04 With the assurances listed above, the project is suitable for a Bank loan of US$64 million equivalent, to be made to FERTILIZANTES, for 15 years, including 4 years of grace at the Bank's prevailing interest rate to which a fee payable to the Government would be added increasing the cost to FERTILIZANTES to 10%.

Industrial Projects Department
January 1977

President's
Report

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**Report No.** P-1988a-BR

REPORT AND RECOMMENDATION

OF THE

PRESIDENT OF THE

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

TO THE

EXECUTIVE DIRECTORS

ON A

PROPOSED LOAN

TO

PETROBRAS FERTILIZANTES S.A.

WITH THE GUARANTEE

OF THE

FEDERATIVE REPUBLIC OF BRAZIL

FOR THE

SERGIPE NITROGEN FERTILIZER PROJECT

April 6, 1977

## CURRENCY EQUIVALENTS

(As of March 9, 1977)

| | | |
|---|---|---|
| Currency Unit | = | Cruzeiro (Cr$) |
| US$1 | = | Cr$12.98 |
| Cr$1 | = | US$.0770 |
| Cr$1,000 | = | US$77.04 |
| Cr$1,000,000 | = | US$77,042 |

## ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| BNDE | Banco Nacional do Desenvolvimento Economico |
| COFEN | Construcao de Fertilizantes Nitrogenados |
| DAP | Diammonium Phosphate |
| FAFER | Fabrica de Fertilizantes S.A. |
| FERTILIZANTES | Petrobras Fertilizantes S.A., the Company |
| K | Potassium |
| $K_2O$ | Potassium Oxide equivalent in fertilizers |
| MAP | Monoammonium Phosphate |
| MSCF | 1000 Standard cubic feet |
| NFP | National Fertilizer Program |
| $NM^3$ | Normal cubic meter |
| P | Phosphorous |
| PETROBRAS | Petroleo Brasileiro S.A. |
| PETROFERTIL | Petrobras Quimica Fertilizantes S.A. |
| PETROQUISA | Petrobras Quimica S.A. |
| $P_2O_5$ | Phosphorous Pentoxide equivalent content in fertilizers |
| RFFSA | Rede Ferroviaria Federal S.A. |
| TPD | Tons (Metric) Per Day |
| TPY | Tons (Metric) Per Year |
| ULTRAFERTIL | Industria e Comercio de Fertilizantes S.A. |

## FINANCIAL YEAR

January 1 - December 31

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

# REPORT AND RECOMMENDATION OF THE PRESIDENT TO THE EXECUTIVE DIRECTORS ON A PROPOSED LOAN TO PETROBRAS FERTILIZANTES S.A. WITH THE GUARANTEE OF THE FEDERATIVE REPUBLIC OF BRAZIL FOR THE SERGIPE NITROGEN FERTILIZER PROJECT



1. I submit the following report and recommendation on a proposed loan to PETROBRAS Fertilizantes S.A. (FERTILIZANTES) with the guarantee of the Federative Republic of Brazil for the equivalent of US$64 million to help finance the Sergipe nitrogen fertilizer project. The loan would be for 15 years, including 4 years of grace with interest at 8.2% per annum. The Government of Brazil would charge FERTILIZANTES a guarantee fee of 1.8% per annum on the outstanding amount of the Bank loan bringing the cost of the loan to FERTILIZANTES to 10% per annum.

## PART I - THE ECONOMY

2. A report, entitled "Economic Memorandum on Brazil" (1267a-BR), dated January 26, 1977, was distributed to the Executive Directors on February 8, 1977. Country data sheets are attached as Annex 1.

3. The late 60s and early 70s were years of remarkable economic growth and development for Brazil. The 10% average annual rate of growth in GDP during this period was accompanied by a strong balance of payments performance. The dollar value of exports rose by 300% from 1967-73 and a process of export diversification significantly reduced Brazil's dependence upon coffee as the single primary source of foreign exchange earnings. At the same time, inflation was brought progressively under control. During the early 70s prices rose at less than 20% per annum on average -- a considerable improvement upon the inflation of a decade earlier. The crawling peg exchange rate combined with widespread monetary correction and indexation minimized the distortions which often accompany inflation (while, the indexing also tends to perpetuate inflation).

4. The world economic crisis of 1974 marked a turning point in the recent economic performance of Brazil. Although growth continued at a strong 9.5% in that year, it proved impossible to maintain the good balance-of-payments performance that had accompanied growth in previous years. The continuation of expansionary policies during 1974 in the context of a sharp deterioration in the terms of trade resulted in a trade deficit amounting to US$4.7 billion. The elimination of that deficit, and the reestablishment of the previous near equilibrium in merchandise trade has been a major objective of economic policy since that time and continues to be a major policy objective today.

5. Growth since 1974 has been deeply affected by balance-of-payments constraints. In 1975 GDP increased by only 4% and the trade deficit was reduced to US$3.5 billion. Unaccustomed to such a relatively low growth rate, however, the Government feared that Brazil might be heading for a recession and once again adopted more expansionary policies towards the end of 1975. As a result of these policies, and notwithstanding subsequent measures introduced during the course of 1976 to control the situation, growth last year reached 8.8%. It is remarkable that despite such a high rate of GDP growth, the trade deficit was reduced further to US$2 billion. This was due to a rapid 17 percent growth in export earnings while imports were practically unchanged from the previous year. The exceptionally high level of imports in previous years and the increasing effectiveness of the Government's import-substitution program made possible a high level of growth in 1976 without any further expansion in imports over the level of the previous year.

6. The acceleration of growth in 1976 was not without its cost, however. The high level of aggregate demand associated with the Government's expansionary policies in late 1975 contributed significantly to higher inflation. Domestic prices rose by 46% in 1976 compared with 28% in the previous year. This was a disturbing departure from the much lower levels of inflation that had characterized the early 1970s. The Government is concerned that prices do not get out of hand and control of inflation has now been adopted as a major policy objective alongside control of the balance of payments.

7. During the course of 1976, measures were introduced on a number of fronts to curb inflationary pressures. Half way through the year the official wage guidelines were modified in such a way as to reduce wage increases below the current rate of inflation. In the field of monetary policy, commercial bank reserve requirements were progressively raised from 27% to the legal maximum of 35%, and the Central Bank's rediscount rate was raised from 22% to 28%. Stiffer terms were decreed for installment credit and for real estate credit, and there was an upward shift in the overall interest rate structure. In response to these quite stringent measures inflation abated in the final quarter of the year to a rate equivalent to some 30% on an annual basis. Whether or not the Government will continue to make headway against inflation during 1977 will depend in large measure upon its success in controlling the expansion of money and credit.

8. Fiscal policy is yet another area in which the Government has announced measures designed to curb inflation. Plans have been drawn up to reduce the gap between public sector investment and public sector savings by some Cr$44 billion (in 1977 prices) -- equivalent to about 2.2% of GDP. Measures to achieve this goal include the limitation of wage increases in 1977 to 30% for federal government employees. Strict controls are also being imposed on the hiring of additional personnel. A number of subsidies have been eliminated or reduced. In addition, the investment programs of state enterprises are to be closely controlled, and the savings of such enterprises will be increased by raising tariffs.

9. The Government recognizes the need for growth to be moderated in the next two or three years if inflation is to be kept under control, the balance of payments is to be further improved and a sound basis for longer

term growth is to be established. In keeping with this view, it is projected that growth may be in the order of 5% in 1977 and may average no more than 6% during the remaining years of the decade. Beyond that, however, there is every indication that Brazil has the potential to sustain high levels of growth similar to those in the past provided that the present difficulties can be overcome and provided that sound economic policies are consistently pursued. In this respect the Government's development strategy provides a sound framework for future development.

10. The second National Development Plan (1975-79) was published in the wake of the world petroleum crisis and incorporates a sectoral development strategy which focuses sharply upon relieving Brazil's balance-of-payment's constraints in the longer term. The export potential of agriculture has received explicit recognition in the development plan and the results achieved during the last several years (particularly in soya production) justify the priority given to this sector. Agriculture constitutes a vehicle for raising the living standards of the rural poor and for developing the vast frontier lands of Brazil's interior. In the case of industry, sophisticated incentive schemes have been introduced to encourage exports. The major thrust of Brazil's industrial development strategy, however, concentrates upon massive import-substitution programs in steel, non-ferrous metals, petrochemicals, fertilizers and capital goods. Brazil aims at self-sufficiency in many of these products by the early 1980s. Beyond that point these same industries may develop a good export potential.

11. Despite its previous impressive growth performance and vast future potential, Brazil is still a country wih a very unequal distribution of income and extensive absolute poverty. The present Government acknowledges the country's income distribution problem and accepts responsibility for its alleviation. While, like the previous Government, it believes that a high rate of growth is necessary to increase the incomes of the poor, it does not believe that the "trickle down" effects of rapid growth are enough and has formulated a new policy which could be labeled as "redistribution along with growth." To implement this policy in addition to pursuing some of the social programs initiated by its predecessor, the Government is taking new measures in three broad areas: (a) regional development; (b) provision of social services; and (c) wage policy. In addition, recent tax changes have tended to have a favorable, albeit marginal, impact on income distribution.

12. As one of its measures to help promote development in poorer regions, the Government has formulated a program known as POLONORDESTE for rural development in the Northeast. The program envisages investment expenditures of about US$2.5 billion during 1975-79 and is designed to raise the productivity and incomes of small farmers through, inter alia, formulation and execution of integrated rural development projects, which are likely in some cases to include changes in land tenure. POLONORDESTE is based on the assumption that the rural Northeast cannot be regarded as a homogeneous whole and, therefore, standardized programs are inadequate. The Government identified 28 subregions covering large portions of the Northeast on which POLONORDESTE funds would be used initially. The Rio Grande do Norte project (Ln. 1195-BR approved in December 1975) was one of the first under POLONORDESTE.

13. Active consideration is being given to a major modification in the state value-added tax system to redistribute fiscal resources from the richer to the poorer states, in order to give the latter the fiscal resources which they badly need to accelerate social programs, particularly in education. In the area of social services, the Government has created a new Ministry of Social Security in order to consolidate its social benefit programs and to extend these programs to a larger share of the population. The Government is also strengthening the nutrition program which, under the previous Government, got off to a slow start. Greater emphasis is being given by the National Housing Bank to low-income housing, the beneficiaries of which will enjoy better financial terms than in the past. The Housing Bank is also developing a site and services program to encourage construction of self-help housing by families that cannot afford builder-constructed units. In agriculture, the recently reorganized rural extension agency will expand and strengthen its activities directed specifically toward the small-scale farmer; and the new federal agriculture research institution is defining its program to include a selection of crops and farming systems which will ensure that small-scale farms benefit from research efforts. Overall, the Government's public investment program for 1975-77 gives high priority to education, health, agriculture and regional development, which together account for about 30% of total public investment. Finally, the Government intends to pursue a more liberal wage policy to maintain the real value of the minimum wage and improve personal income distribution. For this purpose it revised the formula governing the adjustment of the union wage scale so that the real minimum wage was increased by 6.5% in 1975 and by 3% in 1976. While in 1977 the Government may be obliged to restrict wage increases as part of a policy package designed to control overall demand and to combat inflation, this does not signify any basic change in the Government's longer term goal of improving income distribution.

14. In order to achieve the twin goals of high growth and an improved distribution of income, Brazil will continue to require large inflows of capital in the medium-term future. These inflows should be less than in the recent past, however. Compared with a US$6 billion three-year average for 1974-76, it is estimated that the annual net inflow of medium- and long-term capital (that is, direct foreign investment and net disbursements from official and private sources) may be in the order of US$4.5 billion for 1977-80.

15. At June 30, 1976, Brazil's public external debt amounted to US$13 billion; the public debt service ratio for 1976 is estimated at 18%. Out of the total (public and private) external debt of US$23.4 billion at mid-1976, about two-thirds, or US$16 billion, was in the form of financial credits. The debt service ratio during 1976 on this total external debt was about 44% (c.f. an average of 42% in the previous three years). However, net foreign exchange reserves at the end of 1976 were about US$6.0 billion, equivalent to some six months of the 1976 imports of goods and non-factor services. The service ratio on total debt is estimated to rise slightly further in the next two or three years. However, if an export growth rate of around 17% per year in dollar terms can be maintained over the 1975-80 period and if average maturities of new financial credits gradually improve from six to eight years, the debt service ratio in 1980 can be expected to return to the 44% level and to

continue falling in subsequent years to somewhat less than 30% in 1985. Despite Brazil's heavy debt service burden, the large foreign exchange reserves ensure that the country will have the liquidity to meet its debt service obligations in the short term, while the country's record of financial management provides grounds for confidence in the maintenance of creditworthiness over the longer run. There can be no doubt, however, that very careful management of the external accounts will be necessary in the coming two to three years.

## PART II - BANK OPERATIONS IN BRAZIL

16. By February 28, 1977 the Bank had approved 68 loans for Brazil, amounting to US$3,009.5 million, of which 37 were not fully disbursed. During FY65-69, disbursements averaged only US$10 million per year, increasing to an average of US$136 million per year during FY70-74, reaching US$225 million in FY74, US$248 million in FY75 and US$202 million in FY76. In the first half of FY77 US$97.1 million was disbursed. The decline in disbursements in FY76 and FY77 is due primarily to the reduced level of lending in FY73-74. Disbursements are expected to increase during the next few years. Annex II contains a summary statement of Bank loans as of February 28, 1977 and notes on the execution of ongoing projects.

17. Bank lending to Brazil was very active in FY72, when seven loans were approved totalling US$437 million, including three loans totalling US$192 million for the Stage II expansion of the steel industry. In FY73-74 nine loans were approved amounting to US$429.7 million; in FY75, five loans totalling US$426.5 million; and in FY76 ten loans totalling US$498 million were approved. So far in FY77 four loans have been approved: US$40 million for a second Minas Gerais water supply and sewerage project, US$83 million for a second agro-industries credit project, US$82 million for power transmission in the south of Brazil, and US$42 million for an integrated rural development project in the State of Minas Gerais. Documents for a proposed loan of US$82 million for a phosphate fertilizer project in the state of Minas Gerais are expected to be circulated to the Executive Directors shortly. We are working actively with the Brazilians on a project in support of a non-flat steel plant, a pollution control project for the metropolitan area of Sao Paulo, several rural development projects, a vocational education project and a highways maintenance and rehabilitation project.

18. Of Brazil's external public debt outstanding and disbursed at the end of 1975, amounting to US$11 billion, the Bank held about 10%. The Bank's share of the service on this debt was about 4.5%. If present trends continue as expected, the Bank's share in total external public debt outstanding would increase to 12% by 1980. The Bank's share of public debt service would rise in 1980 to about 6% while its share of Brazil's total (public and private) external debt service would remain at the present level of 2.7%.

19. IFC has committed more financial resources to Brazil than to any other country. As of February 28, 1977, IFC had made 30 commitments to Brazil, totalling US$287.3 million of which US$32.6 million has been cancelled, US$23.3

million repaid and US$136.9 million sold. Of the balance of US$94.5 million, US$70.0 million represents loans and US$24.5 million equity. A summary of IFC's investments up to February 28, 1977 is given in Annex II.

Lending Strategy

20. In its lending to Brazil, the Bank has sought to help the Government achieve a number of important development objectives which are interdependent and complementary. An important lending objective in Brazil is to support the effort of the Government to identify and develop projects designed to increase productivity and incomes of the lowest income segment of the population, to broaden the economic opportunities open to those groups, and to alleviate poverty. The recently approved loans for nutrition research and development, agricultural research, Rio Grande do Norte and Minas Gerais integrated rural development, and Lower Sao Francisco polders projects were all designed to assist low-income groups in rural areas. Government authorities, with the collaboration of Bank staff, are making a particular effort to help Brazil develop additional integrated rural development projects of this type. The recently approved water supply and sewerage project for the State of Minas Gerais was designed particularly to help reach low-income groups in towns and cities as would proposed sites and services and water supply and pollution control projects. We are also actively working with the Government on the preparation of vocational and rural education projects.

21. A second Bank lending objective in Brazil is to support institutional development and policy reform, designed inter alia to help maximize public savings and ensure that they are used economically. The proposed project will contribute towards further strengthening of FERTILIZANTES which is already benefitting from the implementation of the Bank-financed Araucaria project. The institution-building objective has also been important in Bank assistance to the transportation sector where emphasis has been given to the rational selection of investment, the strengthening of railway operations, and the improvement of the railways' financial performance. Loans for electric power, industrial finance, highways, agricultural research and extension and urban development also have important institution-building objectives.

22. Another lending objective is to ease the foreign exchange constraint on development, a constraint that has become more critical since the increase in petroleum prices, by supporting projects designed to increase Brazil's export capacity and, where economical, to substitute domestic production for imports. As a result of the deterioration in Brazil's terms of trade and balance of payments in the past two years, this objective has been placed in the forefront of the Government's economic policy. Bank support of fertilizer projects such as the proposed project is assisting Brazil to substitute imports with large-scale efficient domestic production and aid its balance-of-payments position. Bank lending for agro-industries in the Center and South of Brazil has also supported this objective and much of the Bank assisted investment in the transport sector -- railways, ports and highways -- is designed to facilitate the smooth and economical flow of exports. Also, support of the steel expansion program is helping Brazil to expand domestic output of a traditional import commodity which can be produced efficiently in Brazil due to the country's ample supply of high-grade iron ore and the scale of its internal markets.

23. A final objective which applies to all Bank lending to Brazil is to provide part of the very large volume of medium- and long-term capital inflows that Brazil has needed and will continue for some years to need in order to sustain rapid growth and achieve its employment creation and regional development objectives. Continued active lending by the Bank in Brazil is regarded by the international financial community as an important sign of confidence in Brazil and encourages them to continue their own activities there. In some sectors, especially in electric power and steel, the Bank's participation has helped Brazil obtain additional bilateral resources in greater amounts and on more favorable terms. In the fertilizer sector Bank participation is also expected to help Brazil obtain additional bilateral resources on favorable terms. FERTILIZANTES is negotiating with a group of private banks a loan of US$25 million for the Araucaria project which the Bank helped finance with a US$50 million loan in 1976 (Ln. 1256-BR) and plans to do the same for the proposed Sergipe project.

## PART III - INDUSTRY, AGRICULTURE, AND THE FERTILIZER SUBSECTOR IN BRAZIL

### Industry and Agriculture

24. Industry has played a central role in the rapid growth of the Brazilian economy in the last few years. During 1967 to 1974 real industrial output increased at an average annual rate of 12.2%. Industrial growth decreased to 4% in 1975 as a result of balance-of-payment constraints and is expected to be about 10% in 1976. The most dynamic element of Brazil's industrial expansion has been the production of consumer durables and capital goods, which increased at an annual average rate of 18% during 1967 to 1974, and now accounts for about 28% of total manufacturing production. On the other hand, the slowest growing subsector has been the traditional consumer goods industries (textiles, clothing, food products) whose share in manufacturing output declined from 36% in 1967 to 28% in 1974. Production of intermediate goods (chemicals, fertilizers, paper, rubber, semi-finished metals), which account for 42% of manufacturing output, has increased at a good pace, averaging 12% since 1967. Increased production of these intermediate goods, however, has not been sufficient to cope with growth in domestic demand, and imports are still significant, reaching US$4.1 billion in 1975 (excluding petroleum) or 34% of total imports. There is, therefore, substantial opportunity for import substitution in this subsector of industry. The proposed project is part of the Government's program to achieve self-sufficiency in fertilizers in the next five to ten years.

25. While the rapid expansion of the Brazilian economy during 1967-74 was spearheaded by accelerated industrial production, the agricultural sector also performed well, providing an increasing share of Brazil's growing domestic requirements for food and fibers as well as a rising export volume. Agricultural output grew at a rate of about 6% per annum during 1967-74, and at 3.4% in 1975, despite adverse climatic conditions in four out of seven

years. Part of this growth was due to substantial increases in the production of new crops, such as soybeans and wheat in the south and southeast regions of Brazil. Brazil has now become the world's largest producer of sugar, and it is the second largest supplier of soybeans, while remaining the world's leading coffee producer. While the sector's contribution to gross domestic product has declined from about 20% in 1967 to about 15% at present, it still accounts for over 60% of the value of exports. Three commodities -- coffee, soybeans and sugar -- generate 40% of total export earnings. While coffee continues to play an important role in the sector, accounting for about 12% of output, its share in total exports has declined from 44% in 1967 to about 11% in 1975.

26. In the past, Brazil's increasing agricultural output has resulted mainly from expansion of the cultivated area. Although it is expected that the area under cultivation will continue to expand, agricultural growth will have to depend to an increasing extent on raising the productivity of presently cultivated areas. The Government has established a goal of 40% (7% annually) of real increase in agricultural output for the 1975-79 period, with the aim of making Brazil one of the world's foremost producers and exporters of foodstuffs. The Government's strategy to achieve this objective has two components. First, it has allocated substantial public resources to incorporate additional new areas to agricultural production through programs such as the National Integration Program and the POLAMAZONIA and POLOCENTRO programs which provide agricultural credit and financing of transport and rural infrastructure and the like in the North and Center-West, respectively. The goal of these programs is to expand agricultural area by 4% to 5% annually and to encourage settlement to bring these areas into production as quickly as possible. A second component of the Government strategy is to increase productivity through modernization of agriculture and increased use of fertilizers and improved seeds. A substantial expansion in the supply of credit and complementary technical asssistance for the purchase of modern agricultural inputs is included in the Government program. These inputs should bring about a 2% to 3% annual increase in productivity necessary to achieve the overall growth target of 7% for the agriculture sector. The proposed fertilizer project is an important component of the Government's program to achieve this increase in agricultural productivity.

27. Increased agricultural productivity is particularly important to improve the income of small farmers as they are normally unable to increase their income by expanding their areas under cultivation. To this effect, the Government has introduced special regional programs such as POLONORDESTE. It has also reorganized federal research and extension services to serve a broader segment of the rural population. In addition, it operates a crop-credit insurance scheme to insure farmers against a large portion of losses resulting from natural disasters.

28. The overall package of new programs reflects a shift in agricultural policy in Brazil to place more emphasis on raising the productivity of small farmers. The past orientation of the Government's agricultural policies was predominantly toward the promotion and establishment of large commercially oriented agricultural enterprises as the main vehicle for

developing the agricultural sector. It was feared that small-farmer programs would absorb considerable public expenditure without a commensurate increase in production. It was also assumed that large-scale agricultural, agro-industrial and industrial development would generate more employment opportunities to absorb redundant or low productivity agricultural labor than any program to assist small farmers directly. Previous efforts to help the rural poor were often restricted to social services, whereas the Government's new approach represents an attempt to achieve both distribution and production ends. To be sure, no overnight eradication of rural poverty, which has been endemic in some regions of Brazil, especially in the Northeast, for decades, is likely to be forthcoming from these programs. Nevertheless, responsible efforts to improve the productivity of Northeast agriculture together with programs to increase industrial activity in the region already have resulted in a more rapid growth of per capita income in the Northeast than in Brazil as a whole; with the initiation of new programs this process is expected to continue.

The Fertilizer Industry and Government Policies in the Fertilizer Sector

29. Brazil's fertilizer industry consists of about 50 relatively small private sector and 3 larger government-owned companies with a total production capacity in 1976 of 270,000 tons of nitrogen and 690,000 tons of phosphate. The industry, especially the private sector, has concentrated on importing, mixing, blending and distribution rather than on establishing large-scale efficient production facilities. Most companies compete at the retail level largely with imported materials while only a few have their own, generally small, production facilities which have to be protected when world fertilizer prices are low. The low level of domestic production has been due to Brazil's lack of easily exploitable natural resources, the rapidly rising capital requirements for the manufacture of chemical fertilizers, and inadequate government policies during the 1960s for the petrochemical sector in general and the fertilizer sector in particular.

30. Large amounts of raw, intermediate and finished fertilizer materials, therefore, have been imported, and in 1975 total imports amounted to 507,000 tons (two-thirds of total consumption), valued at about US$500 million. To overcome this dependency on imports, the Government has embarked on a National Fertilizer Program, whose objective is to attempt to assure self-sufficiency in fertilizers by 1980. An interministerial fertilizer commission is charged with ensuring the rational development of the sector and has developed a program for large, basic production facilities of which the Araucaria and Sergipe projects form a part.

31. Production costs of local fertilizers have in the past generally been higher than the cost of imports. To ensure that domestic production facilities are fully employed, the Government established a quota system that required retailers to purchase a given proportion of domestic fertilizer. The Government has changed this ratio periodically depending on consumption forecasts and local availability. As the new, large-scale efficient fertilizer

plants enter into production, costs of domestic fertilizers are expected to move, in the longer run, in line with long-term international prices, thereby obviating the need for the import quota system.

32. International fertilizer prices were at a very high level in 1973-75 causing a decline in the purchasing power of agricultural products in relation to fertilizers and inducing a leveling off of fertilizer consumption in Brazil as in many other import dependent countries. Concerned about the impact of lower fertilizer consumption on its plans for expanding agricultural production, the Government introduced a price subsidy in April, 1975 which effectively reduced the cost of fertilizers to the farmers by 15-30%. However, since international prices have been decreasing and as domestic ex-factory costs have also declined in response to more efficient local production, the Government eliminated the subsidy in December 1976. Prospects for continued significant growth of fertilizer demand are good, since the relationship between the prices of agricultural products and fertilizer prices is favorable, and the Government has provided assurances that this will remain so in the future.

Historical Consumption and Supply of Fertilizer

33. Growth of fertilizer consumption in Brazil has been rapid but also erratic. Up to 1966 there was little growth, reflecting the Government's neglect of the agricultural and fertilizer sectors. Stimulating measures introduced in the mid-1960s brought six years of very rapid growth with annual increments averaging 35% through 1972. Over the past three years, fertilizer consumption increased only modestly, primarily as a result of the sharp rise in international prices and the scarcity of fertilizer in the world market. A significant recovery in consumption occurred in 1976 due to the Government's subsidy and low international prices. Phosphate consumption is high relative to that of other nutrients. This is agronomically justifiable on account of soil characteristics in Brazil. Although detailed statistics of fertilizer application rates per crop are not yet available, it is estimated that four crops, namely, sugar, coffee, soybeans and wheat account for 50% to 60% of total consumption.

34. On the supply side, domestic fertilizer production has grown at an average rate of 22% since 1965, but in 1975 supply from national sources still represented only about 35%. On a nutrient basis, 37% of nitrogen, 51% of soluble phosphates and none of the potash comes from the domestic fertlizer industry. Most of the domestic phosphate production uses imported phosphate rock, since Brazilian phosphate rock production accounts for only 10% of the country's requirements. It is however expected that Brazilian production of phosphate rock would increase to 60% by 1982.

35. Given the erratic nature of past growth of fertilizer consumption in Brazil and the lack of detailed and consistent fertilizer statistics, demand projections carry a considerable amount of uncertainty. Of all the factors

influencing fertilizer consumption, the most important is the presence or absence of strong government policies to promote the increased use of fertilizers. In view of (i) the Government's interest in higher agricultural production for which fertilizers are an essential input; (ii) its willingness to stabilize the ratio of agricultural product to fertilizer prices; and finally (iii) its declared goal of assuring a stable supply of fertilizers by sharply increasing the share of domestic production, the conditions for significant further growth in fertilizer consumption are favorable. The limiting factors appear to be bottlenecks in transportation, deficiencies in the extension services and lack of foreign exchange for the import of fertilizer and materials.

36. The upper limit for future demand can be estimated by normative analysis from necessary nutrient replacement and by projections of land suitable for cultivation and cropping patterns. Estimates of this nature result in a potential demand of about 12 million nutrient tons (NPK) in 1985, compared to the consumption of 2.3 million nutrient tons estimated for 1976. The average annual growth between 1976 and 1985 would, therefore, be around 23%. Actual growth rates through 1985 are expected to be much lower, however, ranging from 10-12% annually, considering the constraints mentioned in the preceding paragraph. While higher levels of agricultural productivity imply an increasing proportion of nitrogen relative to phosphate application, the evolving cropping pattern and the opening of new cultivated areas, which require relatively more phosphate than nitrogen, are expected to result in only a minor change in the country's overall NPK ratio. The regional distribution of fertilizer consumption is assumed to follow the pattern of the last few years with about 10% of total consumption occurring in the Northeast, 60% in the Center and 30% in the South.

37. On the other hand, the pattern of future fertilizer supply is expected to differ dramatically from the present one. Although self-sufficiency by 1980 does not appear to be achievable, during the early 1980s domestic fertilizer supply should provide 60-70% of total consumption as compared to about 35% at present. Self-sufficiency for nitrogen, however, can be reached by 1982 as a result of the three new ammonia/urea plants, Araucaria, Sergipe and Norte Fluminense, going into production. A fourth plant proposed to be built in Rio Grande do Sul in cooperation with the State Government is presently being evaluated by FERTILIZANTES. The most appropriate start of production for this fourth project would be in 1982-83. An earlier start-up might lead to a temporary excess production of nitrogen. To keep abreast of the investment plans in the fertilizer sector and to ensure that new plants are built in accordance with as realistic demand projections as possible, the Government has agreed to exchange views with the Bank from time to time regarding the expansion and development of the fertilizer sector, including investment plans and import and pricing policies (see Section 3.04 of the draft Guarantee Agreement).

Fertilizer Marketing and Distribution

38. About 90% of total fertilizer distribution is effected through blenders which are either owned by fertilizer manufacturers (25% of total), independent companies (65%) or cooperatives (10%). The Government intends private firms to continue handling the marketing and distribution functions in the sector. However, the rapid expansion of consumption expected in the next few years, and changing pattern of supply, might create a severe strain on the existing fertilizer marketing and distribution network. To analyze potential bottlenecks, and their effect on future fertilizer consumption, the Government agreed, in connection with the Bank's loan for the Araucaria project, to undertake a marketing and distribution study under terms of reference satisfactory to the Bank. The study began in October 1976, and its results are expected to be available by late 1977.

## PART IV - THE PROJECT

Project Concept

39. The project involves the construction of a 907 metric tons per day (TPD) (1,000 short tons per day) ammonia plant and an 1,100 TPD urea plant on a 100 hectare site at Laranjeiras, about 20 km northwest of Aracaju in the State of Sergipe. The project will produce about 270,000 metric tons per year (TPY) of ammonia and 327,000 TPY of urea. Of the ammonia production, 190,000 TPY will be used in the plant for the production of urea and the balance of about 80,000 TPY will be sold. The project includes specialized rail cars for the transportation of products and will contain facilities for bagging the entire urea output, but it is expected that a significant proportion will be shipped in bulk.

Project Implementation

40. FERTILIZANTES is a wholly owned subsidiary of PETROBRAS, which created it to own and operate the Bank-financed Araucaria project, the proposed Sergipe project and the Norte Fluminense ammonia/urea project to be implemented in the near future. At the beginning of 1977, FERTILIZANTES took over ownership of Brazil's three existing ammonia-based public sector fertilizer plants (FAFER, PETROFERTIL and ULTRAFERTIL). FERTILIZANTES also has a 20% minority investment in FOSFATADOS FERTILIZANTES -- a recently established public sector company for the exploitation of the phosphate rock deposit at Patos de Minas in Minas Gerais. For the next three to four years, FERTILIZANTES' financial strength will reflect the three existing operations (FAFER, ULTRAFERTIL, PETROFERTIL) of which only ULTRAFERTIL will need to be significantly strengthened, the other two being financially sound. In the longer term, after completion of the three ammonia/urea projects and assuming that the position of ULTRAFERTIL, is strengthened (see paragraph 42 below and Section 4.06 of the draft Loan Agreement), FERTILIZANTES will be in a strong

financial position. The financial forecasts for the project assume a dividend payment beginning in 1982 equivalent to 10% of the equity, which is comparable to the dividend payments made by successful Brazilian enterprises. Even with this dividend rate, the project is expected to accumulate substantial funds for reinvestment. The debt-equity ratio would improve rapidly from 55:45 in 1980 to 36:64 by 1983. FERTILIZANTES would maintain, at all times after project completion, a debt-equity ratio of 60:40 or better and a current ratio of at least 1.2 to 1.0, would not incur any debt if the projected debt service coverage ratio would thereby fall below 1.5 to 1.0, nor would it pay dividends (other than dividends on preferred shares), prepay debt or make financial commitments to any of its subsidiaries or make any cash distribution if the current ratio would thereby fall below 1.5 to 1.0 (see Section 5.04 of the draft Loan Agreement).

41. PETROBRAS is a government-owned corporation established in 1953 with a legal monopoly for the exploration and exploitation of Brazil's hydrocarbon resources. At present PETROBRAS has eight refineries in operation with a total capacity of about one million barrels per day (BPD) of crude and owns and operates a large retail system. It is currently building two new refineries, one at Araucaria (Parana) and the other at Sao Jose dos Campos (Sao Paulo), which would add by 1979 an additional 310,000 BPD of crude capacity. Brazil currently imports about 80% of its 900,000 BPD petroleum consumption. In order to reduce this import dependence, PETROBRAS has sharply increased its exploration program, and has started to enter into service contracts with foreign companies. As a result, its total investment program increased from US$600 million in 1973 to US$1.4 billion in 1975 and is expected to continue at this level for the next four years. In the latter period, internal funds would provide about 54% of all funds required by PETROBRAS, with new equity provided by the Government supplying 15%, and loans 31%. On this basis, the financing program of PETROBRAS is sound, as is PETROBRAS' current financial position. As of December 31, 1975, its net worth was US$3.6 billion. Its current ratio stood at 1.6:1 and its long-term debt to equity ratio at 25:75. During the year ending December 31, 1975, net income reached US$679 million equivalent.

42. PETROBRAS has been substantially involved in the nitrogen fertilizer industry through its wholly owned subsidiary PETROQUISA, which owned two fertilizer companies, ULTRAFERTIL in Sao Paulo, and PETROFERTIL in Bahia and had one operating division (FAFER) which is the oldest fertilizer production facility in Brazil. ULTRAFERTIL was established in 1966 with majority ownership in the hands of Phillips Petroleum Company, a U.S. petroleum and fertilizer company. IFC participated in the financing of this company providing US$11.2 million in equity and loans. Financial problems, related to technical difficulties that led to low capacity utilization, caused Phillips to withdraw in 1974 and PETROQUISA acquired all of Phillips' interest in ULTRAFERTIL. Following an improvement in the production of all ULTRAFERTIL units, and with the substantial fertilizer price increases in 1974, ULTRAFERTIL

was able to earn a large net income in that year; however, the company earned only a small return on operations in 1975, and suffered a net loss in 1976. ULTRAFERTIL and PETROFERTIL, with an installed nutrient capacity of about 150,000 TPY, account for about 55% of the present nitrogen production capacity of Brazil. PETROFERTIL is undergoing a substantial expansion program which would add another 225,000 TPY of nitrogen capacity in 1977.

43. PETROBRAS' fertilizer project implementation unit, Construcao de Fertilizantes Nitrogenados (COFEN), supported by PETROBRAS' engineering department, will supervise project execution on behalf of FERTILIZANTES, coordinate the work of the foreign and local engineering firms, and contract with local firms (yet to be selected) for civil works and erection. Procurement of all but technically specialized items will be undertaken by FERTILIZANTES' own purchasing department. PETROBRAS has already signed contracts with Pullman Kellogg (USA) for provision of process license, basic engineering design, procurement assistance, and technical advisory services relating to the ammonia unit and general site facilities, and with the Toyo Engineering Company (Japan) for provision of similar services and process license relating to the urea unit. Detailed engineering of the ammonia unit and general plant facilities will be undertaken by a Brazilian firm, Promon Engenharia S.A., acting as a nominated subcontractor and under the supervision of Kellogg. Another local engineering firm, Montreal Engenharia S.A., will undertake detailed engineering of the urea unit as nominated subcontractor and under the supervision of Toyo.

Production and Market

44. The ammonia plant will be based on the Kellogg high pressure steam reforming process using natural gas feed originating from PETROBRAS' on- and off-shore deposits in Sergipe and Alagoas states. The urea plant will be based on the Mitsui Toatsu total recycle C process using ammonia and carbon dioxide produced in the ammonia process as raw materials. The ammonia plant will consume annually 215 million $NM^3$ of natural gas, 109,000 tons of vacuum gas and 50,000 tons of Bunker C fuel oil. The total reserves of natural gas available are currently estimated at 19 billion $NM^3$ proven.

45. PETROBRAS currently operates a gas transmission pipeline supplying the State of Bahia with gas from its gas compression and distribution center near Aracaju. It plans to construct a new gas liquid separation plant adjacent to this center and a new dry gas supply pipeline to the project site. PETROBRAS is also constructing a gas gathering and conservation scheme in the States of Sergipe and Alagoas to reduce gas losses and boost supplies to the Aracaju terminal. In order to ensure that a sufficient continuous supply of natural gas would be available for carrying out the project, PETROBRAS has agreed to dedicate a minimum of 3.1 billion $NM^3$ of gas (a supply sufficient for 15 years operation at full capacity) from its reserves for the exclusive use of the project (see Section 4(a) of the PETROBRAS draft Shareholders Agreement). Vacuum gas and Bunker C fuel oil requirements of the project will

be met from PETROBRAS' Mataripe refinery near Salvador, Bahia and shipped in rail tank cars to a storage terminal adjacent to the project site. Satisfactory arrangements for the supply of natural gas and other raw materials (vacuum gas and Bunker C fuel oil) and for the construction of water and electricity supply facilities would be conditions of loan effectiveness. (See Section 7.01 of draft Loan Agreement.)

46. The Sergipe plant will be located just south of the main fertilizer consumption center of the Northeast and will supply that region's nitrogen requirements. Growth of fertilizer consumption in that region has averaged about 22% per year over the last decade, compared to rates of 34% and 20% for the South and Center, respectively. Because of the poor soils and the arid and semi-arid climate of the Northeast, fertilizer consumption is primarily restricted to those areas where rainfalls are high or where irrigation schemes provide the required water for efficient use of fertilizers. This is the case in the narrow, humid belt along the coast (the Zona da Mata) and to a more limited extent in the transition zone (the Agreste) between the humid coast and the arid interior.

47. Up to the late 1960s, the Northeast used fertilizers nearly exclusively for sugarcane, the predominant crop in the coastal belt. A detailed farm survey, however, which was done by a joint effort of Superintendencia do Desenvolvimento do Nordeste and the Bank in 1973, revealed that use of fertilizers has become much more diversified. According to the survey, fertilizer was used in 1973 as follows: 50% for sugarcane, 15% for cacao, 15% for beans, 10% for manioc and 10% for other crops.

48. Also in 1973, the Government contracted Associacao Nacional para Diffusao Adubos for a three-year program to determine the bottlenecks preventing increased use of fertilizer and to conduct a large number of tests of fertilizer use in the various states and for all the major crops cultivated in the Northeast. The results of this program, which was actively supported by FAO, are now available and are very encouraging; they clearly show that more fertilizer can significantly increase agricultural yields as well as gross revenues and net profits to the farmer at benefit-cost ratios which indicate no undue increase in the risk to him.

49. Against this background, the prospects for continued growth of fertilizer consumption in the Northeast are good. A normative analysis, similar to the one for the whole of Brazil, indicates a potential fertilizer demand of about one million nutrient tons by 1985 (see para. 35). This would imply an average annual growth rate of about 19% for the period 1977-85, against one of 22% for the last ten years. Because of the constraints mentioned for the whole of Brazil it is more likely that the actual growth rate will be lower and 12% per year is assumed here.

50. On the supply side, given the reserves of natural gas, the ideal raw material for production of nitrogen, and its concentration in the Northeast, this region is particularly well suited for the production of ammonia and urea. The PETROFERTIL plant at Camacari in the State of Bahia which is

presently being expanded, and the proposed Sergipe project, will together produce considerably more nitrogen than required by the Northeast. Until 1981, the region's demand for nitrogen will be satisfied by the increasing production from the Camacari plant which will provide an important stimulus to fertilizer consumption. From 1981 onward, the Sergipe plant, because it is closer to the main markets, will supply the Northeast with nitrogen. On the other hand all of the ouput of the Camacari plant, located near the new chemical port of Aratu (near Salvador), which will have facilities for loading some of the output of the Sergipe plant, will have to be shipped to other regions in Brazil, primarily the Center, where it will substitute for imports. By 1986 demand in the Northeast is expected to exceed the production from the project, and in the following years the Camacari plant will again increasingly supply the Northeastern market.

51. Of the total nitrogen consumption in the Northeast, it is estimated that in 1976, 65% was consumed in the form of urea and 35% as ammonium sulfate. The completion of the Camacari expansion, the Sergipe project and the planned MAP/DAP plants will bring the share of urea consumption to about 70% with the remaining nitrogen requirements being satisfied by MAP, DAP and ammonimum sulfate. This is not a significant change from the current composition of nitrogen consumption. Urea has been accepted in the market as an efficient fertilizer, and from tests done by the extension services, the universities and the fertilizer companies, it can be concluded that urea is a fully suitable fertilizer.

52. The project's urea output will be sold to bulkblenders and mixers who have plants close to the ports of Recife and Maceio. Transportation of urea to Recife and Maceio is planned to be mostly by railway in bags, although FERTILIZANTES intends to increase bulk shipments to large customers for which bulk unloading facilities would be economic. Exploitation of the potash deposit at Carmopolis, about 30 km to the northwest of the project site and expected to start by the mid-1980s, will make the area attractive for the location of new mixing and blending installations.

53. Of the project's saleable ammonia output of 80,000 TPY of ammonia, 48,000 TPY are expected to be consumed by ammonium phosphate plants planned for Recife and Maceio, and the remaining 32,000 TPY would be shipped to other regions in Brazil via the port of Aratu. PETROBRAS will be responsible for the coastal shipping of ammonia and will either buy or charter boats for that purpose. The ports of Santos (Center) and Rio Grande (South) to which ammonia will be shipped have adequate special storage and handling facilities for ammonia.

54. As a result of the Camacari expansion and the proposed project, the railway transportation requirements in the Northeast will significantly increase. While the capacity of the lines is sufficient to handle the expected traffic up to about 1995, certain track and station improvements are needed, and so is an improvement in track maintenance if the traffic to be generated by the project is to be carried efficiently. The Federal Railways (RFFSA) is prepared to take the necessary measures. Execution will be supervised by Bank

staff as part of the follow-up of the two existing loans to RFFSA. Special rail cars for the transport of liquid ammonia and bulk urea will be purchased by FERTILIZANTES as part of the project. Box cars for bagged urea, tank cars for gas and Bunker C oil and locomotives will be supplied by RFFSA.

55. The projected continued growth in fertilizer demand will require significant additional investments in the marketing and distribution system in the Northeast and the private sector is expected to continue to make such investments. For FERTILIZANTES it is most important to keep in close contact with the developments in the fertilizer sector in the Northeast and all of Brazil. For that purpose FERTILIZANTES will set up its own market analysis and marketing group. The main tasks of this group will be (i) to analyze the market in order to gain an understanding of the forces affecting demand (including Government policies); (ii) to make regional and overall fertilizer demand projections; and (iii) to closely monitor the development of the marketing and distribution system which is largely in the hands of the private sector. FERTILIZANTES is establishing such a group and has prepared a work program which has been presented to the Bank and which would enable it to monitor the development in the fertilizer sector.

Project Cost and Financing

56. The project requires financing of US$283.4 million equivalent, including working capital and interest during construction, of which US$101.9 million is in foreign exchange. The cost estimates, which are summarized below, are based on year-end 1976 prices and include provisions for physical contingencies and price escalation. All imported equipment and materials for the project will be exempt from import duty.

Summary of Capital Cost Estimate

| | US$ Million | | | |
|---|---|---|---|---|
| | Foreign Exchange | Local Currency | Total | % |
| Land & Civil Works | 2.6 | 20.2 | 22.8 | 12 |
| Equipment & Materials | 54.5 | 55.2 | 109.7 | 56 |
| Engineering & Licenses | 9.1 | 10.9 | 20.0 | 10 |
| Erection | 4.2 | 23.7 | 27.9 | 14 |
| Pre-Operating Expenses | - | 16.4 | 16.4 | 8 |
| Base Cost Estimate (BCE) | 70.4 | 126.4 | 196.8 | 100 |
| Physical Contingency (8.5% of BCE) | 6.1 | 11.0 | 17.1 | |
| Price Escalation (13.6% of BCE + Phys. Cont.) | 7.8 | 21.4 | 29.2 | |
| Installed Cost | 84.3 | 158.8 | 243.1 | |
| Working Capital | - | 15.0 | 15.0 | |
| Interest During Construction | 17.6 | 7.7 | 25.3 | |
| Total Financing Req'd | 101.9 | 181.5 | 283.4 | |

57. The financing plan for the project envisages that 41% of the financing required (or US$116 million) will be provided as equity by PETROBRAS, with the balance provided as loans from the World Bank (US$64 million) foreign private lenders (US$25 million), the Banco Nacional do Desenvolvimento Economico (BNDE) (US$71 million), and PETROBRAS (US$7 million). The latter could also be provided in the form of equity or through other local or foreign loans jointly to be determined by PETROBRAS and FERTILIZANTES.

58. FERTILIZANTES proposes to obtain a loan of at least US$25 million through one or more foreign private lenders. If FERTILIZANTES is able thereby to obtain more favorable terms, this loan would be associated with the proposed Bank loan in a co-financing arrangement similar to that entered into in connection with the Bank's 1975 loan to Companhia Siderurgica Nacional (Ln. 1151-BR). The private loan would take the form either of a private placement with institutional investors, or a loan from foreign commercial banks.

59. The principal amount of the BNDE loan would be subject to monetary correction, in accordance with the domestic inflation rate, with an interest rate of 4% per annum. FERTILIZANTES has applied to BNDE for a loan of US$71 million equivalent in current terms with a maturity of 15 years including 4 years of grace.

60. The World Bank loan of US$64 million equivalent is proposed for 15 years, including 4 years of grace, at the Bank's current interest plus a guarantee fee to the Government sufficient to bring the total cost to the borrower up to 10% per annum. The Bank loan, the BNDE loan and possibly the foreign private loans as well, would be made to FERTILIZANTES. The company would bear the foreign exchange risk for all the foreign loans. Should any shortfall occur in the financing plan, or should the project require additional funds, PETROBRAS would provide the necessary funds in the form of equity and/or loans to complete the project. The funds would be provided in a form that would ensure that the project's debt to equity ratio at project completion would not exceed 60:40, and that the project entity's current ratio would not be lower than 1.2 to 1.0 (see Section 2(a) of the draft Shareholders Agreement). The expected cash generation and borrowing program of PETROBRAS will be adequate to finance its investment programs including the equity contribution for this project.

Procurement and Disbursement

61. The proceeds of the Bank loan would finance 100% of foreign expenditures or 100% of the ex-factory price for products manufactured in Brazil for (a) equipment and materials procured through international competitive bidding in accordance with the Bank's guidelines for procurement (US$30 million); (b) imported technically specialized items with bidders restricted to proven suppliers (US$13 million); (c) imported items and packages costing less than US$100,000 each procured through international shopping (US$12 million); and (d) foreign engineering and advisory services (US$9 million). Local suppliers would be granted a margin of preference of 15% (or the import duty rate, if lower) for the purposes of evaluating bids on (a) above and it is expected that they will be able to compete with foreign suppliers for items totalling about US$20 million, and to win perhaps US$12 million of those orders. Expenditures of up to US$1.5 million for foreign engineering services would be financed retroactively. It is estimated that the Bank loan will be fully disbursed by 1980 (see page 2 of Annex III).

62. A separate list of goods, jointly prepared by FERTILIZANTES and the Ministry of Finance in consultation with domestic manufacturing associations and representing 60% of the equipment to be procured, would be reserved for local procurement as a measure of support for the domestic capital goods industry. The cost of this reserved procurement is estimated to total about US$73 million equivalent (including contingencies and price escalation) and FERTILIZANTES estimates that some of this local equipment will cost up to 40% more than the CIF price of imports. This percentage is lower than the average customs duty for the equipment concerned. The reserved procurement is expected to increase the total cost of the project by about 5% and the total cost of equipment and materials by about 11% above what it would be if all equipment suitable for it were procured on the basis of international competitive bidding. None of the reserved procurement would be eligible for financing under the Bank loan.

Financial and Economic Benefits

63. Over the life of the project the international FOB price of urea is expected to average about US$171 per ton (bagged) in constant 1976 US dollars. This price is higher than prevailing prices in 1976. After the increases in 1973-74, international prices fell in 1975 and reached a low point in the first half of 1976 due to supply surpluses. They are expected to move up slowly reaching US$171 per ton by 1985. Since the project's output will substitute temporarily for imports into the Sao Paulo area, freight and handling charges are added to arrive at a delivered price of US$185 per ton bulk urea which is used for the economic analysis. For ammonia the same price of US$185 per ton is used, assuming an ammonia/urea price relationship of 1:1 which reflects the production cost relationship of the nitrogen in ammonia to the nitrogen in urea.

64. The financial analysis (in constant 1976 dollars) assumes an ex-factory urea price of US$205 per ton destined for the Northeast market and US$175 per ton destined for the Center. The same price assumptions are made for ammonia. The production cost, at 90% capacity utilization, is about US$105/ton for ammonia and US$115/ton for bagged urea. These cost figures are based on natural gas, vacuum gas and Bunker C oil prices of US$0.84 per MSCF, US$58.4 per ton and US$49.2 per ton, respectively. On this basis the project would earn a financial rate of return of 19% before and 15% after income taxes.

65. The project's economic rate of return is calculated at 17% and would remain satisfactory even under the most adverse foreseeable circumstances. A shadow exchange rate, 25% higher than the official rate, has been used in this calculation to reflect foreign trade distortions caused by import tariffs, export taxes and subsidies, as well as other forms of import restrictions and export incentives. The project's net annual foreign exchange savings at 90% capacity utilization are estimated at US$65 million, before provision for principal and interest payments on foreign loans.

Conclusions

66. The project has a good economic return and would contribute towards the growth of the agricultural sector by reliably providing fertilizers to the farmers at stable prices. In addition, the positive secondary effects from the required infrastructure will benefit the Northeast region which is one of Brazil's poorest and least industrialized. The project also supports the Government's policy of industrial decentralization while building up the economy of the poverty-ridden Northeast.

67. PETROBRAS and the engineering firms have the management and technical capabilities to minimize project risks in these areas. Since the project's financial performance is largely dependent on government controls, the Government has agreed not to take any action with regard to the price of ammonia, urea and feedstock, that may prevent FERTILIZANTES, operating efficiently, from covering its costs, servicing its debts, and earning a reasonable return on its invested capital (see Section 3.03 of the draft Guarantee Agreement).

Since FERTILIZANTES would depend on private companies, which are already active in distribution, to market its products in the Northeast, FERTILIZANTES has decided to establish its own market analysis and marketing group to monitor the development in the sector thus minimizing the marketing risk.

## PART V - LEGAL INSTRUMENTS AND AUTHORITY

68. The draft Loan Agreement between the Bank and FERTILIZANTES, the draft PETROBRAS Shareholder Agreement between the Bank and PETROBRAS, the draft Guarantee Agreement between the Bank and the Federative Republic of Brazil, the Report of the Committee provided for in Article III, Section 4(iii) of the Articles of Agreement and the text of a draft resolution approving the proposed loans are being distributed to the Executive Directors separately.

69. Additional condition of effectiveness requires FERTILIZANTES to enter into arrangements with various agencies to ensure the supply of the raw materials and utilities needed for the successful operation of the project (paragraph 45). Special conditions of the project are listed in Section III of Annex IV.

70. I am satisfied that the proposed loan would comply with the Articles of Agreement of the Bank.

## PART VI - RECOMMENDATION

71. I recommend that the Executive Directors approve the proposed loan.

Robert S. McNamara
President

By J. Burke Knapp

Attachments
April 6, 1977

# BRAZIL - SOCIAL INDICATORS DATA SHEET

LAND AREA (THOU KM2)
TOTAL 8512.0
AGRIC. ..

| | BRAZIL | | | REFERENCE COUNTRIES (1970) | | |
|---|---|---|---|---|---|---|
| | 1960 | 1970 | MOST RECENT ESTIMATE | MEXICO | URUGUAY | JAPAN ** |
| GNP PER CAPITA (US$) | 300.0 | 540.0 | 1010.0 | 780.0 | 960.0 | 2650.0 |
| **POPULATION AND VITAL STATISTICS** | | | | | | |
| POPULATION (MID-YR, MILLION) | 69.8 | 92.8 | 107.0 | 50.4 | 2.7 | 104.3 |
| POPULATION DENSITY | | | | | | |
| PER SQUARE KM. | 8.0 | 11.0 | 13.0 | 26.0 | 15.0 | 282.0 |
| PER SQUARE KM. AGRIC. LAND | 51.0 | 66.0 | .. | 52.0 | 18.0 | 1575.0 |
| VITAL STATISTICS | | | | | | |
| CRUDE BIRTH RATE PER THOUSAND | 40.8 | 38.4 | 37.1 | 43.8 | 22.1 | 17.[illegible] |
| CRUDE DEATH RATE PER THOUSAND | 11.7 | 9.9 | 8.8 | 10.2 | 9.2 | 7.[illegible] |
| INFANT MORTALITY RATE (/THOU) | 180.0 | 110.0 | .. | 68.5 | .. | 13.[illegible] |
| LIFE EXPECTANCY AT BIRTH (YRS) | 56.0 | 59.7 | 61.4 | 61.0 | 69.3 | 71.1 |
| GROSS REPRODUCTION RATE | 2.[illegible] | 2.6 | 2.5 | 3.1 | 1.4 | 1.0 |
| POPULATION GROWTH RATE (%) | | | | | | |
| TOTAL | 3.0 | 2.9 | 2.9 | 3.4 | 0.7 | 1.0 |
| URBAN | 5.5 | 5.0 | 4.3 | 4.8 | 1.2 | 4.0 |
| URBAN POPULATION (% OF TOTAL) | 46.0 | 56.0 | 59.1 | 58.[illegible] | 78.[illegible] | 84.4 |
| AGE STRUCTURE (PERCENT) | | | | | | |
| 0 TO 14 YEARS | 43.0 | 42.0 | 41.7 | 46.2 | 28.3 | 24.0 |
| 15 TO 64 YEARS | 54.0 | 55.0 | 55.1 | 50.1 | 63.[illegible] | 68.9 |
| 65 YEARS AND OVER | 3.0 | 3.0 | 3.2 | 3.7 | 8.2 | 7.1 |
| AGE DEPENDENCY RATIO | 0.9 | 0.8 | 0.8 | 1.0 | 0.6 | 0.5 |
| ECONOMIC DEPENDENCY RATIO | 1.6 | 1.5 | .. | 2.0 | 1.0 | 0.6 |
| FAMILY PLANNING- | | | | | | |
| ACCEPTORS (CUMULATIVE, THOU) | .. | 250.0 | .. | 55.5 | .. | .. |
| USERS (% OF MARRIED WOMEN) | .. | 1.6 | .. | .. | .. | .. |
| **EMPLOYMENT** | | | | | | |
| TOTAL LABOR FORCE (THOUSAND) | 22700.0 | 29600.0 | .. | 13000.0 | 1020.0 | 53300.0 |
| LABOR FORCE IN AGRICULTURE (%) | 52.0 | 44.0 | .. | 40.0 | 17.0 | 19.0 |
| UNEMPLOYED (% OF LABOR FORCE) | .. | .. | .. | .. | 8.0 /a | 1.2 |
| **INCOME DISTRIBUTION** | | | | | | |
| % OF PRIVATE INCOME REC'D BY- | | | | | | |
| HIGHEST 5% OF HOUSEHOLDS | 28.0 /a | 35.0 /a | .. | 37.8 | 19.0 /b | 14.2 |
| HIGHEST 20% OF HOUSEHOLDS | 54.0 /a | 62.0 /a | .. | 63.2 | 47.5 /b | 37.6 |
| LOWEST 20% OF HOUSEHOLDS | 4.0 /a | 3.0 /a | .. | 4.2 | 4.8 /b | 8.8 |
| LOWEST 40% OF HOUSEHOLDS | 12.0 /a | 10.0 /a | .. | 10.2 | 14.2 /b | 22.3 |
| **DISTRIBUTION OF LAND OWNERSHIP** | | | | | | |
| % OWNED BY TOP 10% OF OWNERS | .. | 45.0 | .. | 37.1 | .. | .. |
| % OWNED BY SMALLEST 10% OWNERS | .. | 1.5 | .. | 0.3 | .. | .. |
| **HEALTH AND NUTRITION** | | | | | | |
| POPULATION PER PHYSICIAN | 2170.0 | 1950.0 | 1660.0 /a | 1440.0 | 880.0 | 880.0 |
| POPULATION PER NURSING PERSON | .. | 3300.0 /a | 2920.0 /a | 1570.0 | 3340.0 | 240.0 |
| POPULATION PER HOSPITAL BED | 275.0 | 260.0 | .. | 930.0 | 150.0 | 80.0 |
| PER CAPITA SUPPLY OF - | | | | | | |
| CALORIES (% OF REQUIREMENTS) | 102.0 | 109.0 | 110.0 /c | 110.0 | 107.0 | 106.0 |
| PROTEIN (GRAMS PER DAY) | 61.0 | 64.0 | 65.0 /c | 65.0 | 96.0 | 76.0 |
| -OF WHICH ANIMAL AND PULSE | 38.0 | 39.0 | .. | 28.0 /a | 64.0 | 45.0 |
| DEATH RATE (/THOU) AGES 1-4 | .. | .. | .. | 9.8 | 1.3 | 1.0 |
| **EDUCATION** | | | | | | |
| ADJUSTED ENROLLMENT RATIO | | | | | | |
| PRIMARY SCHOOL | 100.0 /b | 87.0 | 71.0 /b,d | 106.0 | 110.0 | 101.0 |
| SECONDARY SCHOOL | 11.0 /b | 28.0 /d | 74.0 /b,d | 23.0 | 59.0 | 91.0 |
| YEARS OF SCHOOLING PROVIDED (FIRST AND SECOND LEVEL) | 13.0 | 13.0 | 13.0 | 12.0 | 12.0 | 12.0 |
| VOCATIONAL ENROLLMENT (% OF SECONDARY) | 19.0 | 17.0 | 18.0 /b | 24.0 | 21.0 | 20.0 |
| ADULT LITERACY RATE (%) | 61.0 | 68.0 | .. | 76.0 | 91.0 | 99.0 |
| **HOUSING** | | | | | | |
| PERSONS PER ROOM (AVERAGE) | .. | 1.0 | 1.1 /a | 2.2 | .. | 1.0 |
| OCCUPIED DWELLINGS WITHOUT PIPED WATER (%) | .. | 73.0 /c | 67.0 /a,c | 61.0 /b | .. | 5.0 |
| ACCESS TO ELECTRICITY (% OF ALL DWELLINGS) | .. | 48.0 | 53.0 /a | 59.0 | .. | .. |
| RURAL DWELLINGS CONNECTED TO ELECTRICITY (%) | .. | 8.0 | 11.0 /a | 28.0 | .. | .. |
| **CONSUMPTION** | | | | | | |
| RADIO RECEIVERS (PER THOU POP) | 66.0 | 60.0 | 61.0 /a | 270.0 | 346.0 | 551.0 |
| PASSENGER CARS (PER THOU POP) | 7.0 | 25.0 | 31.0 /a | 24.0 | 45.0 | 84.0 |
| ELECTRICITY (KWH/YR PER CAP) | 325.0 | 491.0 | 684.0 | 567.0 | 762.0 | 3391.0 |
| NEWSPRINT (KG/YR PER CAP) | 3.3 | 2.7 | 2.6 | 3.1 | 7.0 | 18.9 |

SEE NOTES AND DEFINITIONS ON REVERSE

## NOTES

Unless otherwise noted, data for 1960 refer to any year between 1959 and 1961, for 1970 between 1968 and 1970 and for Most Recent Estimate between 1973 and 1975.

** Japan has been selected as an objective country since the Brazilian Government has shown particular interest in Japan's developmental experience; also the two governments have conducted joint studies to identify possible future economic problems of Brazil on the basis of the experience in Japan.

BRAZIL 1960 /a Economically active population; /b 7-10 and 11-17 years of age respectively.

1970 /a Economically active population; /b Hospital personnel; /c Inside only; /d 12-18 years of age.

MOST RECENT ESTIMATE: /a 1972; /b 1971; /c 1969-71 average; /d 7-14 and 15-17 years of age respectively; /e Inside only.

MEXICO 1970 /a 1964-66; /b Inside only.

URUGUAY 1970 /a Montevideo only; /b 1967.

R10, December 27, 1976

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## DEFINITIONS OF SOCIAL INDICATORS

Land Area (thou km$^2$)
Total - Total surface area comprising land area and inland waters.
Agric. - Most recent estimate of agricultural area used temporarily or permanently for crops, pastures, market & kitchen gardens or to lie fallow.

GNP per capita (US$) - GNP per capita estimates at current market prices, calculated by same conversion method as World Bank Atlas (1973-75 basis); 1960, 1970 and 1975 data.

Population and vital statistics
Population (mid-yr. million) - As of July first: if not available, average of two end-year estimates; 1960, 1970 and 1975 data.

Population density - per square km - Mid-year population per square kilometer (100 hectares) of total area.
Population density - per square km of agric. land - Computed as above for agricultural land only.

Vital statistics
Crude birth rate per thousand - Annual live births per thousand of mid-year population; ten-year arithmetic averages ending in 1960 and 1970, and five-year average ending in 1975 for most recent estimate.
Crude death rate per thousand - Annual deaths per thousand of mid-year population; ten-year arithmetic averages ending in 1960 and 1970, and five-year average ending in 1975 for most recent estimate.
Infant mortality rate (/thou) - Annual deaths of infants under one year of age per thousand live births.
Life expectancy at birth (yrs) - Average number of years of life remaining at birth; usually five-year averages ending in 1960, 1970 and 1975 for developing countries.
Gross reproduction rate - Average number of live daughters a woman will bear in her normal reproductive period if she experiences present age-specific fertility rates; usually five-year averages ending in 1960, 1970 and 1975 for developing countries.
Population growth rate (%) - total - Compound annual growth rates of mid-year population for 1950-60, 1960-70 and 1970-75.
Population growth rate (%) - urban - Computed like growth rate of total population; different definitions of urban areas may affect comparability of data among countries.
Urban population (% of total) - Ratio of urban to total population; different definitions of urban areas may affect comparability of data among countries.
Age structure (percent) - Children (0-14 years), working-age (15-64 years), and retired (65 years and over) as percentages of mid-year population.
Age dependency ratio - Ratio of population under 15 and 65 and over to those of ages 15 through 64.
Economic dependency ratio - Ratio of population under 15 and 65 and over to the labor force in age group of 15-64 years.
Family planning - acceptors (cumulative, thou) - Cumulative number of acceptors of birth-control devices under auspices of national family planning program since inception.
Family planning - users (% of married women) - Percentages of married women of child-bearing age (15-44 years) who use birth-control devices to all married women in same age group.

Employment
Total labor force (thousand) - Economically active persons, including armed forces and unemployed but excluding housewives, students, etc.; definitions in various countries are not comparable.
Labor force in agriculture (%) - Agricultural labor force (in farming, forestry, hunting and fishing) as percentage of total labor force.
Unemployed (% of labor force) - Unemployed are usually defined as persons who are able and willing to take a job, out of a job on a given day, remained out of a job, and seeking work for a specified minimum period not exceeding one week; may not be comparable between countries due to different definitions of unemployed and source of data, e.g., employment office statistics, sample surveys, compulsory unemployment insurance.

Income distribution - Percentage of private income (both in cash and kind) received by richest 5%, richest 20%, poorest 20%, and poorest 40% of households.

Distribution of land ownership - Percentages of land owned by wealthiest 10% and poorest 10% of land owners.

Health and Nutrition
Population per physician - Population divided by number of practicing physicians qualified from a medical school at university level.
Population per nursing person - Population divided by number of practicing male and female graduate nurses, "trained" or "certified" nurses, and auxiliary personnel with training or experience.
Population per hospital bed - Population divided by number of hospital beds available in public and private general and specialized hospital and rehabilitation centers; excludes nursing homes and establishments for custodial and preventive care.
Per capita supply of calories (% of requirements) - Computed from energy equivalent of net food supplies available in country per capita per day; available supplies comprise domestic production, imports less exports, and changes in stock; net supplies exclude animal feed, seeds, quantities used in food processing and losses in distribution; requirements were estimated by FAO based on physiological needs for normal activity and health considering environmental temperature, body weights, age and sex distributions of population, and allowing 10% for waste at household level.
Per capita supply of protein (grams per day) - Protein content of per capita net supply of food per day; net supply of food is defined as above; requirements for all countries established by USDA Economic Research Services provide for a minimum allowance of 60 grams of total protein per day, and 20 grams of animal and pulse protein, of which 10 grams should be animal protein; these standards are lower than those of 75 grams of total protein and 23 grams of animal protein as an average for the world, proposed by FAO in the Third World Food Survey.
Per capita protein supply from animal and pulse - Protein supply of food derived from animals and pulses in grams per day.
Death rate (/thou) ages 1-4 - Annual deaths per thousand in age group 1-4 years, to children in this age group; suggested as an indicator of malnutrition.

Education
Adjusted enrollment ratio - primary school - Enrollment of all ages as percentage of primary school-age population; includes children aged 6-11 years but adjusted for different lengths of primary education; for countries with universal education, enrollment may exceed 100% since some pupils are below or above the official school age.
Adjusted enrollment ratio - secondary school - Computed as above; secondary education requires at least four years of approved primary instruction; provides general, vocational or teacher training instructions for pupils of 12 to 17 years of age; correspondence courses are generally excluded.
Years of schooling provided (first and second levels) - Total years of schooling; at secondary level, vocational instruction may be partially or completely excluded.
Vocational enrollment (% of secondary) - Vocational institutions include technical, industrial or other programs which operate independently or as departments of secondary institutions.
Adult literacy rate (%) - Literate adults (able to read and write) as percentage of total adult population aged 15 years and over.

Housing
Persons per room (average) - Average number of persons per room in occupied conventional dwellings in urban areas; dwellings exclude non-permanent structures and unoccupied parts.
Occupied dwellings without piped water (%) - Occupied conventional dwellings in urban and rural areas without inside or outside piped water facilities as percentage of all occupied dwellings.
Access to electricity (% of all dwellings) - Conventional dwellings with electricity in living quarters as percent of total dwellings in urban and rural areas.
Rural dwellings connected to electricity (%) - Computed as above for rural dwellings only.

Consumption
Radio receivers (per thou pop) - All types of receivers for radio broadcasts to general public per thousand of population; excludes unlicensed receivers in countries and in years when registration of radio sets was in effect; data for recent years may not be comparable since most countries abolished licensing.
Passenger cars (per thou pop) - Passenger cars comprise motor cars seating less than eight persons; excludes ambulances, hearses and military vehicles.
Electricity (kwh/yr per cap) - Annual consumption of industrial, commercial, public and private electricity in kilowatt hours per capita, generally based on production data, without allowance for losses in grids but allowing for imports and exports of electricity.
Newsprint (kg/yr per cap) - Per capita annual consumption in kilograms estimated from domestic production plus net imports of newsprint.

# ECONOMIC DEVELOPMENT DATA SHEET 1/

| | Actual | | | Est. | Projected | | Growth Rates | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1973 | 1974 | 1975 | 1976 | 1980 | 1985 | 1969-73 | 1973-76 | 1976-80 | 1980-85 | 1973 | 1976 | 1980 | 1985 |
| **A. National Accounts** | Millions US$ at 1973 Prices and Exchange Rate | | | | | | | | | | As Percent of GDY | | | |
| 1. Gross Domestic Product | 77,891 | 85,361 | 88,934 | 95,323 | 121,089 | 182,819 | 10.9 | 7.0 | 6.2 | 8.6 | 100.0 | 102.8 | 102.9 | 102.1 |
| 2. Gains from Terms of Trade | - | -791 | -1,790 | -2,578 | -3,364 | -3,805 | - | - | - | - | - | -2.8 | -2.9 | -2.1 |
| 3. Gross Domestic Income | 77,891 | 84,570 | 87,144 | 92,745 | 117,725 | 179,013 | 11.3 | 6.0 | 6.1 | 8.7 | 100.0 | 100.0 | 100.0 | 100.0 |
| 4. Imports | 7,577 | 9,757 | 8,647 | 7,555 | 9,263 | 13,873 | 21.0 | 0.1 | 5.2 | 8.4 | 9.7 | 8.1 | 7.9 | 7.7 |
| 5. Exports - Volume | 6,596 | 6,306 | 7,292 | 8,223 | 11,757 | 17,944 | 12.1 | 7.6 | 9.3 | 8.8 | 8.5 | 8.9 | 10.0 | 10.0 |
| 6. Exports - TT Adjusted | 6,596 | 5,515 | 5,502 | 5,645 | 8,393 | 14,138 | 16.9 | -4.6 | 10.4 | 11.0 | 8.5 | 6.1 | 7.1 | 7.9 |
| 7. Resource Gap (4-6) | 981 | 4,242 | 3,145 | 1,910 | 870 | 265 | - | - | - | - | 1.2 | 2.1 | 0.7 | 0.1 |
| 8. Consumption | 61,529 | 66,866 | 69,788 | 73,233 | 88,590 | 131,676 | 9.9 | 6.0 | 4.9 | 8.2 | 79.0 | 79.0 | 75.3 | 73.6 |
| 9. Investment | 17,343 | 21,946 | 20,501 | 21,423 | 30,005 | 47,072 | 17.8 | 7.3 | 8.8 | 9.4 | 22.3 | 23.1 | 25.5 | 26.3 |
| 10. National Savings | 15,655 | 16,953 | 16,088 | 18,036 | 27,393 | 45,571 | 16.5 | 4.8 | 11.0 | 10.7 | 20.1 | 19.4 | 23.3 | 25.5 |
| 11. Domestic Savings | 16,362 | 17,704 | 17,356 | 19,512 | 29,135 | 47,337 | 16.5 | 6.0 | 10.5 | 10.2 | 21.0 | 21.0 | 24.7 | 26.4 |
| **B. Merchandise Trade** | Millions US$ at Current Prices | | | | | | | | | | As Percent of Total Imports | | | |
| 1. Imports | | | | | | | | | | | | | | |
| Consumer Goods | 1,125 | 1,638 | 1,358 | 1,348 | 1,649 | 3,034 | 34.3 | 6.2 | 5.2 | 13.0 | 18.2 | 11.2 | 8.9 | 7.9 |
| Petroleum and Derivatives | 727 | 2,875 | 2,998 | 3,740 | 5,676 | 9,799 | 37.4 | 72.1 | 11.0 | 11.5 | 11.7 | 31.1 | 30.5 | 25.6 |
| Intermediate Goods | 2,197 | 5,020 | 3,881 | 3,442 | 4,734 | 8,182 | 37.2 | 16.1 | 8.3 | 11.6 | 35.5 | 28.6 | 25.4 | 21.4 |
| Capital Goods | 2,143 | 3,108 | 3,932 | 3,510 | 6,567 | 17,229 | 27.0 | 17.9 | 17.0 | 21.3 | 34.6 | 29.2 | 35.3 | 45.1 |
| Total (FOB) | 6,192 | 12,641 | 12,169 | 12,040 | 18,626 | 38,244 | 32.8 | 24.8 | 11.5 | 15.5 | 100.0 | 100.0 | 100.0 | 100.0 |
| 2. Exports | | | | | | | | | | | As Percent of Total Exports | | | |
| Coffee | 1,344 | 980 | 932 | 2,230 | 2,136 | 2,483 | 12.3 | 18.4 | -1.0 | 3.1 | 21.7 | 22.1 | 11.1 | |
| Other Agricultural Goods | 2,454 | 3,415 | 3,479 | 3,023 | 7,362 | 16,983 | 32.2 | 7.2 | 24.9 | 18.2 | 39.6 | 29.9 | 38.3 | |
| Minerals | 399 | 641 | 1,010 | 1,048 | 2,434 | 5,463 | 22.0 | 38.0 | 23.4 | 17.5 | 6.4 | 10.4 | 12.7 | |
| Semi-Processed Goods | 476 | 634 | 645 | 840 | 1,753 | 4,452 | 22.6 | 20.8 | 20.2 | 20.5 | 7.7 | 8.3 | 9.1 | |
| Manufactured Goods | 1,365 | 2,086 | 2,380 | 2,670 | 5,188 | 13,407 | 52.6 | 25.1 | 18.1 | 20.9 | 22.0 | 26.4 | 27.0 | |
| Other | 161 | 195 | 209 | 300 | 331 | 525 | 72.9 | 23.1 | 2.5 | 9.7 | 2.6 | 3.0 | 1.7 | |
| Total | 6,199 | 7,951 | 8,655 | 10,111 | 19,203 | 43,313 | 28.0 | 17.7 | 17.4 | 17.7 | 100.0 | 100.0 | 100.0 | |
| **C. Sector Output** | Percent of NDP at Factor Cost at 1973 Prices and Exchange Rates | | | | | | | | | | | | | |
| 1. Agriculture | 15.3 | 15.1 | 15.0 | 14.0 | 13.9 | 11.7 | 6.1 | 3.9 | 6.5 | 5.1 | | | | |
| 2. Industry | 33.3 | 32.8 | 32.8 | 33.7 | 34.1 | 35.3 | 12.9 | 7.4 | 5.5 | 9.4 | | | | |
| 3. Services | 51.5 | 52.0 | 52.2 | 52.4 | 52.1 | 52.9 | 10.8 | 7.6 | 6.5 | 8.9 | | | | |
| **D. Prices (1973 = 100)** | | | | | | | | | | | | | | |
| 1. Export Price Index | 100 | 135 | 126 | 130 | 175 | 260 | 13.5 | 9.3 | 7.6 | 8.2 | | | | |
| 2. Import Price Index | 100 | 156 | 171 | 196 | 247 | 336 | 8.8 | 25.0 | 6.0 | 6.4 | | | | |
| 3. Terms of Trade Index | 100 | 86 | 74 | 67 | 71 | 77 | - | 10.0 | 1.5 | 1.7 | | | | |
| 4. General Price Index | 100 | 129 | 164 | - | - | - | - | - | - | - | | | | |
| 5. Average Exchange Rate | 100 | 111 | 133 | - | - | - | - | - | - | - | | | | |

| **E. Selected Indicators** | 1969-73 | 1973-76 | 1977-80 | 1981-85 |
|---|---|---|---|---|
| 1. ICOR | 1.80 | 3.40 | 4.10 | 2.89 |
| 2. Import Elasticity | 1.93 | -.15 | .79 | .98 |
| 3. Average National Savings Rate | 0.21 | .19 | .24 | .26 |
| 4. Marginal National Savings Rate | 0.31 | .09 | .43 | .30 |
| 5. Imports/GDP | 0.076 | .10 | .08 | .07 |
| 6. Investment/GDP | 0.229 | .23 | .25 | .26 |
| 7. Resource Gap/GDP | 0.01 | .03 | .01 | .00 |

| **F. Employment** | 1960 | 1970 |
|---|---|---|
| 1. Total (Millions) 2/ | 22,651 | 29.545 |
| 1.1. Agriculture (%) | 53.70 | 44.24 |
| 1.2. Industry (%) | 13.08 | 17.82 |
| 1.3. Services (%) | 33.22 | 37.94 |

| **G. Public Finance 3/** | Percent of GDP | | | |
|---|---|---|---|---|
| | 1973 | 1974 | 1975 | 1976 |
| 1. Current Revenue | 11.1 | 11.4 | 10.7 | 11.9 |
| 1.1. Tax Revenue | 10.4 | 11.0 | 9.9 | 11.0 |
| 2. Current Expenditures | 5.4 | 5.4 | 5.3 | 6.5 |
| 3. Current Savings | 5.7 | 6.1 | 5.4 | 5.4 |
| 4. Capital Expenditures | 5.6 | 5.5 | 5.4 | 5.4 |
| 4.1. Public Sector Fixed Capital Formation | 11.2 | 11.7 | 12.0 | - |

| **H. Current Federal Government Expenditure** | Percent of Total | | |
|---|---|---|---|
| | 1973 | 1974 | 1975 |
| 1. Education | 8.6 | 9.0 | 9.8 |
| 2. Other Social Services | 25.6 | 24.0 | 24.0 |
| 3. Agriculture | 2.1 | 1.9 | 2.1 |
| 4. Other Economic Services | 11.7 | 12.5 | 15.7 |
| 5. Administration and Defense | 35.9 | 35.9 | 38.0 |
| 6. Other | 16.0 | 16.7 | 10.4 |
| Total Current Expenditure | 100.00 | 100.0 | 100.0 |

| DETAIL ON PUBLIC SECTOR INVESTMENT PROGRAM | US$ million at 1973 prices and ER 1971-74 | % of Total |
|---|---|---|
| Social Sectors | 4,504 | 11.3 |
| Agriculture | 187 | 0.5 |
| Industry and Mining | 6,060 | 15.2 |
| Power | 5,499 | 13.8 |
| Transport and Communications | 7;384 | 18.6 |
| Regional Development | 1,441 | 3.6 |
| Other /3 | 14,712 | 37.0 |
| Total expenditure | 39,787 | 100.0 |
| FINANCING | | |
| Public Sector Savings | 33,674 | 84.6 |
| Foreign Borrowings (net) | 5,762 | 14.5 |
| Domestic Borrowings | 351 | 0.9 |
| Total financing | 39,787 | 100.0 |

1/ Columns may not sum to totals because of rounding.

2/ Economically active population.

3/ Federal Government.

4/ Includes financial investment.

December 21, 1976

## BALANCE OF PAYMENTS, EXTERNAL ASSISTANCE AND DEBT[1/]

(In millions of U.S. dollars at current prices)

| | Actual | | | | | Est. | Projected | |
|---|---|---|---|---|---|---|---|---|
| | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1980 | 1985 |
| **A. Summary of Balance of Payments** | | | | | | | | |
| 1. Exports (incl. NFS) | 3,175 | 4,272 | 6,596 | 8,471 | 9,255 | 10,771 | 20,749 | 46,841 |
| 2. Imports (incl. NFS) | 4,028 | 5,205 | 7,577 | 14,678 | 14,296 | 14,218 | 28,061 | 45,274 |
| 3. Resource Balance | -853 | -933 | -981 | -6,207 | -5,041 | -3,447 | -1,312 | 1,567 |
| 4. Net Factor Service Income | -468 | -561 | -734 | -917 | -1,711 | -2,212 | -3,486 | -4,758 |
| 1. Net Interest Payments | -302 | -359 | -514 | -652 | -1,439 | -1,955 | -3,116 | -4,373 |
| 2. Direct Investment Income | -118 | -161 | -198 | -248 | -235 | -237 | -350 | -565 |
| 3. Other Factor Service Income | -48 | -41 | -22 | -16 | -37 | -20 | -20 | -20 |
| 5. Current Transfers (Net) | 14 | 5 | 27 | 1 | - | 10 | 10 | 10 |
| 6. Balance on Current Account | -1,307 | -1,489 | -1,688 | -7,122 | -6,751 | -5,649 | -4,788 | -3,381 |
| 7. Private Direct Investment | 168 | 318 | 940 | 887 | 890 | 950 | 1,455 | 2,340 |
| Medium- and Long-Term Loans | | | | | | | | |
| a. Official Sources | | | | | | | | |
| 8. Disbursements | 411 | 425 | 562 | 947 | 907 | 1,010 | 1,395 | 1,689 |
| 9. Amortization | -212 | -188 | -217 | -191 | -273 | -462 | -550 | -1,198 |
| 10. Net Disbursements | 199 | 237 | 345 | 756 | 634 | 548 | 845 | 491 |
| b. Private Sources | | | | | | | | |
| 11. Disbursements | -1,876 | 4,091 | 3,998 | 6,080 | 5,974 | 6,459 | 7,535 | 9,569 |
| 12. Amortization | -881 | -1,210 | -1,529 | -1,716 | -1,868 | -2,008 | -5,046 | -7,345 |
| 13. Net Disbursements | 995 | 2,881 | 2,469 | 4,364 | 4,106 | 4,451 | 2,489 | 2,224 |
| 14. Use of IMF Resources | 48 | 47 | - | 7 | - | - | - | - |
| 15. Short-term Capital Transactions | 507 | 47 | -130 | 464 | 424 | 1,000 | - | - |
| 16. Capital Transactions NEI | -80 | 398 | 243 | -285 | -253 | - | - | - |
| 17. Change in Reserves (- = increase) | -530 | -2,439 | -2,179 | 936 | 950 | -1,300 | - | -1,674 |
| 18. Foreign Exchange Reserves (End of Period) | 2,018 | 4,457 | 6,636 | 5,700 | 4,750 | 6,050 | 6,050 | 11,319 |
| **B. Grant and Loan Commitments** | | | | | | | | |
| 1. Total M&LT Loan | 2,526 | 5,203 | 4,926 | 7,012 | 7,180 | | | |
| 1.1. IBRD | 256 | 455 | 199 | 140 | 426 | | | |
| 1.2. IDA | 108 | 182 | 242 | 181 | 215 | | | |
| 1.3. Governments | 225 | 380 | 440 | 475 | 525 | | | |
| 1.4. Suppliers | 496 | 694 | 857 | 1,088 | 1,376 | | | |
| 1.5. Bonds | - | 96 | 37 | 25 | - | | | |
| 1.6. Financial Credits | 1,441 | 3,396 | 3,151 | 5,103 | 4,638 | | | |
| **C. Memorandum Items** | | | | | | | | |
| 1. Grant Element of Total Commitments | 1.5 | 2.0 | 2.5 | 2.5 | 2.5 | | | |
| 2. Average Interest (Percent) | 6.5 | 7.4 | 8.8 | 9.5 | 9.5 | | | |
| 3. Average Maturity (Years) | 6.1 | 6.8 | 7.2 | 9.0 | 9.9 | | | |

| **F. External Debt (Disbursed Only)** | Outstanding December 31, 1975 Amount | Percent |
|---|---|---|
| 1. IBRD | 1,094 | 5.2 |
| 2. Other Multilateral | 416 | 2.0 |
| 3. Governments | 2,567 | 12.1 |
| 4. Suppliers | 1,980 | 9.3 |
| 5. Bonds | 161 | 0.8 |
| 6. Financial Credits | 14,561 | 68.8 |
| 7. Other | 392 | 1.8 |
| 8. Total M&LT Debt | 21,171 | 100.0 |
| 9. Total Public M&LT Debt | 11,461 | 54.1 |

| **G. Debt Profile** | |
|---|---|
| 1. Total Debt Service 1976-80/Total DOD end of 1975 | 153.8 |

| DEBT AND DEBT SERVICE | Actual 1972 | 1973 | 1974 | 1975 |
|---|---|---|---|---|
| **A. Medium- and Long-Term Debt (Disbursed only)** | | | | |
| 1. Total Debt Outstanding (end of period) | 9,521 | 12,571 | 17,166 | 21,171 |
| 1. Financial Credits | 5,528 | 7,848 | 11,211 | 14,561 |
| 2. Others (Bil.,Multi.,Bonds,Suppliers) | 3,993 | 4,723 | 5,955 | 6,610 |
| 3. Public and Publicly Guaranteed | -- | 6,496 | 8,533 | 11,461 |
| 4. Private | -- | 6,075 | 8,633 | 9,710 |
| 2. Total Debt Service | 1,887 | 2,586 | 3,277 | 3,945 |
| 1. Total Interest | 489 | 860 | 1,370 | 1,806 |
| 2. Net Interest | 359 | 514 | 652 | 1,439 |
| 3. Public Debt Service | -- | -- | 1,287 | 1,390 |
| **B. Debt Burden** | | | | |
| 1. Total Debt Service Ratio | 44.2 | 39.2 | 38.7 | 42.6 |
| 2. Total Debt Service Ratio[2/] | 47.9 | 42.2 | 41.6 | 45.2 |
| 3. Public Debt Service Ratio | -- | -- | 15.2 | 16.7 |
| 4. Liquidity Ratio[3/] | 25.4 | 22.8 | 31.2 | 37.8 |
| 5. Total Debt Service/GDP[4/] | 3.2 | 3.3 | 3.1 | 3.2 |
| 6. Public Debt Service/GDP[4/] | -- | -- | 1.2 | 1.2 |
| 7. Total DOD/GDP[4/] | 16.2 | 16.1 | 16.4 | 17.0 |
| **C. Terms** | | | | |
| 1. Interest on Total DOD/Total DOD | 7.4 | 8.8 | 10.9 | 10.5 |
| 2. Total Debt Service/Total DOD | 19.8 | 20.6 | 19.1 | 18.6 |
| **D. Dependency Ratios for M&LT Debt** | | | | |
| 1. Gross Disbursements/Imports (inc. NFS) | 86.8 | 60.2 | 47.9 | 48.1 |
| 2. Net Transfer/Imports (inc. NFS) | 50.5 | 26.0 | 25.5 | 20.5 |
| 3. Net Transfer/Gross Disbursements | 58.2 | 43.3 | 53.4 | 42.7 |
| **E. Exposure** | | | | |
| 1. IBRD Disb./Gross Total Disb. | 3.6 | 4.2 | 3.5 | 3.6 |
| 2. IBRD DOD/Total DOD | 5.1 | 5.1 | 5.1 | 5.2 |
| 3. IBRD Debt Service/Total Debt Service | 2.7 | 2.7 | 2.6 | 2.4 |

1/ Columns may not sum to totals because of rounding.
2/ Including net direct investment income.
3/ Debt service as a percent of exports plus reserved in excess of 3 months imports.
4/ In constant 1973 prices.
-- Not Available

December 21, 1976

# THE STATUS OF BANK GROUP OPERATIONS IN BRAZIL

## A. SUMMARY STATEMENT OF LOANS
## (AS OF FEBRUARY 28, 1977)

| Loan # | Year | Borrower | Purpose | Amount less Cancellations (US$ Million) | Undis-bursed |
|---|---|---|---|---|---|
| Thirty-One Loans Fully Disbursed | | | | 890.9 | |
| 677 | 1970 | Furnas - Centrais Eletricas Marimbondo | Power | 80.0 | 4.2 |
| 728 | 1971 | Centrais Eletricas do Sul do Brasil - Salto Osorio | Power | 70.0 | 6.7 |
| 755 | 1971 | Brazil | Education | 8.4 | 2.9 |
| 756 | 1971 | Brazil | Ports | 45.0 | 24.4 |
| 757 | 1971 | Superintendencia de Agua e Esgotos da Capital | Water Supply | 22.0 | 0.5 |
| 758 | 1971 | Companhia Metropolitana de Saneamento de Sao Paulo | Control | 12.0 | 2.2 |
| 786 | 1971 | Rede Ferroviaria Federal | Railways | 46.0 | 5.2 |
| 797 | 1972 | Companhia Siderurgica Nacional | Industry | 64.5 | 2.6 |
| 812 | 1972 | Usinas Siderurgicas de Minas Gerais | Industry | 63.0 | 7.3 |
| 813 | 1972 | Brazil | Roads | 89.0 | 2.8 |
| 828 | 1972 | Companhia Siderurgica Paulista | Industry | 64.5 | 3.7 |
| 829 | 1972 | Centrais Eletricas de Minas Gerais - Sao Simao | Power | 60.0 | 7.9 |
| 853 | 1972 | Brazil | Land Setl. | 6.7 | 5.7 |
| 887 | 1973 | LIGHT-Servicos de Eletri. | Power | 20.0 | 13.6 |
| 923 | 1973 | Furnas Centrais Eletricas - Itumbiara | Power | 125.0 | 79.2 |
| 924 | 1973 | Brazil | Agro-Indust. | 54.0 | 32.5 |
| 1008 | 1974 | Cia. Hidro Eletrica do Sao Francisco-Paulo Afonso IV | Power | 81.0 | 78.0 |
| 1009 | 1974 | Banco Nacional de Habitacao | Water Supply | 36.0 | 23.5 |
| 1067 | 1974 | Brazil | Education | 23.5 | 23.3 |
| 1074 | 1975 | Rede Ferroviaria Federal | Railways | 175.0 | 168.2 |
| 1075 | 1975 | Brazil | Roads | 110.0 | 84.5 |
| 1151 | 1975 | Companhia Siderurgica Nacional | Industry | 95.0 | 95.0 |
| 1152 | 1975 | Companhia Siderurgica Nacional | Industry | 60.0 | 59.3 |
| 1153 | 1975 | Brazil | Agriculture | 23.0 | 21.0 |
| 1171 | 1975 | FEPASA-Ferrovia Paulista | Railways | 75.0 | 75.0 |
| 1195 | 1976 | Brazil | Rural Develop. | 12.0 | 12.0 |

# THE STATUS OF BANK GROUP OPERATIONS IN BRAZIL

## A. SUMMARY STATEMENT OF LOANS
## (AS OF FEBRUARY 28, 977)

| Loan # | Year | Borrower | Purpose | Amount less Cancellations (US$ million) | Undisbursed |
|---|---|---|---|---|---|
| 1206 | 1976 | Brazil | Develop. Bank | 85.0 | 85.0 |
| 1207 | 1976 | Brazil | Feeder Roads | 55.0 | 55.0 |
| 1249 | 1976 | Brazil | Agriculture | 40.0 | 39.7 |
| 1256 | 1976 | Petrobras Fertilizantes | Fertilizer | 50.0 | 44.7 |
| 1257 | 1976 | Companhia Paraense de Energia Eletrica-COPEL | Power | 52.0 | 52.0 |
| 1300 | 1976 | Eletrobras | Power | 50.0 | 50.0 |
| 1302 | 1976 | Brazil | Nutrition | 19.0 | 19.0 |
| 1309 | 1976 | Banco Nacional de Habitacao | Water Supply | 40.0 | 40.0 |
| 1317 /2 | 1976 | Brazil | Agro. Industry | 83.0 | 83.0 |
| 1343 /2 | 1977 | ELETROSUL | Power | 82.0 | 82.0 |
| 1362 /2 | 1977 | State of Minas Gerais | Rural Develop. | 42.0 | 42.0 |
| | | Total | | 3,009.5 /1 | 1,433.6 |
| | | Of which has been repaid to the Bank | | 354.2 | |
| | | Total now outstanding | | 2,655.3 | |
| | | Amount Sold | 45.5 | | |
| | | of which has been paid | 19.9 | 25.6 | |
| | | Total now held by Bank | | 2,629.7 | |
| | | Total Undisbursed | | | 1,433.6 |

/1 No IDA credits have been made to Brazil.

/2 Not yet effective.

B. STATEMENT OF IFC INVESTMENTS (As of February 28, 1977)

| Fiscal Year | Obligor | Type of Business | Amount in US$ million | | |
|---|---|---|---|---|---|
| | | | Loans | Equity | Total |
| 1957 | Siemens do Brasil Cia. de Eletricidade | Electrical Equipment | 2.00 | - | 2.00 |
| 1958 | Olinkraft, S.A. Celulose e Papel | Pulp and Paper | 1.20 | - | 1.20 |
| 1958 | D.L.R. Plasticos do Brasil, S.A. | Automotive Parts | 0.45 | - | 0.45 |
| 1958 | Willys-Overland do Brasil, S.A. Industria e Comercio | Motor Vehicles | 2.45 | - | 2.45 |
| 1959 | Companhia Mineira de Cimento Portland, S.A. | Cement | 1.20 | - | 1.20 |
| 1959 | Champion Celulose, S.A. | Pulp | 4.00 | - | 4.00 |
| 1966/1968/ 1972 | Acos Villares, S.A. | Steel | 8.00 | 1.93 | 9.93 |
| 1966/1969 | Papel e Celulose Catarinense, S.A. | Pulp and Paper | 3.71 | 3.48 | 7.19 |
| 1967/1972 | Ultrafertil, S.A. - Industria e Comercio de Fertilizantes | Fertilizers | 8.22 | 3.03 | 11.25 |
| 1969 | Petroquimica Uniao, S.A. | Petrochemicals | 5.50 | 2.88 | 8.38 |
| 1970 | Poliolefinas, S.A. Industria e Comercio | Petrochemicals | 5.50 | 2.88 | 8.38 |
| 1971 | Oxiteno, S.A. Industria e Comercio | Petrochemicals | 4.60 | 1.44 | 6.04 |
| 1971 | Industria de Celulose Borregaard, S.A. | Pulp | 4.90 | - | 4.90 |
| 1972/1975 | Companhia de Cimento Nacional de Minas | Cement | 29.14 | 3.20 | 32.34 |
| 1973/1974/1977 | Companhia Siderurgica da Guanabara - COSIGUA | Steel | 76.96 | 7.50 | 84.46 |
| 1973 | Capital Market Development Fund - FUMCAP | Capital Market Development | 5.00 | - | 5.00 |
| 1973 | Empresa de Desenvolvimento de Recursos Minerais - CODEMIN, S.A. | Nickel Mining and Refining | 26.00 | 4.40 | 30.40 |
| 1974 | Industrias Villares, S.A. | Elevators and Industrial Equipment | 6.00 | - | 6.00 |
| 1974 | Fabrica de Tecidos Tatuape, S.A. | Textiles | 31.00 | - | 31.00 |
| 1975 | Capuava Carbonos Industriais Ltd. | Carbon Black | 6.18 | 1.08 | 7.26 |
| 1975 | Oxiteno Nordeste, S.A. | Petrochemicals | 10.00 | - | 10.00 |
| 1976 | Santista Industria - Textil do Nordeste, S.A. | Textiles | 6.45 | 1.00 | 7.45 |
| 1976 | Tecanor S.A. - Textil Catarinense do Nordeste | Textiles | 6.00 | - | 6.00 |
| | Total Gross Commitments | | 254.46 | 32.82 | 287.28 |
| | Less Cancellations, Terminations, Repayments and Sales | | 184.70 | 8.34 | 193.04 |
| | Total Commitments Now Held by IFC | | 69.76 | 24.48 | 94.24 |
| | Total Undisbursed | | 18.61 | 0.53 | 19.14 |

## C. PROJECTS IN EXECUTION 1/

(As of February 28, 1977)

There are now 32 effective Bank loans under disbursement:

Loan No.

677 Marimbondo Hydroelectric Project: US$80 million loan of May 25, 1970; Effective Date: September 29, 1970; Closing Date: May 31, 1977. Construction work is proceeding on schedule. The cost of the project has increased by US$42 million, or 15% over the original estimate, because of increased excavation and concrete work, resulting from poor rock foundation, and increased equipment prices. This has not significantly affected the economic justification of the project.

728 Salto Osorio Hydroelectric Project: US$70 million loan of April 5, 1971; Effective Date: July 19, 1971; Closing Date: May 31, 1977. The construction of the Salto Osorio hydroelectric plant is progressing satisfactorily and the first two of the planned four generating units are now in commercial operation. A cost overrun of about US$127 million, due to increased equipment and construction costs, is foreseen, but this does not significantly affect the economic justification of the project. The cost overrun is being financed by loans from ELETROBRAS and a commercial bank. The construction of the transmission system, delayed to allow required modifications, is proceeding satisfactorily. The project is expected to be completed shortly.

755 Education Project: US$8.4 million loan of June 21, 1971; Effective Date: October 28, 1971; Closing Date: December 31, 1977. Progress on the construction and equipping of the project schools is now proceeding satisfactorily. However, the project implementation is behind the original schedule due to initial delays in establishing and staffing the project unit and because of subsequent changes in project content. The original Closing Date was December 31, 1975.

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1/ These notes are designed to inform the Executive Directors regarding the progress of projects in execution, and in particular to report any problems which are being encountered, and the action being taken to remedy them. They should be read in this sense, and with the understanding that they do not purport to present a balanced evaluation of strengths and weaknesses in project execution.

Loan No.

756 Santos Port Project: US$45 million loan of June 21, 1971; Effective Date: October 29, 1971; Closing Date: June 30, 1979. Execution of the project is now proceeding satisfactorily, although there have been further delays and cost overruns which will be financed by the Borrower. The Government has approved legislation which converted DNPVN from a government agency to a public corporation, PORTOBRAS. PORTOBRAS, with the assistance of management consultants, has been improving port operations in Santos. The National Port Development Study financed under the project is now completed.

757 Sao Paulo Water Supply Project: US$22 million loan of June 21,1971; Effective Date: January 13, 1972; Closing Date: June 30, 1977. The project suffered initial delays caused by the State of Sao Paulo not furnishing the required counterpart funds, which are now included in the state budget. The Government has consolidated all the water and sewerage companies in the state into a single company, SABESP, and a loan assumption agreement with the new company, SABESP, was concluded on December 18, 1974. Because of the reorganization of the sector and of management problems which are now resolved, the Closing Date, originally June 30, 1975 has been postponed to June 30, 1977. Progress of the project has improved with new management of the company which took office in March 1975.

758 Sao Paulo Pollution Control Project: US$15 million loan of June 21, 1971; Effective Date: January 13, 1972; Closing Date: June 30, 1977. A review of the original design resulted in its modification to exclude the discharge of raw sewage and a related treatment facility. As a result of the modifications in the project, the loan amount was reduced to US$12 million. The Government has consolidated all the water and sewerage companies in the state into a single company, SABESP, and a loan assumption agreement with the new company was concluded December 18, 1974. The Description of the Project has been slightly modified again because of changes in the Investment Plan. Because of the reorganization of the sector and of management problems which are now resolved, the Closing Date, originally June 30, 1975, has been postponed to June 30, 1977. Progress of the project has improved with new management which took office in March 1975.

786 Railway Project - MBR: US$46 million loan of August 25, 1971; Effective Date: February 4, 1972; Closing Date: March 31, 1978. The project is now completed, except for the construction and equipping of the Borrower's main workshop at Jaceaba. The purchase of equipment for this workshop was delayed because of a change in the

Loan No.

location of the workshop resulting from the Government's decision to build a new railway line between the cities of Belo Horizonte and Volta Redonda. To allow additional time required for the purchase of this equipment, the Closing Date, originally September 30, 1975, was postponed to March 31, 1978.

797 CSN Steel Expansion Project, Stage II: US$64.5 million loan of February 8, 1972; Effective Date: August 31, 1972; Closing Date: September 30, 1977. The latest cost estimate, is US$736 million, an increase of about 72% over the appraisal estimate due to design evolution, unforeseen site works and increases in local construction costs. This cost increase will not significantly affect the economic justification of the project. The project is now 90% complete and is about one year behind the appraisal schedule. The original Closing Date was July 1, 1976.

812 USIMINAS Steel Expansion Project, Stage II: US$63 million loan of April 11, 1972; Effective Date: July 28, 1972; Closing Date: June 1, 1977. The latest cost estimate is US$975 million, an increase of about 70% over the appraisal estimate, due primarily to design evolution and increases in local construction costs. This cost increase will not significantly affect the economic justification of the project. The project is 90% complete and is about twelve months behind the original schedule. Implementation of Stage III, which is not being financed by the Bank, is well underway. The original Closing Date was June 1, 1976.

813 Third Highway Construction Project: US$89 million loan of April 11, 1972; Effective Date: December 4, 1972; Closing Date: June 30, 1977. Construction works are more than 98% completed but are slightly behind schedule; the estimated total contract cost is about 2% above the appraisal estimate. The feasibility studies and detailed engineering financed under the loan were started later than planned, but are now completed at a cost substantially below the appraisal estimate. Disbursements have improved during the past year, but are still lagging behind the appraisal forecast. The Closing Date originally June 30, 1976, has been postponed to June 30, 1977.

828 COSIPA Steel Expansion Project, Stage II: US$64.5 million loan of June 14, 1972; Effective Date: October 5, 1972; Closing Date: January 15, 1978. The latest cost estimate is US$784 million, an increase of about 60% over the appraisal estimate due primarily to increased local construction costs. This will not significantly affect the economic justification of the project. The project is now 75% complete and is about sixteen months behind the original schedule. The original Closing Date was January 15, 1976.

Loan No.

829 Sao Simao Hydroelectric Project: US$60 million loan of June 14, 1972; Effective Date: September 20, 1972; Closing Date: September 30, 1979. Construction of the project is proceeding according to schedule. An anticipated 50% cost overrun, which does not affect the economic justification of the project, is being covered by local and foreign borrowing.

853 Alto Turi Land Settlement Project: US$6.7 million loan of July 24, 1972; Effective Date: February 15, 1973; Closing Date: December 1, 1978. COLONE has prepared revised farm development plans whose credit component, to be financed by public financial institutions, will be significantly higher than originally estimated, although still low in comparison to other settlement projects. Administrative delays in the release of public funds for farm credit and COLONE working capital requirements and difficulties in recruiting project staff delayed the start of project execution. Settlement, however, has now begun and the project should be completed in 1978 as envisaged.

887 Power Distribution Project: US$20 million loan of April 16, 1973; Effective Date: July 31, 1973; Closing Date: June 30, 1977. Principally due to difficulties encountered in preparing bidding documents and delays in deliveries of equipment and materials, the project is about two years behind schedule. Complete delivery and installation of equipment and materials to be financed by the loan will probably take until July 1977 and a postponement of the Closing Date will be required.

923 Itumbiara Hydroelectric Project: US$125 million loan of August 1, 1973; Effective Date: October 30, 1973; Closing Date: December 31, 1982. Contracts for penstocks, turbines, and concrete and earth works have been awarded. Commissioning of the first generating unit is scheduled for March 1980, four months behind original schedule due to delay in awarding the civil works contracts.

924 Agro-Industries Credit Project: US$54 million loan of August 1, 1973; Effective Date: March 11, 1974; Closing Date: December 31, 1978. The project is proceeding according to schedule.

1008 Paulo Afonso IV Hydroelectric Power Project: US$81 million loan of June 17, 1974; Effective Date: April 15, 1975; Closing Date: December 31, 1978. A Bank mission recently reviewed the progress of the preparation and implementation of plans for resettlement of the 9,700 families to be displaced by the Sobradinho reservoir. Execution of these plans is underway, and construction of new towns to house the urban portion of the population has begun. The

Loan No.

rural population is being offered the opportunity of resettlement in a promising new agricultural area in the Corrente River region in the western part of the State of Bahia. Those who prefer to remain near their present houses will be resettled in new villages on the edge of the future reservoir. The construction of the underground power station and Sobradinho Dam is proceeding on schedule.

1009 Minas Gerais Water Supply Project: US$36 million loan of June 17, 1974; Effective Date: January 9, 1975; Closing Date: August 15, 1977. Thirty-nine subprojects have been approved, and the loan is almost fully committed. All subprojects approved are in various stages of construction. Disbursements reached 35% (US$12.5 million) as of December 31, 1976, and are expected to be completed by June 1979.

1067 Second Education Project: US$23.5 million loan of December 27, 1974; Effective Date: April 17, 1975; Closing Date: December 31, 1979. Project execution has started reasonably well, and is expected to be completed by the target date. Project implementation units have been established in all eight project states and these, together with the main project unit, PREMEN, are working well. The pre-investment studies in the Northeast, financed under the loan, have been completed and are expected to yield useful information for future sector investment planning.

1074 Second Railway Project: US$175 million loan of January 17, 1975; Effective Date: June 17, 1975; Closing Date: December 31, 1979. Project execution is progressing satisfactorily and appropriate steps are being taken to strengthen project management and control. Cost estimates for the Investment Plan, of which the project is a part, have increased substantially on several items. Therefore, the Plan has been revised and several items have been deleted or postponed. This revision is not expected to affect significantly the items included under Bank financing. The financial situation of the Borrower deteriorated seriously in 1975 and 1976 because of increased costs of materials and higher social charges which were not matched by adequate tariff increases. Procurement is progressing reasonably well, although slower than expected.

1075 Fifth Highway Project: US$110 million loan of January 17, 1975; Effective Date: May 15, 1975; Closing Date: December 31, 1979. Project execution is proceeding satisfactorily. Contracts for civil works for all 21 lots have now been awarded and construction works are proceeding according to schedule. Implementation of the road maintenance component of the project is slightly delayed due to protracted negotiations for the hiring of consultants.

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1151 CSN Steel Expansion Project - Stage III: US$95.0 million loan of August 4, 1975; Effective Date: April 30, 1976; Closing Date: June 30, 1980. The latest cost estimate is US$3,530 million, an increase of about 67% over the appraisal estimate due to a slower than expected start of project implementation, higher than expected construction costs, difficulties in holding the scope of the project to its essentials and some problems in the management of the expansion program. As a result of these difficulties CSN has contracted special consultancy services to review the project scope with a view to trimming capital costs and to helping improve project management. The project is about nine months behind the original schedule.

1152 COSIPA Steel Expansion Project - Stage III: US$60.0 million loan of August 4, 1975; Effective Date: March 4, 1976; Closing Date: June 30, 1980. Procurement for equipment is underway.

1153 Lower Sao Francisco Polders Project: US$23.0 million loan of August 4, 1975; Effective Date: November 25, 1975; Closing Date: December 31, 1979. CODEVASF is making good progress in defining the details of the project and should be in a position to let several major contracts during 1977. Cost estimates remain at the same level as reported by the last supervision report because, until new bids are received, there is no meaningful basis for revising them. Procurement problems experienced in the past have been carefully reviewed with CODEVASF staff and it is anticipated that with a better understanding of what is required there will be fewer problems in the future. The Technical Department of CODEVASF has improved over the last six months, and, for the first time, CODEVASF appears to be fully in control of the project, leading and supervising the various consulting firms under contract.

1171 Third Railway Project (FEPASA): US$75.0 million loan of November 12, 1975; Effective Date: March 24, 1976; Closing Date: June 30, 1979. Implementation of the Project is progressing slower than expected, mainly because of lack of State Government funds to finance FEPASA's Investment Plan, and a revision of that plan will be necessary. FEPASA is in a serious financial situation, and tariffs for most of the commodities are too low to cover increasing costs; however, FEPASA has taken positive steps in order to correct this situation. As of December 5, 1976 FEPASA increased its published freight tariff by 25% and its intercity passeger tariffs by 20% and is planning further increases. Cuts in operational costs are also being prepared, and if all the measures included in FEPASA's Plan of Action are implemented, FEPASA will come close to meeting the financial targets set at appraisal for 1977.

Loan No.

1195 Rio Grande do Norte Rural Development Project: US$12.0 million loan of March 1, 1976; Effective Date: July 30, 1976; Closing Date: June 30, 1981. Initial disbursements have now been made. Operational plans for 1977 were prepared and are satisfactory, and the project unit has made progress in resolving problems related to project start-up. Recent delays in the transfer of funds from the Federal Government to state level executing agencies, which interfered with performance, have now been corrected.

1206 Development Banking Project: US$85.0 million loan of March 1, 1976; Effective Date: August 26, 1976; Closing Date: March 31, 1979. Because of the Government's introduction of a 20% ceiling on annual monetary correction on loans contracted in 1976 from federal lending institutions by industrial enterprises, only investment subprojects contracted after January 1, 1977 will be eligible for financing under the loan. Project implementation is expected to be completed as originally anticipated by March 31, 1979.

1207 Secondary and Feeder Roads Project: US$55.0 million loan of March 1, 1976; Effective Date: July 13, 1976; Closing Date: December 31, 1978. The project is proceeding according to schedule.

1249 Agricultural Research I Project: US$40.0 million loan of April 27, 1976; Effective Date: September 21, 1976; Closing Date: December 31, 1981. The project is proceeding according to schedule. Civil engineering for 21 experiment stations is well advanced.

1256 Araucaria Fertilizer Project: US$52 million loan of March 19, 1976; Effective Date: July 20, 1976; Closing Date: December 31, 1980. The project is proceeding according to schedule.

1257 COPEL Power Distribution Project: US$52.0 million loan of May 19, 1976; Effective Date: August 17, 1976; Closing Date: December 31, 1979. The project is proceeding according to schedule.

1309 Minas Gerais Water Supply and Sewerage Project Project II: US$40.0 million loan of August 27, 1976; Effective Date: January 18, 1977; Closing Date: September 30, 1980. Eighty-four sub-projects have been approved for this loan. The majority of them are in small communities under 5,000 inhabitants. Bank disbursements should begin in the fourth quarter of fiscal year 1977.

# BRAZIL

## SERGIPE NITROGEN FERTILIZER PROJECT

## LOAN AND PROJECT SUMMARY

**Borrower:** Petrobras Fertilizantes, S.A.

**Guarantor:** Federative Republic of Brazil

**Amount:** US$64 million equivalent

**Terms:** 15 years, including 4 years of grace, at 82% interest per annum. Fee of 1.8% payable to Guarantor.

**Project Description:** The project consists of the construction of an ammonia/urea plant at Laranjeiras, Sergipe, with a manufacturing capacity of 907 metric tons per day; an adjacent plant to manufacture urea, with a capacity of 1,100 metric tons per day; provision for bagging the entire urea output and facilities for storage and transportation of ammonia and urea.

**Estimated Cost:**

| | (US$ Million) | | | |
|---|---|---|---|---|
| | Foreign | Local | Total | % |
| Land and Civil Works | 2.6 | 20.2 | 22.8 | 12 |
| Equipment and Materials | 54.5 | 55.2 | 109.7 | 56 |
| Engineering and Licenses | 9.1 | 10.9 | 20.0 | 10 |
| Erection | 4.2 | 23.7 | 27.9 | 14 |
| Pre-Operating Expenses | - | 16.4 | 16.4 | 8 |
| Base Cost Estimates | 70.4 | 126.4 | 196.8 | 100 |
| Physical Contingencies (10.5%) | 6.1 | 11.0 | 17.1 | |
| Price Escalation (14%) | 7.8 | 21.4 | 29.2 | |
| Installed Cost | 84.3 | 158.8 | 243.1 | |
| Working Capital | - | 15.0 | 15.0 | |
| Interest During Construction | 17.6 | 7.7 | 25.3 | |
| Financing Required | 101.9 | 181.5 | 283.4 | |

(US$ Million)

Financing Plan:

| | |
|---|---|
| Equity contribution from PETROBRAS | 116 |
| BNDE | 71 |
| Foreign Private Lenders | 25 |
| IBRD | 64 |
| Loan from PETROBRAS | 7 |
| | 283 |

Estimated Disbursements:

| | US$ Million by Calendar Year | | | |
|---|---|---|---|---|
| | 1977 | 1978 | 1979 | 1980 |
| Annually | 3.7 | 25.3 | 26.0 | 9.0 |
| Cumulative | 3.7 | 29.0 | 55.0 | 64.0 |

Procurement Arrangements:

For goods to be financed under the proposed loan, procurement would follow Bank guidelines. The proceeds of the Bank loan would finance expenditures for: (a) equipment and materials procured through international competitive bidding (US$30 million), (b) imported technically specialized items with restricted bidders lists (US$13 million), (c) imported items and packages costing less than US$100,000 each procured through international shopping (US$12 million), and (d) foreign engineering and advisory services (US$9 million).

Technical Assistance:

PETROBRAS has engaged Pullman Kellogg (USA) for provision of process license, basic engineering design, procurement assistance, and technical advisory services relating to the ammonia unit and general site facilities, and Toyo Engineering Company (Japan) for provision of similar services and process license relating to the urea unit. Detailed engineering of the ammonia unit and general plant facilities will be done by Promon Engenharia S.A., a Brazilian firm under the supervision of Kellogg. Montreal Engenharia S.A., another Brazilian firm, will do the detailed engineering of the urea unit under the supervision of Toyo.

| | |
|---|---|
| Rate of Return: | The estimated economic rate of return is 17%. |
| Completion Date: | Project completion expected January 1, 1981. |
| Appraisal Report: | Report No. 1414-BR, dated January 31, 1977. |

ANNEX IV

# BRAZIL

## SERGIPE NITROGEN FERTILIZER PROJECT

## SUPPLEMENTARY PROJECT DATA SHEET

### Section I - Timetable of Key Events

(a) Time taken by country to prepare project: approximately 8 months (from October 1975 to June 1976).

(b) Project prepared by: Petroleo Brasiliero S.A. (PETROBRAS)

(c) First presentation to the Bank: May 1975

(d) Departure of Appraisal Mission: June 22, 1976

(e) Completion of Negotiations: March 11, 1977

(f) Planned Deadline for Effectiveness: August 15, 1977

### Section II - Special Bank Implementing Actions

None.

### Section III - Special Conditions

(a) As a condition for loan effectiveness, FERTILIZANTES would contract with various appropriate agencies, including PETROBRAS, agreements which would guarantee the supply of the raw materials and utilities required for successful operation of the project (paragraph 45);

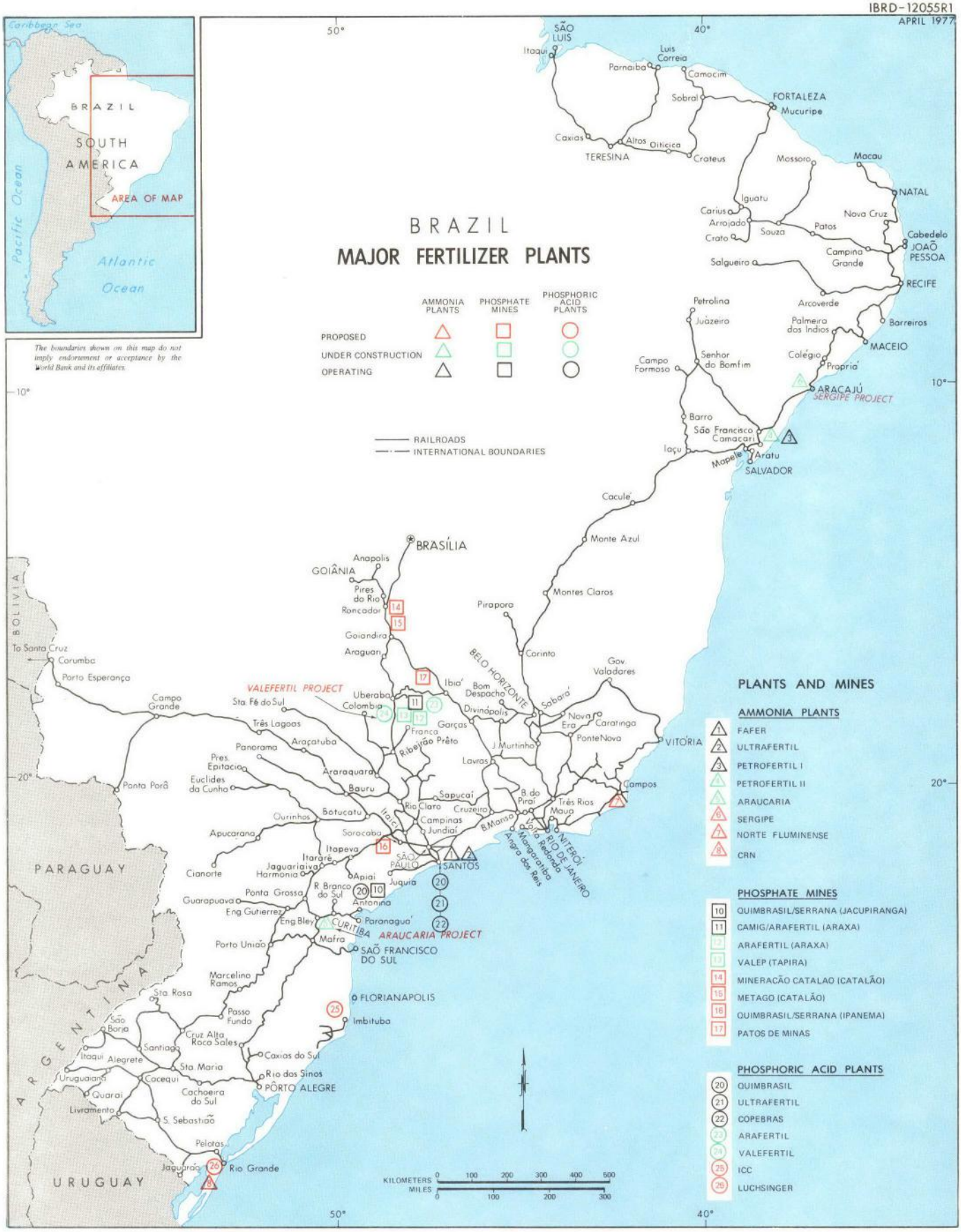
(b) The Government will exchange views with the Bank on the expansion and development of the fertilizer sector, including investment plans and import and pricing policies (paragraph 37);

(c) FERTILIZATES will furnish a report on the financial condition of its newly acquired subsidiary ULTRAFERTIL, and on its plans for improving its financial situation (see paragraphs 40 and 42)

(d) PETROBRAS will dedicate for the exclusive use of the project a sufficient supply of gas from its reserves to ensure its operation at full capacity for 15 years (see paragraph 45);

(e) the Government will not take any action with regard to the price of ammonia, urea and feedstock, that may prevent FERTILIZANTES from meeting its financial obligations (see paragraph 67).

IBRD-12055R1
APRIL 1977



LOAN AGREEMENT

WP#L-843-B/cg
Legal Department
CONFIDENTIAL DRAFT
(Subject to Change)
ARigo
July 5, 1979



LOAN NUMBER 1406 BR

# LOAN ASSUMPTION AGREEMENT

(Sergipe Fertilizer Project)

between

INTERNATIONAL BANK FOR RECONSTRUCTION
AND DEVELOPMENT

and

Fertilizantes Nitrogenados do Nordeste -
NITROFERTIL NE

Dated , 1979

WP#L-843-B(7170-A-2)

LOAN ASSUMPTION AGREEMENT

AGREEMENT, dated _____, 1979, between INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (hereinafter called the Bank) and FERTILIZANTES NITROGENADOS DO NORDESTE - NITROFERTIL NE (hereinafter called NITROFERTIL).

WHEREAS by a loan agreement (hereinafter called the Loan Agreement), dated April 29, 1977, between the Bank and Petrobras Fertilizantes S.A. - PETROFERTIL (hereinafter called PETROFERTIL), as amended, the Bank has made a loan (hereinafter called the Loan) to PETROFERTIL in an amount in various currencies equivalent to sixty-four million dollars ($64,000,000) on the terms and conditions set forth in the Loan Agreement;

WHEREAS by a guarantee agreement (hereinafter called the Guarantee Agreement), dated April 29, 1977, between the Federative Republic of Brazil (hereinafter called the Guarantor) and the Bank, the Guarantor has guaranteed the obligations of PETROFERTIL in the Loan Agreement contained, on the terms and conditions set forth in the Guarantee Agreement;

Whereas by a shareholder agreement (hereinafter called the Shareholder Agreement), dated April 29, 1977, between Petroleo Brasileiro S.A. (hereinafter called PETROBRAS) and the Bank, PETROBRAS has undertaken the obligations in the Shareholder Agreement contained;

WHEREAS PETROFERTIL has transferred all of its assets in respect of the project described in Schedule 2 to the Loan Agreement to NITROFERTIL, and PETROFERTIL, PETROBRAS and the Guarantor have requested the Bank to agree to the undertaking by NITROFERTIL of all of PETROFERTIL's covenants, agreements and obligations in the Loan Agreement contained and, for that purpose, to enter into this agreement and into the agreements described below with PETROFERTIL, PETROBRAS and the Guarantor;

WHEREAS PETROFERTIL owns 85.42% of the shares in the capital of NITROFERTIL and has agreed to undetake certain obligations to the Bank in respect of NITROFERTIL in a supplemental shareholder agreement (hereinafter called the Supplemental Shareholder Agreement) of even date herewith;

WHEREAS PETROBRAS has agreed to confirm its obligations in the Shareholder Agreement contained and to undertake certain additional obligations to the Bank in respect of PETROFERTIL in the Supplemental Shareholder Agreement;

WHEREAS the Guarantor has agreed to confirm its obligations in the Guarantee Agreement contained and to undertake certain additional obligations to the Bank in a supplemental guarantee agreement (hereinafter called the Supplemental Guarantee Agreement) of even date herewith, between the Guarantor and the Bank;

WHEREAS upon the basis, inter alia, of the foregoing the Bank and NITROFERTIL have agreed to enter into this agreement (hereinafter called the Loan Assumption Agreement) upon the terms and conditions hereinafter set forth;

NOW THEREFORE, it is hereby agreed as follows:

ARTICLE I

Particular Covenants of NITROFERTIL

Section 1.01. NITROFERTIL hereby assumes, and agrees to carry out and fulfill, all of the covenants, agreements and obligations of PETROFERTIL in the Loan Agreement contained, and the Bank hereby recognizes the succession of NITROFERTIL to the rights of PETROFERTIL under the Loan Agreement, all with the same effect as though ULTRAFERTIL were substituted for PETROFERTIL as a party to and Borrower under the Loan Agreement.

Section 1.02. NITROFERTIL acknowledges that all action taken under the Loan Agreement by PETROFERTIL shall be valid and binding on PETROFERTIL as though PETROFERTIL were PETROFERTIL and that the coming into effect of this Agreement shall not affect any right acquired or obligation incurred or the consequences of action taken or omitted to be taken by the Bank or PETROFERTIL under the Loan Agreement.

ARTICLE II

Effective Date

Section 2.01. (a) The Loan Assumption Agreement shall become effective on the date upon which the Bank dispatches to NITROFERTIL, PETROFERTIL, PETROBRAS and the Guarantor notice of its acceptance of evidence that: (i) the Loan Assumption Agreement has been registered with Banco Central do Brasil; and (ii) the execution and delivery of the Loan Assumption Agreement, the Supplemental Shareholder Agreement and the Supplemental Guarantee Agreement on behalf of the parties thereto have been duly authorized or ratified by all necessary governmental and corporate action.

(b) As part of such evidence, there shall be furnished to the Bank an opinion or opinions satisfactory to the Bank of counsel acceptable to the Bank showing: (i) on behalf of NITROFERTIL, that the Loan Assumption Agreement has been duly authorized or ratified, and executed and delivered on behalf of NITROFERTIL and is legally binding upon NITROFERTIL in accordance with its terms; (ii) on behalf of PETROBRAS and PETROFERTIL, that the Supplemental Shareholder Agreement has been duly authorized or ratified by, and executed and delivered on behalf of, PETROBRAS and PETROFERTIL and is legally binding upon PETROBRAS and PETROFERTIL in accordance with its terms; and (iii) on behalf of the Guarantor, that the Supplemental Guarantee Agreement has been duly authorized or ratified by and delivered on behalf of, the Guarantor and is legally binding upon the Guarantor in accordance with its terms.

ARTICLE III

Addresses

Section 3.01. The following addresses are specified for the purposes of any notice required or permitted to be given pursuant to this Agreement:

For the Bank:

International Bank for
Reconstruction and Development
1818 H Street, N.W.
Washington, D.C. 20433
United States of America

| Cable address: | Telex: |
|---|---|
| INTBAFRAD<br>Washington, D.C. | 440098 (ITT)<br>248423 (RCA) or<br>64145 (WUI) |

For NITROFERTIL:

Fertilizantes Nitrogenados
Do Nordeste - NITROFERTIL NE
_____
_____
_____

| Cable address: | Telex: |
|---|---|
| _____<br>_____ | _____<br>_____ |

IN WITNESS WHEREOF, the parties hereto, acting through their representatives thereunto duly authorized, have caused this Agreement to be signed in their respective names in the District of Columbia, United States of America, as of the day and year first above written.

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

By

FERTILIZANTES NITROGENADOS DO NORDESTE -
NITROFERTIL NE

By

Authorized Representative

CONFORMED COPY

LOAN NUMBER 1406 BR

# LOAN AGREEMENT

(Sergipe Fertilizer Project)

between

INTERNATIONAL BANK FOR RECONSTRUCTION
AND DEVELOPMENT

and

PETROBRÁS FERTILIZANTES S.A.

Dated April 29, 1977

LOAN AGREEMENT

AGREEMENT, dated April 29, 1977, between INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (hereinafter called the Bank) and PETROBRÁS FERTILIZANTES S.A. (hereinafter called the Borrower).

ARTICLE I

General Conditions; Definitions

Section 1.01. The parties to this Agreement accept all the provisions of the General Conditions Applicable to Loan and Guarantee Agreements of the Bank, dated March 15, 1974, with the same force and effect as if they were fully set forth herein (said General Conditions Applicable to Loan and Guarantee Agreements of the Bank being hereinafter called the General Conditions).

Section 1.02. Wherever used in this Agreement, unless the context otherwise requires, the several terms defined in the General Conditions have the respective meanings therein set forth and the following additional terms have the following meanings:

(a) "PETROBRÁS means Petróleo Brasileiro S.A.

(b) "PETROBRÁS Shareholder Agreement" means the agreement of even date herewith between the Bank and PETROBRÁS whereby PETROBRÁS agrees, inter alia, to undertake certain obligations in respect of the provisions of funds to the Borrower for the Project.

(c) "Subsidiary" means any company of which a majority of the outstanding voting stock or other proprietary interest is owned or effectively controlled by the Borrower or by any one or more subsidiaries of the Borrower or by the Borrower and one or more of its subsidiaries.

(d) "Estatutos" means the estatutos set forth in the escritura de constituição da Sociedade Petrobrás Fertilizantes S.A. dated March 24, 1976, as amended to the date of this Agreement.

ARTICLE II

The Loan

Section 2.01. The Bank agrees to lend to the Borrower, on the terms and conditions in the Loan Agreement set forth or referred to, an amount in various currencies equivalent to sixty-four million dollars ($64,000,000).

Section 2.02. (a) The amount of the Loan may be withdrawn from the Loan Account in accordance with the provisions of Schedule 1 to this Agreement, as such Schedule may be amended from time to time by agreement between the Borrower and the Bank, for expenditures made (or, if the Bank shall so agree, to be made) in respect of the reasonable cost of goods and services required for the Project described in Schedule 2 to this Agreement and to be financed out of the proceeds of the Loan.

Section 2.03. Except as the Bank shall otherwise agree, contracts for the purchase of goods to be financed out of the proceeds of the Loan, shall be procured in accordance with the provisions of Schedule 4 to this Agreement.

Section 2.04. The Closing Date shall be November 30, 1981 or such later date as the Bank shall establish. The Bank shall promptly notify the Borrower and the Guarantor of such later date.

Section 2.05. The Borrower shall pay to the Bank a commitment charge at the rate of three-fourths of one per cent (3/4 of 1%) per annum on the principal amount of the Loan not withdrawn from time to time.

Section 2.06. The Borrower shall pay interest at the rate of eight and two-tenths per cent (8.20%) per annum on the principal amount of the Loan withdrawn and outstanding from time to time.

Section 2.07. Interest and other charges shall be payable semi-annually on June 1 and December 1 in each year.

Section 2.08. The Borrower shall repay the principal amount of the Loan in accordance with the amortization schedule set forth in Schedule 3 to this Agreement.

ARTICLE III

Execution of the Project

Section 3.01. The Borrower shall carry out the Project with due diligence and efficiency and in conformity with sound engineering, financial and administrative practices.

Section 3.02. The Borrower shall take all reasonable measures to ensure that the execution and operation of the Project are carried out with due regard to ecological and environmental factors, and, to that end, the Borrower shall monitor and treat effectively the ecologically harmful discharge from the Project facilities.

Section 3.03. (a) The Borrower undertakes to insure, or make adequate provision for the insurance of, the imported goods to be financed out of the proceeds of the Loan against hazards incident to the acquisition, transportation and delivery thereof to the place of use or installation, and for such insurance any indemnity shall be payable in a currency freely usable by the Borrower to replace or repair such goods.

(b) Except as the Bank shall otherwise agree, the Borrower shall cause all goods and services financed out of the proceeds of the Loan to be used exclusively for the Project.

Section 3.04. The Borrower shall furnish to the Bank, promptly upon request, the plans, specifications, reports, contract documents and work and procurement schedules for the Project, and any material modifications thereof or additions thereto, in such detail as the Bank shall reasonably request.

Section 3.05. (a) The Borrower: (i) shall maintain records adequate to reflect the progress and cost of the Project and to identify the goods and services financed out of the proceeds of the Loan, and to disclose their use in the Project; (ii) shall, without limitation upon the provisions of paragraph (b) of this Section, enable the Bank's representatives to visit the facilities and construction sites included in the Project and to examine the goods financed out of the proceeds of the Loan and any relevant records and documents; and (iii) shall furnish to the Bank all such information as the Bank shall reasonably request concerning the Project, the expenditure of the proceeds of the Loan and the goods and services financed out of such proceeds.

(b) The Borrower shall enable the Bank's representatives to visit all plants, installations, sites, works, buildings, property and equipment of the Borrower, and shall furnish to the Bank all such information relating thereto as the Bank shall reasonably request.

## ARTICLE IV

### Management and Operations of the Borrower

Section 4.01. (a) The Borrower shall at all times manage its affairs, carry out its operations, plan the development of its business and undertaking and maintain its financial position, all in accordance with sound industrial, financial and administrative practices under the supervision of qualified and experienced management.

(b) The Borrower shall: (i) operate and maintain its plants, equipment, properties and facilities and shall, from time to time, promptly as needed, make all necessary renewals and repairs thereof, all in accordance with sound engineering practices; and (ii) not sell, lease, transfer or otherwise dispose of any of its properties or assets required for the efficient carrying out of its business and undertaking, including the carrying out of the Project, except in the normal course of its business or with the prior agreement of the Bank.

Section 4.02. The Borrower shall at all times take all steps necessary: (i) to maintain its right to carry on its operations, including the Project; and (ii) to acquire and retain such land and properties, and to acquire, maintain and renew such licenses, consents, franchises and other rights, as may be necessary or useful for the construction and operation of the Project and the conduct of its business and undertaking.

Section 4.03. The Borrower shall take out and maintain with responsible insurers, insurance against such risks and in such amounts as shall be consistent with sound industrial insurance practice.

Section 4.04. The Borrower shall inform the Bank before establishing or acquiring any Subsidiary or making any substantial financial commitment in or with regard to any Subsidiary.

Section 4.05. The Borrower shall, by March 31, 1978, furnish to the Bank a detailed plan, satisfactory to the Bank, to recruit and train the staff required to operate the facilities included in the Project, and shall thereafter carry out such plan.

Section 4.06. The Borrower shall, by August 31, 1977, cause to be furnished to the Bank a report on the financial condition of Industria e Comercio de Fertilizantes, S.A. and on its plans for improving the latter's financial results.

ARTICLE V

Financial Covenants

Section 5.01. The Borrower shall maintain records adequate to reflect in accordance with consistently maintained sound accounting practices its operations and financial condition, and, separately, the operations and financial condition of the Project. For the latter purpose, except as the Bank and the Borrower shall agree, the Borrower shall maintain records reflecting separately the income, cash flow, and pro-forma balance sheet accounts for such facilities, as if they were separate profit centers.

Section 5.02. (a) The Borrower shall: (i) have its accounts and financial statements (balance sheets, statements of income and expenses and related statements), including the accounts required by Section 5.01 in respect of the Project, for each fiscal year audited, in accordance with sound auditing principles consistently applied, by independent auditors acceptable to the Bank; (ii) furnish to the Bank as soon as available, but in any case not later than four months after the end of each such year, beginning with the fiscal year ending December 31, 1976, (A) certified copies of its financial statements for such year as so audited and (B) the report of such audit by said auditors, of such scope and in such detail as the Bank shall have reasonably requested; and (iii) furnish to the Bank such other information concerning the

accounts and financial statements of the Borrower and the audit thereof as the Bank shall from time to time reasonably request.

(b) The Borrower shall furnish to the Bank, as soon as available but in any case not later than four months after the end of each fiscal year of the Borrower, consolidated financial statements, prepared as in paragraph (a) of this Section provided, covering the Borrower's operations and the operations of its Subsidiaries during that fiscal year.

Section 5.03. (a) The Borrower represents that at the date of this Agreement no lien exists on any of its assets as security for any debt.

(b) The Borrower undertakes that, except as the Bank shall otherwise agree, if the Borrower shall create any lien, or if any statutory lien shall be created, on any assets of the Borrower as security for any debt, the Borrower shall forthwith create, at no cost to the Bank, an equivalent lien, satisfactory to the Bank, to secure the payment of the principal of, and interest and other charges on, the Loan; provided, however that the foregoing provisions of this paragraph shall not apply to: (A) any lien created on property, at the time of purchase thereof, solely as security for the payment of the purchase price of such property; or (B) any lien arising in the ordinary course of banking transactions and securing a debt maturing not more than one year after the date on which it is originally incurred.

Section 5.04. Except as the Bank shall otherwise agree, the Borrower:

(a) shall not purchase, redeem or otherwise acquire for value any shares in the Borrower's capital;

(b) (i) shall at all times after the completion of the Project, maintain, in respect of the operations of the Borrower and separately in respect of the operations of the Project, a ratio of current assets to current liabilities of not less than 1.2:1, and (ii) shall not pay dividends (other than dividends payable in shares in the Borrower's capital or dividends on the preferred shares of the Borrower issued in accordance with the Estatutos), or prepay any loans other than the Loan, or prepay part of the outstanding amount of the Loan or make any other cash distribution, or make any financial commitment in or with regard to any Subsidiary, if after any such payment or commitment such ratio would be smaller than 1.5:1;

(c) shall at all times after the completion of the Project, maintain, in respect of the operations of the Borrower and separately in respect of the operations of the Project, a debt/equity ratio not greater than 60:40; and

(d) shall not incur any debt if after the incurrence thereof its projected debt service coverage ratio, in respect of the operations of the Borrower and separately in respect of the

operations of the Project, would fall below 1.5 for any fiscal year after the completion of the Project, including the debt to be incurred.

For purposes of this Section:

(i) "debt" means any debt incurred by the Borrower and maturing more than one year after the date on which it is originally incurred;

(ii) debt shall be deemed to be incurred (1) under a loan contract or agreement, on the date it is drawn down but only to the extent that it is outstanding, and (2) under a guarantee agreement, on the date such agreement is entered into;

(iii) "debt service coverage ratio" means the ratio between the reasonably estimated net revenues for any fiscal year and the aggregate amount of amortization (including sinking fund payments, if any) of, and interest and other charges on, debt payable in the same fiscal year;

(iv) "equity" means the sum of the Borrower's unimpaired paid-in share capital, surplus and free reserves; provided, however, that there shall be excluded therefrom such items as shall represent equity interests of the Borrower in any Subsidiary or of any Subsidiary in the Borrower or in any other Subsidiary;

(v) "net revenues" means gross revenues from all sources less all operating and administrative expenses, and amounts paid or to be paid within the year on account of taxes; provided that the operating and administrative expenses shall not include interest and other charges on debt, and provision for depreciation of assets;

(vi) "current assets" includes cash, accounts receivable due within twelve months, less an appropriate reserve for bad debts, prepaid expenses, and inventories and all other assets (excluding spare parts), which could in the ordinary course of business, be converted within twelve months into cash;

(vii) "current liabilities" includes accounts payable within twelve months, customer advances, amounts due for income taxes, dividends, bonuses and all other liabilities due and payable, or which could be called for payment, within twelve months; and

(viii) whenever it shall be necessary to value in terms of the currency of the Guarantor obligations denominated in another currency, such valuation shall be made using the rates of exchange provided by the Banco Central do Brasil.

Section 5.05. The Borrower shall furnish to the Bank, every year starting on July 1, 1977, its financial projections for the following five years, for all of the Borrower and, separately, for each of its industrial units.

Section 5.06. The Borrower shall punctually pay to the Guarantor the fee referred to in the Preamble to the Guarantee Agreement.

Section 5.07. The Borrower shall take all measures required on its part to obtain: (i) a loan in the currency of the Guarantor, from Banco Nacional do Desenvolvimento Econômico or any other source, in an amount equivalent to not less than $71,000,000, to be repaid in about 15 years, with a grace period of about 4-1/2 years, for purposes of the Project; and (ii) within six months after the date of this Agreement, such untied credit in foreign exchange in such aggregate amount, currently estimated to be $25,000,000 equivalent, as shall be required for purposes of the Project.

ARTICLE VI

Remedies of the Bank

Section 6.01. For the purposes of Section 6.02 of the General Conditions, the following additional events are specified pursuant to paragraph (k) thereof:

(a) a change shall have been made in the Estatutos which shall materially and adversely affect the carrying out of the Project or the operations or financial condition of the Borrower;

(b) PETROBRÁS shall have failed to perform any of its obligations under the PETROBRÁS Shareholder Agreement; and

(c) the right of the Borrower to utilize the funds provided under the PETROBRÁS Shareholder Agreement shall have been suspended or cancelled, in whole or in part.

Section 6.02. For the purposes of Section 7.01 of the General Conditions, the following events are specified pursuant to paragraph (h) thereof:

(a) any of the events specified in Section 6.01 of this Agreement shall occur and shall continue for a period of 60 days after notice thereof shall have been given by the Bank to the Borrower; and

(b) any debt for money borrowed by the Borrower with an original maturity of one year or more shall have become due and payable before its agreed maturity in accordance with the terms thereof.

ARTICLE VII

Effective Date; Termination

Section 7.01. The following events are specified as additional conditions to the effectiveness of the Loan Agreement within the meaning of Section 12.01 (c) of the General Conditions:

(a) this Agreement has been duly registered by Banco Central do Brasil;

(b) the execution and delivery of the PETROBRÁS Shareholder Agreement on behalf of PETROBRÁS have been duly authorized or ratified by all necessary corporate and governmental action; and

(c) the Borrower has made arrangements satisfactory to the Bank with appropriate enterprises for the supply of natural gas, vacuum gas oil, Bunker C fuel oil, electricity and water to ensure the timely availability of such supplies in sufficient quantity and of appropriate quality for the full utilization of the facilities included in the Project.

Section 7.02. The following are specified as additional matters, within the meaning of Section 12.02 (c) of the General Conditions, to be included in the opinion or opinions to be furnished to the Bank:

(a) that this Agreement has been duly registered by Banco Central do Brasil;

(b) on behalf of PETROBRÁS, that the PETROBRÁS Shareholder Agreement has been duly authorized or ratified by all corporate and governmental action, and is legally binding upon PETROBRÁS in accordance with its term; and

(c) that all necessary acts, consents and approvals to be performed or given by the Guarantor, its political subdivisions or agencies, or otherwise to be performed or given in order to authorize the carrying out of the Project and to enable the Borrower to perform all of the obligations of the Borrower in this Agreement contained (including the obligations thereof relating to procurement of goods for the Project) together with all necessary powers and rights in connection therewith, have been duly and validly performed or given and that no other such acts, consents or approval are required in order to authorize the carrying out of the Project and to enable the Borrower to perform all of the obligations of the Borrower in this Agreement contained.

Section 7.03. The date August 1, 1977, is hereby specified for the purpose of Section 12.04 of the General Conditions.

ARTICLE VIII

Addresses

Section 8.01. The following addresses are specified for the purposes of Section 11.01 of the General Conditions:

For the Bank:

International Bank for
Reconstruction and Development
1818 H Street, N.W.
Washington, D.C. 20433
United States of America

Cable address:

INTBAFRAD
Washington, D.C.

Telex:

440098 (ITT)
248423 (RCA) or
64145 (WUI)

For the Borrower:

Petrobrás Fertilizantes S.A.
Praça Pio X, 119
Rio de Janeiro, RJ 20000
Brazil

Cable address:

PETROBRÁS
Rio de Janeiro

IN WITNESS WHEREOF, the parties hereto, acting through their representatives thereunto duly authorized, have caused this Agreement to be signed in their respective names in the District of Columbia, United States of America, as of the day and year first above written.

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

By /s/ A. Krieger

Regional Vice President
Latin America and the Caribbean

PETROBRÁS FERTILIZANTES S.A.

By /s/ P.V. Belotti

Authorized Representative

SCHEDULE 1

Withdrawal of the Proceeds of the Loan

1. The table below sets forth the Categories of items to be financed out of the proceeds of the Loan, the allocation of the amounts of the Loan to each Category and the percentage of expenditures for items so to be financed in each Category:

| Category | Amount of the Loan Allocated (Expressed in Dollar Equivalent) | % of Expenditures to be Financed |
|---|---|---|
| (1) Equipment, railcars, spare parts, and materials | 50,000,000 | 100% of foreign expenditures or 100% of the ex-factory cost of goods manufactured in Brazil |
| (2) Foreign engineering services | 9,100,000 | 100% of foreign expenditures |
| (3) Unallocated | 4,900,000 | |
| TOTAL | 64,000,000 | |

2. For the purposes of this Schedule the term "foreign expenditures" means expenditures in the currency of any country other than the Guarantor and for goods or services supplied from the territory of any country other than the Guarantor.

3. The disbursement percentages have been calculated in compliance with the policy of the Bank that no proceeds of the Loan shall be disbursed on account of payments for taxes levied by, or in the territory of, the Borrower on goods or services, or on the importation, manufacture, procurement or supply thereof; to that end, if the amount of any such taxes levied on or in respect of any item to be financed out of the proceeds of the Loan decreases or increases, the Bank may, by notice to the Borrower, increase or decrease the disbursement percentage then applicable to such item as required to be consistent with the aforementioned policy of the Bank.

4. Notwithstanding the provisions of paragraph 1 above, no withdrawals shall be made in respect of payments made for expenditures prior to the date of this Agreement except that withdrawals, in an aggregate amount not exceeding the equivalent of $1,500,000 may be made on account of payments made for such expenditures before that date but after April 1, 1977.

5. Notwithstanding the allocation of an amount of the Loan or the disbursement percentages set forth in the table in paragraph 1 above, if the Bank has reasonably estimated that the amount of the Loan then allocated to any Category will be insufficient to finance the agreed percentage of all expenditures in that Category, the Bank may, by notice to the Borrower, reallocate to such Category, to the extent required to meet the estimated shortfall, proceeds of the Loan which are then allocated to another Category and which in the opinion of the Bank are not needed to meet other expenditures.

6. If the Bank shall have reasonably determined that the procurement of any item in any Category is inconsistent with the procedures set forth or referred to in this Agreement, no expenditures for such item shall be financed out of the proceeds of the Loan and the Bank may, without in any way restricting or limiting any other right, power or remedy of the Bank under the Loan Agreement, by notice to the Borrower, cancel such amount of the Loan as, in the Bank's reasonable opinion, represents the amount of such expenditures which would otherwise have been eligible for financing out of the proceeds of the Loan.

SCHEDULE 2

Description of the Project

The Project consists in the construction of an ammonia plant at Laranjeiras, Sergipe, with a manufacturing capacity of about 907 metric tons per day, a urea plant with a capacity of about 1,100 metric tons per day, and all related ancillary facilities.

The Project includes facilities for the storage and transportation of ammonia and for the bagging, storage and transportation of urea.

* * *

The Project is expected to be completed by January 1, 1981, and will be deemed to have been completed only when the facilities included in it shall have been in satisfactory operation for not less than sixty consecutive days at an average production rate of not less than 80% of their respective designed capacities.

SCHEDULE 3

Amortization Schedule

| Date Payment Due | Payment of Principal (expressed in dollars)* |
|---|---|
| On each June 1 and December 1 beginning December 1, 1981 through December 1, 1991 | 2,910,000 |
| On June 1, 1992 | 2,890,000 |

* To the extent that any portion of the Loan is repayable in a currency other than dollars (see General Conditions, Section 4.02), the figures in this column represent dollar equivalents determined as for purposes of withdrawal.

Premiums on Prepayment

The following percentages are specified as the premiums payable on repayment in advance of maturity of any portion of the principal amount of the Loan pursuant to Section 3.05 (b) of the General Conditions:

| Time of Prepayment | Premium |
|---|---|
| Not more than three years before maturity | 1.65% |
| More than three years but not more than six years before maturity | 3.30% |
| More than six years but not more than eleven years before maturity | 6.00% |
| More than eleven years but not more than thirteen years before maturity | 7.10% |
| More than thirteen years before maturity | 8.20% |

SCHEDULE 4

Procurement

A. International Competitive Bidding

Except as provided in Part B hereof, contracts for the purchase of goods shall be procured in accordance with procedures consistent with those set forth in the "Guidelines for Procurement under World Bank Loans and IDA Credits" published by the Bank in August 1975 (hereinafter called the Guidelines), on the basis of international competitive bidding as described in Part A of the Guidelines.

B. Other Procurement Procedures; Critical and Small Items

1. The Borrower may procure:

(i) such critical and highly specialized equipment required for the timely execution of the project as the Bank and the Borrower shall agree, after obtaining bids from a reasonable number of suppliers acceptable to the Bank; provided that the aggregate cost of the items so procured does not exceed the equivalent of $13,000,000.

(ii) imported equipment and materials estimated to cost less than $100,000 equivalent each, after obtaining quotations from a reasonable number of

suppliers from different member countries of the Bank (including Switzerland); provided that the aggregate cost of items so procured does not exceed the equivalent of $12,000,000.

2. The manufacturer of the ammonia converter and urea reactor for the Project shall be acceptable to the Bank and the arrangements for the manufacture thereof shall be satisfactory to the Bank.

C. Evaluation and Comparison of Bids for Goods; Preference for Domestic Manufacturers

1. For the purpose of evaluation and comparison of bids for the supply of goods: (i) bidders shall be required to state in their bid the f.o.b. (port of shipment) and the c.i.f. (port of entry) price for imported goods, or the ex-factory price for domestically manufactured goods; and (ii) customs duties and other import taxes on imported goods, including merchant fleet renewal and port improvement taxes, and sales and similar taxes on domestically supplied goods, shall be excluded.

2. Goods manufactured in Brazil may be granted a margin of preference in accordance with, and subject to, the following provisions:

(a) All bidding documents for the procurement of goods shall clearly indicate any preference which will be granted, the information required to establish the eligibility of a bid for

such preference and the following methods and stages that will be followed in the evaluation and comparison of bids.

(b) After evaluation, responsive bids will be classified in one of the following two groups:

(1) Group A: bids offering goods manufactured in Brazil if the bidder shall have established to the satisfaction of the Borrower and the Bank that such goods contain components manufactured in Brazil equal to at least 50% of the value of the complete goods.

(2) Group B: bids offering any other goods.

(c) All evaluated bids in each group shall be first compared among themselves, excluding any customs duties and other import taxes (including merchant fleet renewal and port improvement taxes) on goods to be imported and any sales or similar taxes on goods to be supplied domestically, to determine the lowest evaluated bid of each group. The lowest evaluated bid of each group shall then be compared with each other, and if, as a result of this comparison, a bid from group A is the lowest, it shall be selected for the award.

(d) If, as a result of the comparison under paragraph (c) above, the lowest bid is a bid from group B, all group B bids shall be further compared with the lowest evaluated bid from group

A after adding: (1) to the c.i.f. bid price of goods in each group B bid, an amount equal to the smaller of (i) the amount of customs duties and other import taxes which a non-exempt importer would have to pay for the importation of the goods offered in such group B bid, or (ii) 15% of the c.i.f. bid price of such goods; and (2) to the ex-factory bid price of goods supplied domestically offered in each group B bid, an amount equal to the smaller of (i) the amount of customs duties and other import taxes which would be levied on the goods offered in such group B bid if they originated from the same foreign country as the goods included in the group B bid which is subject to the lowest customs duties and other import taxes, or (ii) 15% of the ex-factory bid price of such goods. If, as a result of this comparison, the bid from group A is the lowest, it shall be selected for the purpose of award; if not, lowest evaluated bid from group B, as determined under paragraph (c) above, shall be selected for purposes of award.

D. Review of Procurement Decisions by the Bank

1. The Borrower shall, before initiating procurement of equipment, including the preparation of the list of suppliers, inform the Bank in detail of the procedures (including advertising procedures) to be followed, and shall introduce such modifications in said procedures as the Bank shall reasonably request. The list of bidders, together with a statement of their qualifications and

of the reasons for the exclusion of any applicant shall be furnished by the Borrower to the Bank for comments before the applicants are notified, and the Borrower shall make such additions to, deletions from, or modifications in, the said list as the Bank shall reasonably request.

2. Review of invitations to bid and of proposed awards and final contracts:

With respect to all contracts estimated to cost the equivalent of $300,000 or more:

(a) Before bids are invited, the Borrower shall furnish to the Bank, for its comments, the text of the invitations to bid and the specifications and other bidding documents, and shall make such modifications in the said documents or procedures as the Bank shall reasonably request. Any further modification to the bidding documents shall require the Bank's concurrence before it is issued to the prospective bidders.

(b) After bids have been received and evaluated, the Borrower shall, before a final decision on the award is made, inform the Bank of the name of the bidder to which it intends to award the contract and shall furnish to the Bank, in sufficient time for its review, a detailed report on the evaluation and comparison of the bids received, and such other information as the Bank shall reasonably request. The Bank shall, if it determines that the

intended award would be inconsistent with the Guidelines or this Schedule, promptly inform the Borrower and state the reasons for such determination.

(c) The terms and conditions of the contract shall not, without the Bank's concurrence, materially differ from those on which bids were asked.

(d) Two conformed copies of the contract shall be furnished to the Bank promptly after its execution and prior to the delivery to the Bank of the first application for withdrawal of funds from the Loan Account in respect of such contract.

3. With respect to each contract to be financed out of the proceeds of the Loan and not governed by the preceding paragraph, the Borrower shall furnish to the Bank, promptly after its execution and prior to delivering to the Bank the first application for withdrawal of funds from the Loan Account in respect of such contract, two conformed copies of such contract, together with the analysis of the respective bids, recommendations for award and such other information as the Bank shall reasonably request. The Bank shall, if it determines that the award of the contract was not consistent with the Guidelines or this Schedule, promptly inform the Borrower and state the reasons for such determination.

4. For bid comparison purposes there shall be used the rates of exchange provided by the Banco Central do Brasil.

GUARANTEE AGREEMENT

WP#L-843-A/cg
Legal Department
CONFIDENTIAL DRAFT
(Subject to Change)
ARigo
July 5, 1979



LOAN NUMBER 1406 BR

# SUPPLEMENTAL GUARANTEE AGREEMENT

(Sergipe Fertilizer Project)

between

FEDERATIVE REPUBLIC OF BRAZIL

and

INTERNATIONAL BANK FOR RECONSTRUCTION
AND DEVELOPMENT

Dated , 1979

WP#L-843-A(7171-A-2)

SUPPLEMENTAL GUARANTEE AGREEMENT

AGREEMENT, dated , 1979, between FEDERATIVE REPUBLIC OF BRAZIL (hereinafter called the Guarantor) and INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (hereinafter called the Bank).

WHEREAS by an agreement (hereinafter called the Loan Assumption Agreement) of even date herewith between the Bank and Fertilizantes Nitrogenados do Nordeste NITROFERTIL NE (hereinafter called NITROFERTIL), the Bank recognizes the succession of ULTRAFERTIL to the rights and obligations of Petrobras Fertilizantes S.A. - PETROFERTIL (hereinafter called PETROFERTIL) under the loan agreement, dated April 29, 1977, between the Bank and PETROFERTIL, as amended, on the conditions set forth in the Loan Assumption Agreement, but only on condition that:

(A) PETROBRAS confirm its obligations in the Shareholder Agreement contained;

(B) PETROBRAS and PETROFERTIL agree to undertake certain obligations to the Bank; and

(C) the Guarantor agree to confirm, maintain and supplement its guarantee undertaken in the guarantee agreement (hereinafter called the Guarantee Agreement), dated April 29, 1977, between the Guarantor and the Bank;

WHEREAS PETROFERTIL owns 85.42% in the share capital of ULTRAFERTIL and PETROBRAS, and PETROFERTIL have agreed to confirm and undertake, as the case may be, said obligations under a supplemental shareholder agreement (hereinafter called the Supplemental Shareholder Agreement) of even date herewith, between the Bank and PETROBRAS and PETROFERTIL;

WHEREAS the Guarantor, in consideration of the Bank's entering into the Loan Assumption Agreement and the Supplemental Shareholder Agreement, has agreed to confirm, maintain and supplement such guarantee;

NOW THEREFORE the parties hereby agree as follows:

Section 1. For the purposes of the Guarantee Agreement, the Guarantor hereby approves the Loan Assumption Agreement and Supplemental Shareholder Agreement and agrees and confirms that the Guarantee Agreement, as supplemented herein, shall remain in full force and effect.

Section 2. The Guarantor shall cause PETROBRAS and PETROFERTIL to perform, punctually, all of their respective obligations under the Supplemental Shareholder Agreement.

Section 3. The Supplemental Guarantee Agreement shall come into force and effect on the date on which the Loan Assumption Agreement becomes effective.

IN WITNESS WHEREOF, the parties hereto, acting through their representatives thereunto duly authorized, have caused this Agreement to be signed in their respective names in the District of Columbia, United States of America, as of the day and year first above written.

FEDERATIVE REPUBLIC OF BRAZIL

By

Authorized Representative

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

By

WP#L-843-A/cg
Legal Department
CONFIDENTIAL DRAFT
(Subject to Change)
ARigo
July 5, 1979

LOAN NUMBER 1406 BR

# SUPPLEMENTAL GUARANTEE AGREEMENT

(Sergipe Fertilizer Project)

between

FEDERATIVE REPUBLIC OF BRAZIL

and

INTERNATIONAL BANK FOR RECONSTRUCTION
AND DEVELOPMENT

Dated , 1979

WP#L-843-A(7171-A-2)

SUPPLEMENTAL GUARANTEE AGREEMENT

AGREEMENT, dated , 1979, between FEDERATIVE REPUBLIC OF BRAZIL (hereinafter called the Guarantor) and INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (hereinafter called the Bank).

WHEREAS by an agreement (hereinafter called the Loan Assumption Agreement) of even date herewith between the Bank and Fertilizantes Nitrogenados do Nordeste NITROFERTIL NE (hereinafter called NITROFERTIL), the Bank recognizes the succession of ULTRAFERTIL to the rights and obligations of Petrobras Fertilizantes S.A. - PETROFERTIL (hereinafter called PETROFERTIL) under the loan agreement, dated April 29, 1977, between the Bank and PETROFERTIL, as amended, on the conditions set forth in the Loan Assumption Agreement, but only on condition that:

(A) PETROBRAS confirm its obligations in the Shareholder Agreement contained;

(B) PETROBRAS and PETROFERTIL agree to undertake certain obligations to the Bank; and

(C) the Guarantor agree to confirm, maintain and supplement its guarantee undertaken in the guarantee agreement (hereinafter called the Guarantee Agreement), dated April 29, 1977, between the Guarantor and the Bank;

WHEREAS PETROFERTIL owns 85.42% in the share capital of ULTRAFERTIL and PETROBRAS, and PETROFERTIL have agreed to confirm and undertake, as the case may be, said obligations under a supplemental shareholder agreement (hereinafter called the Supplemental Shareholder Agreement) of even date herewith, between the Bank and PETROBRAS and PETROFERTIL;

WHEREAS the Guarantor, in consideration of the Bank's entering into the Loan Assumption Agreement and the Supplemental Shareholder Agreement, has agreed to confirm, maintain and supplement such guarantee;

NOW THEREFORE the parties hereby agree as follows:

Section 1. For the purposes of the Guarantee Agreement, the Guarantor hereby approves the Loan Assumption Agreement and Supplemental Shareholder Agreement and agrees and confirms that the Guarantee Agreement, as supplemented herein, shall remain in full force and effect.

Section 2. The Guarantor shall cause PETROBRAS and PETROFERTIL to perform, punctually, all of their respective obligations under the Supplemental Shareholder Agreement.

Section 3. The Supplemental Guarantee Agreement shall come into force and effect on the date on which the Loan Assumption Agreement becomes effective.

IN WITNESS WHEREOF, the parties hereto, acting through their representatives thereunto duly authorized, have caused this Agreement to be signed in their respective names in the District of Columbia, United States of America, as of the day and year first above written.

FEDERATIVE REPUBLIC OF BRAZIL

By

Authorized Representative

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

By

CONFORMED COPY

LOAN NUMBER 1406 BR

# GUARANTEE AGREEMENT

(Sergipe Fertilizer Project)

between

FEDERATIVE REPUBLIC OF BRAZIL

and

INTERNATIONAL BANK FOR RECONSTRUCTION
AND DEVELOPMENT

Dated April 29, 1977

GUARANTEE AGREEMENT

AGREEMENT, dated April 29, 1977, between FEDERATIVE REPUBLIC OF BRAZIL (hereinafter called the Guarantor) and INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (hereinafter called the Bank).

WHEREAS by the Loan Agreement of even date herewith between the Bank and Petrobrás Fertilizantes S.A. (hereinafter called the Borrower) the Bank has agreed to make to the Borrower a loan in various currencies equivalent to sixty-four million dollars ($64,000,000), on the terms and conditions set forth in the Loan Agreement, but only on condition that the Guarantor agree to guarantee the obligations of the Borrower in respect of such loan as hereinafter provided; and

WHEREAS the Guarantor, in consideration of the Bank's entering into the Loan Agreement with the Borrower and of the Borrower's agreement to pay to the Guarantor a fee of 1.8% per annum of the equivalent in the currency of the Guarantor on the disbursed and outstanding balance of the Loan, has agreed so to guarantee such obligations of the Borrower;

NOW THEREFORE the parties hereto hereby agree as follows:

ARTICLE I

General Conditions; Definitions

Section 1.01. The parties to this Agreement accept all the provisions of the General Conditions Applicable to Loan and Guarantee Agreements of the Bank dated March 15, 1974, with the same force and effect as if they were fully set forth herein (said General Conditions Applicable to Loan and Guarantee Agreements being hereinafter called the General Conditions).

Section 1.02. Wherever used in this Agreement, unless the context otherwise requires, the several terms defined in the General Conditions and in Section 1.02 of the Loan Agreement have the respective meanings therein set forth.

ARTICLE II

Guarantee; Provision of Funds

Section 2.01. Without limitation or restriction upon any of its other obligations under the Guarantee Agreement, the Guarantor hereby unconditionally guarantees, as primary obligor and not as surety merely, the due and punctual payment of the principal of, and interest and other charges on, the Loan, and the premium, if any, on the prepayment of the Loan and the punctual performance of all the other obligations of the Borrower, all as set forth in the Loan Agreement.

Section 2.02. The Guarantor undertakes, whenever there is reasonable cause to believe that the funds available to the Borrower, including those provided pursuant to the Petrobrás Shareholder Agreement, will be inadequate to meet the estimated expenditures required for the timely carrying out of the Project, to make arrangements, satisfactory to the Bank, promptly to provide the Borrower or cause the Borrower to be provided with such funds as are needed to meet such expenditures.

ARTICLE III

Other Covenants

Section 3.01. The Guarantor shall take or cause to be taken all reasonable action required for the prompt issuance of such import and other permits and licenses as shall be necessary for the acquisition and importation of the goods and services required for the carrying out of the Project.

Section 3.02. The Guarantor shall cause PETROBRÁS punctually to perform all its obligations under the PETROBRÁS Shareholder Agreement.

Section 3.03. The Guarantor shall not take or permit to be taken any action with regard to the price of either raw materials used by the productive facilities included in the Project or of ammonia and urea that may prevent the Borrower, operating efficiently, from covering all its costs, servicing its debt, and earning a reasonable return on its invested capital.

Section 3.04. The Guarantor shall maintain the Bank informed regarding the expansion and development of the fertilizer sector, including investment plans and pricing policies, and shall afford the Bank a reasonable opportunity to exchange views on these matters.

Section 3.05. (a) It is the policy of the Bank, in making loans to, or with the guarantee of, its members not to seek, in normal circumstances, specific security from the member concerned but to ensure that no other external debt shall have priority over its loans in the allocation, realization or distribution of foreign exchange held under the control or for the benefit of such member. To that end, if any lien shall be created on any public assets (as hereinafter defined), as security for any external debt, which will or might result in a priority for the benefit of the creditor of such external debt in the allocation, realization or distribution of foreign exchange, such lien shall, unless the Bank shall otherwise agree, ipso facto and at no cost to the Bank, equally and ratably secure the principal of, and interest and other charges on, the Loan, and the Guarantor, in creating or permitting the creation of such lien, shall make express provision to that effect; provided, however, that, if for any constitutional or other legal reason such provision cannot be made with respect to any lien created on assets of any of its political or administrative subdivisions, the Guarantor shall promptly and at no cost to the Bank secure the principal of, and interest and other charges on, the Loan by an equivalent lien on other public assets satisfactory to the Bank.

(b) The foregoing undertaking shall not apply to: (i) any lien created on property, at the time of purchase thereof, solely as security for payment of the purchase price of such property; and (ii) any lien arising in the ordinary course of banking transactions and securing a debt maturing not more than one year after its date.

(c) As used in this Section, the term "public assets" means assets of the Guarantor, of any political or administrative sub-division thereof and of any entity owned or controlled by, or operating for the account or benefit of, the Guarantor or any such subdivision, including gold and other foreign exchange assets held by any institution performing the functions of a central bank or exchange stabilization fund, or similar functions, for the Guarantor.

ARTICLE IV

Representative of the Guarantor; Addresses

Section 4.01. The Minister of Finance of the Guarantor is designated as representative of the Guarantor for the purposes of Section 11.03 of the General Conditions.

Section 4.02. The following addresses are specified for the purposes of Section 11.01 of the General Conditions:

For the Guarantor:

Ministério da Fazenda
Edifício Ministério da Fazenda
Esplanada dos Ministérios
Brasilia, D.F. Brazil

Cable address:

Minifaz
Brasilia

For the Bank:

International Bank for
Reconstruction and Development
1818 H Street, N.W.
Washington, D.C. 20433
United States of America

| Cable address: | Telex: |
| --- | --- |
| INTBAFRAD<br>Washington, D.C. | 440098 (ITT)<br>248423 (RCA) or<br>64145 (WUI) |

IN WITNESS WHEREOF, the parties hereto, acting through their representatives thereunto duly authorized, have caused this Agreement to be signed in their respective names in the District of Columbia, United States of America, as of the day and year first above written.

FEDERATIVE REPUBLIC OF BRAZIL

By /s/ M.H. Simonsen
Authorized Representative

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

By /s/ A. Krieger
Regional Vice President
Latin America and the Caribbean

SHAREHOLDER AGREEMENT

WP#L-843-C/cg
Legal Department
CONFIDENTIAL DRAFT
(Subject to Change)
ARigp
July 5, 1979



LOAN NUMBER 1406 BR

# SUPPLEMENTAL SHAREHOLDER AGREEMENT

(Sergipe Fertilizer Project)

between

INTERNATIONAL BANK FOR RECONSTRUCTION
AND DEVELOPMENT

and

PETROLEO BRASILEIRO S.A. - PETROBRAS

and

PETROBRAS FERTILIZANTES S.A. - PETROFERTIL

Dated , 1979

WP#L-843-C(7169-A-2)

SUPPLEMENTAL SHAREHOLDER AGREEMENT

AGREEMENT, dated , 1979, between INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (hereinafter called the Bank) and PETROLEO BRASILEIRO S.A. - PETROBRAS (hereinafter called PETROBRAS) AND PETROBRAS FERTILIZANTES S.A. - PETROFERTIL (hereinafter called PETROFERTIL).

WHEREAS by a loan agreement (hereinafter called the Loan Agreement), dated April 29, 1977, between the Bank and PETROFERTIL, as amended, the Bank has made a loan (hereinafter called the Loan) to PETROFERTIL in an amount in various currencies equivalent to sixty-four million dollars ($64,000,000), on the terms and conditions set forth in the Loan Agreement;

WHEREAS by a guarantee agreement (hereinafter called the Guarantee Agreement), dated April 29, 1977, between the Federative Republic of Brazil (hereinafter called the Guarantor) and the Bank, the Guarantor has guaranteed the obligations of PETROFERTIL in the Loan Agreement contained, on the terms and conditions set forth in the Guarantee Agreement;

WHEREAS by a shareholder agreement (hereinafter called the Shareholder Agreement), dated April 29, 1977, between the Bank and Petroleo Brasileiro S.A. - PETROBRAS (hereinafter called PETROBRAS), PETROBRAS has undertaken the obligations in the Shareholder Agreement contained;

WHEREAS PETROFERTIL has transferred all of its assets in respect of the project described in Schedule 2 to the Loan Agreement (hereinafter called the Project) to NITROFERTIL, and PETROFERTIL, PETROBRAS and the Guarantor have requested the Bank to agree to the undertaking by NITROFERTIL of all of PETROFERTIL's covenants, agreements and obligations in the Loan Agreement contained;

WHEREAS the Bank has agreed to such request on condition that:

(a) PETROBRAS confirm its obligations in the Shareholder Agreement contained;

(b) PETROBRAS and PETROFERTIL agree to undertake certain obligations to the Bank; and

(c) the Guarantor agree to confirm its obligations in the Guarantee Agreement contained and to undertake certain additional obligations to the Bank;

WHEREAS the Guarantor has agreed to confirm its obligations in the Guarantee Agreement contained and to undertake certain additional obligations to the Bank under a supplemental guarantee agreement of even date herewith between the Guarantor and the Bank;

WHEREAS upon the basis, inter alia, of the foregoing the Bank and PETROBRAS and PETROFERTIL have agreed to enter into this Agreement upon the terms and conditions hereinafter set forth;

NOW THEREFORE, it is hereby agreed as follows:

ARTICLE I

Particular Covenants of PETROBRAS

Section 1.01. For the purposes of the Shareholder Agreement, PETROBRAS hereby approves the Loan Assumption Agreement and agrees and confirms that the Shareholder Agreement, as supplemented herein, shall remain in full force and effect.

Section 1.02. PETROBRAS shall cause PETROFERTIL to perform all of the obligations of PETROFERTIL under Article II of this Agreement.

ARTICLE II

Particular Covenants of PETROFERTIL

Section 2.01. (a) PETROFERTIL shall exercise every power, right and recourse available to it to cause NITROFERTIL to perform all of the obligations assumed by NITROFERTIL under the Loan Assumption Agreement, and shall not take, and shall use its best efforts to prevent others from taking, any action which would prevent or interfere with such performance.

(b) The Bank and PETROFERTIL shall cooperate fully to assure that the purposes of the Loan will be accomplished. To that end, the Bank and PETROFERTIL shall: (i) from time to time, at the request of either of them, furnish to the other party all such information as such party shall reasonably request; and (ii) inform each other of any condition which interferes with, or threatens to interfere with, the progress of the Project, the accomplishment of the purposes of the Loan or the performance of the obligations referred to in paragraph (a) thereof.

ARTICLE II

Effectiveness

Section 3.01. This Agreement shall come into force and effect on the date upon which the Loan Assumption Agreement becomes effective.

ARTICLE IV

Addresses

Section 4.01. The following addresses are specified for the purposes of any notice required or permitted to be given pursuant to this Agreement:

For the Bank:

International Bank for
Reconstruction and Development
1818 H Street, N.W.
Washington, D.C. 20433
United States of America

Cable address: INTBAFRAD
Washington, D.C.

Telex: 440098 (ITT)
248423 (RCA) or
64145 (WUI)

For PETROBRAS:

_____
_____
_____
_____

Cable address: _____
_____

Telex: _____
_____

For PETROFERTIL:

Petrobras Fertilizantes S.A.
Praça Mahatma Gandhi, 14-40º andar
Rio de Janerio, RJ 20000
Brazil

Cable address: PETROBRAS
Rio de Janerio

Telex: 2123880

IN WITNESS WHEREOF, the parties hereto, acting through their representatives thereunto duly authorized, have caused this Agreement to be signed in their respective names in the District of Columbia, United States of America, as of the day and year first above written.

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

By

PETROLEO BRASILEIRO S.A. - PETROBRAS

By
Authorized Representative

PETROBRAS FERTILIZANTES S.A.

By
Authorized Representative

Black Book

DRAFT

PETROLEO BRASILEIRO S.A.

International Bank for
Reconstruction and Development
1818 H Street, N.W.
Washington, D.C. 20433

Re: Loan No. -BR
(Sergipe Fertilizer Project)
Section 4 of the Petrobrás
Shareholder Agreement

Dear Sirs:

With reference to Section 4 of the Petrobrás Shareholder Agreement between us of even date herewith, we wish to confirm the following:

1. During not less than 20 years we will dedicate to Petrobrás Fertilizantes S.A., for purposes of the operation of the productive facilities included in the Project, not less than 3.1 billion normal cubic meters of natural gas with a hydrocarbon content of not less than 95% by volume, from our proven reserves of such gas.

2. We will maintain the current offshore and onshore drilling rig activity in the States of Sergipe and Alagoas to the extent necessary to ensure that current proven gas reserves be maintained at satisfactory levels in relation to the amount of gas still dedicated to the Project, taking into account all other supply commitments, if any.

3. Up to and following full development of all oil and gas fields in the States of Sergipe and Alagoas confine utilization of gas (other than for the Project), including sales to third parties, within levels consistent with the maintenance of an adequate surplus of proven reserves over and above the net amount of gas remaining dedicated to the Project.

4. We will immediately shut in and conserve until start-up of the Productive facilities included in the Project the non-associated gas deposits contained within the Furado and Sao Miguel dos Campos fields, with current proven reserves of 2.7 billion normal cubic meters, and thereafter maintain such reserves (less the quantity supplied to the said productive facilities from other sources) for the exclusive use of such facilities.

5. We will provide Petrobrás Fertilizantes S.A., every six months or more often, with updated reports of reserves of associated and non-associated gas by fields, and summaries of gas production and utilization reports for the period covered.

6. We will enable accredited representatives of the Bank and/or of Petrobrás Fertilizantes S.A. to inspect from time to time the above mentioned gas fields operations and records related thereto, and we will inform the Bank and/or Petrobrás Fertilizantes S.A. of any condition which interferes or threatens to interfere with the above.

Sincerely,

PETROLEO BRASILEIRO, S.A.

By_____
Authorized Representative

CONFORMED COPY

LOAN NUMBER 1406 BR

# PETROBRÁS SHAREHOLDER AGREEMENT

(Sergipe Fertilizer Project)

between

INTERNATIONAL BANK FOR RECONSTRUCTION
AND DEVELOPMENT

and

PETRÓLEO BRASILEIRO S.A.

Dated April 29, 1977

PETROBRÁS SHAREHOLDER AGREEMENT

AGREEMENT, dated April 29, 1977, between INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (hereinafter called the Bank) and PETRÓLEO BRASILEIRO S.A. (hereinafter called PETROBRÁS).

WHEREAS (A) by the Loan Agreement of even date herewith between the Bank and Petrobrás Fertilizantes S.A. (hereinafter called the Borower) the Bank has agreed to make to the Borrower a loan in various currencies equivalent to sixty-four million dollars ($64,000,000), on the terms and conditions set forth in the Loan Agreement, but only on condition that PETROBRÁS agree to undertake certain obligations to the Bank as hereinafter provided;

(B) PETROBRÁS owns the majority of the voting shares in the capital of the Borrower.

(C) PETROBRÁS agrees that the project described in Schedule 2 to the Loan Agreement is of paramount importance to the development plans of Brazil and that, for the purpose of carrying out and operating such Project, inter alia, PETROBRÁS has established the Borrower and will contribute additional resources to the Borrower; and

(D) PETROBRÁS, in consideration of the Bank's entering into the Loan Agreement with the Borrower, has agreed to undertake the obligations hereinafter provided;

NOW THEREFORE the parties hereto hereby agree as follows:

Section 1. Whenever used in this Agreement, unless the context otherwise requires, the several terms defined in the General Conditions, as defined in the Loan Agreement, and in Section 1.02 of the Loan Agreement have the respective meanings therein set forth.

Section 2. PETROBRÁS shall exercise every power, right, and recourse available to it to cause the Borrower to perform all its obligations under the Loan Agreement, and shall not take, and shall use its best efforts to prevent others from taking, any action which would prevent or interfere with such performance.

Section 3. Except as the Bank shall otherwise agree, PETROBRÁS shall:

(a) provide sufficient funds to the Borrower either in the form of loans or as payment for shares in the Borrower's capital, as required to enable the Borower: (i) to carry out the Project in accordance with the provisions of the Loan Agreement, and (ii) to obtain, on the date of completion of the Project, a debt/equity ratio and a current ratio (as defined in Section 5.04 of the Loan Agreement) not greater than 60:40 and not lower than 1.2:1, respectively; and

(b) without limitation or restriction upon the provisions of paragraph (a) hereof: (i) assist the Borrower in obtaining such untied credit in foreign exchange in such aggregate

amount, currently estimated to be $25,000,000 equivalent, as shall be required for purposes of the Project; and (ii) assist the Borrower in obtaining a loan in the currency of the Guarantor, from Banco Nacional do Desenvolvimento Econômico or any other source, in an amount equivalent to not less than $71,000,000, to be repaid in about 15 years, with a grace period of about 4-1/2 years, for purposes of the Project; and

(c) refinance any repayment of principal of any credits or loans that otherwise would become payable by the Borrower before the completion of the Project.

Section 4. PETROBRÁS shall:

(a) supply natural gas to the Borrower in sufficient quantity and of appropriate quality, as required for the full utilization of the facilities included in the Project;

(b) construct the facilities required to supply such gas at the site of such facilities; and

(c) dedicate 3.1 billion cubic meters of natural gas from its fields in the States of Sergipe and Alagoas exclusively for purposes of (a) above.

Section 5. The Bank and PETROBRÁS shall cooperate fully to assure that the purposes of the Loan will be accomplished. To that end, the Bank and PETROBRÁS shall:

(a) from time to time, at the request of either of them, furnish to the other party all such information as such party shall reasonably request; and

(b) inform each other of any condition which interferes with, or threatens to interfere with, the progress of the Project, the accomplishment of the purposes of the Loan or the performance of the obligations referred to in paragraph (a) hereof.

Section 6. This Agreement shall come into force and effect on the Effective Date, and shall terminate on the date the Loan Agreement shall terminate.

Section 7. The following addresses are specified for the purposes of any notice required or permitted to be given pursuant to this Agreement:

For PETROBRÁS:

Petróleo Brasileiro S.A.
Avenida Chile, 65
Rio de Janeiro, RJ 20000
Brazil

Cable address: PETROBRÁS
Rio de Janeiro

Telex: (021)22573

For the Bank:

International Bank for
Reconstruction and Development
1818 H Street, N.W.
Washington, D.C. 20433
United States of America

Cable address:

INTBAFRAD
Washington, D.C.

Telex:

440098 (ITT)
248423 (RCA) or
64145 (WUI)

IN WITNESS WHEREOF, the parties hereto, acting through their representatives thereunto duly authorized, have caused this Agreement to be signed in their respective names in the District of Columbia, United States of America, as of the day and year first above written.

INTERNATIONAL BANK FOR
RECONSTRUCTION AND DEVELOPMENT

By /s/ A. Krieger
Regional Vice President
Latin America and the Caribbean

PETRÓLEO BRASILEIRO S.A.

By /s/ P.V. Belotti
Authorized Representative

YELLOW COVER

WORLD BANK / INTERNATIONAL FINANCE CORPORATION

Black Book (with Yellow Cover Report)

# OFFICE MEMORANDUM

TO: Mr. S. M. L. van der Meer, Director, LAC Projects (Through Mr. H. Fuchs, Director, Industrial Projects)

DATE: January 7, 1977

FROM: Chauncey F. Dewey, Chief, Division III, Industrial Projects

SUBJECT: BRAZIL - Sergipe Fertilizer Project
Transmission of Yellow Cover Appraisal Report

A. General

1. The Draft Appraisal Report (Yellow Cover) for the Sergipe Fertilizer Project is attached. The report recommends a Bank loan of US$70 million.

2. The following timetable is suggested:

| | |
|---|---|
| January 7, 1977 | Yellow Cover Report Circulated |
| January 14, 1977 | Approval of CPS and Regional Projects Director |

3. Questions and comments should be addressed to Mr. N. Petry (extension 6804) and, if written, a copy should be sent to the Regional Projects Director's office.

B. Main Points

4. The project itself, similar to many other ammonia/urea fertilizer projects we have done, presents no major problems. The main points to note, involving availability of gas, capital costs, financing plan and sector development, are the following:

Availability of Gas

5. As indicated in the report (para 4.02), PETROBRAS has determined total gas reserves of the offshore and onshore deposits as being adequate for the project. The Bank has asked a consultant to audit PETROBRAS' estimate which was done in Brazil during December 1976. Preliminary results from the consultant's audit indicate that sufficient gas should be available to the project. During the week of January 17, 1977, the consultant will be in Washington to discuss his findings with us in detail. Before going to the Loan Committee, we will therefore definitively know what the status of gas availability is. Also, as indicated in the report (para 4.03), the conclusion of a gas dedication agreement between PETROBRAS and FERTILIZANTES will be a condition of Board presentation.

Capital Costs

6. During the week of January 3, 1977, representatives from PETROBRAS and FERTILIZANTES were here in Washington to review with us the capital cost estimate in detail. This review, which requires some more work, principally by the Brazilians, during the next three weeks indicates that the total financing requirements are likely to be about US$14 million or about 5%

higher than shown in the report. This increase is mainly caused by higher local costs because of an additional project management charge by PETROBRAS to FERTILIZANTES of about US$17 million equivalent and by an additional US$5 million equivalent expected increase in other local costs. At the same time, the foreign costs, mainly for equipment and materials, have come down by about US$8 million. This increase will not importantly affect the financial and economic viability of the project. As agreed to by the Government, FERTILIZANTES and the Bank, the capital cost estimate for equipment and materials is based on reserving 60% of its value for Brazilian procurement while the other 40% will be procured internationally in accordance with the Bank's procurement guidelines. The Bank will also assure that the equipment reserved for local procurement will be manufactured by technically acceptable Brazilian suppliers.

Advanced Contracting and Retroactive Financing

7. Engineering contracts with the two foreign (Kellogg, Toyo) and two local (Promon, Montreal) engineering firms, which are acceptable to the Bank, have been signed at the beginning of November 1976. These contracts constitute a commitment of an estimated US$15 million of which about US$4 million will have been expended by the time of Board presentation scheduled for late March or early April. Advance contracting for materials and equipment is not expected to exceed US$4 million of which only about US$0.5 million would have been spent before Board presentation. The report therefore recommends US$4.5 million in retroactive financing.

Financing of Local Engineering Services

8. In line with what we have done in the past, we recommend financing of local engineering services as a means to encourage the transfer of technology and to support the development of the Brazilian engineering industry. We are aware of Mr. Knapp's ruling that Bank financing of these services should not be included in this project. We have therefore indicated (para 5.11) that the proposed Bank loan would have to be reduced to about US$69 million, if the Bank indeed decides not to finance the local engineering services, despite the fact that they are closely linked with the foreign engineering services and will allow a highly desirable transfer of technology to Brazil. We would like to have an opportunity to review this matter again with the Loan Committee to obtain clear guidance as to whether the decision to avoid financing of local engineering services--a decision which appears to be contrary to the sentiments expressed in the recent Problem Projects Review Meeting and differs from recent practice in this Department--is to apply specifically to Brazil or generally. We need this guidance in particular since we expect this point to be brought up during negotiations by the Brazilians who know that the Bank did finance local engineering services in the recent Araucaria fertilizer project.

Proposed Bank Loan Amount

9. Based on the total amount of items at present considered eligible for Bank financing (including local engineering services of US$5.6 million but excluding foreign exchange of interest during construction of about US$18 million) as presented in the Yellow Cover Report is about US$74.7 million. Thus the proposed Bank loan of US$70 million would not cover an estimated US$4.7 million of equipment and materials which could be financed by the Bank. The Program Department has therefore recommended that the loan amount be made equal to the total estimated amount of items eligible for Bank financing, i.e. either US$75 million if it is decided to finance local engineering services or US$69 million if these services are not to be financed. The Bank loan in such a case would still not exceed the total direct and indirect foreign exchange costs (excluding the indirect foreign exchange of the items on the reserve list) of the project estimated at US$85 million. However, as a result of the capital cost review, mentioned in para 6, it now appears that, because of an overall reduction in the costs of equipment and materials, the amount of items eligible for Bank financing could be about US$5 million lower than the amounts mentioned in the Yellow Cover.

Cofinancing

10. The financing plan includes additional foreign funds (US$25 million) from a cofinancing arrangement either with a commercial bank or with private institutional investors in the US. For the also Bank-financed Araucaria project, FERTILIZANTES has started to negotiate with the Bank of America a cofinancing arrangement totalling US$25 million. Whether FERTILIZANTES will conclude a similar arrangement for this project or will go to the institutional investor's market depends on market conditions at the time FERTILIZANTES will try to obtain these funds. If, for reasons beyond FERTILIZANTES' control, this financing is not forthcoming, it will be PETROBRAS' (FERTILIZANTES' parent company) responsibility to supply these funds and any other funds that might be required to complete the project. An assurance to that effect will be sought from PETROBRAS during negotiations.

Market and Marketing

11. As was indicated already in the Araucaria appraisal report, information regarding the fertilizer sector is incomplete in Brazil, and the results of the market and marketing study, which is now being executed, are not yet available. However, because of the large potential increase in fertilizer consumption in Brazil and the Government's active support policies of the agricultural and fertilizer sectors, there is only a small risk that the market for this project, which was foreseen by and included in the analysis of the Araucaria appraisal report, will not materialize as expected.

cc: Messrs. van der Tak (8), Fuchs, Kalmanoff, Moore, Thadani, Cash, Sheldrick, Soncini, Glaessner, McClure, Wiese, Skillings, Mirza, Knight, Hughes, Aguirre, Wyss, Scandizzo, Newman, Uhlig, Mole, Cabezas, Plant (IFC), Tixhon, Perram, Evans, Brown, Loos, Carpio, Petry

NPetry:siv

WORLD BANK / INTERNATIONAL FINANCE CORPORATION

Blank Book
Chart already filed

# OFFICE MEMORANDUM

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cc: Messrs. van der Tak (8), Fuchs, Kalmanoff, Moore, Thadani, Cash, Sheldrick, Soncini, Glaessner, McClure, Wiese, Skillings, Mirza, Knight, Hughes, Aguirre, Wyss, Scandizzo, Newman, Uhlig, Mole, Cabezas, Plant (IFC), Tixhon, Perram, Evans, Brown, Loos, Carpio, Petry

NPetry:siv

Document of

# The World Bank

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**DRAFT**
**CONFIDENTIAL**

**Report No.** 1414-BR

BRAZIL

APPRAISAL OF THE SERGIPE

FERTILIZER PROJECT

January 7, 1977

INDUSTRIAL PROJECTS DEPARTMENT

Report approved by: (Division) III

(Originating Department) Industrial Projects

(Other Concerned Department) _____

Report prepared by: N. Petry

Figures checked by: D. Carpio & P. Liétard

Date: 1/7/77

Industrial Projects Department

## CURRENCY EQUIVALENTS

Except where otherwise indicated, all figures are quoted in Brazilian Cruzeiros (Cr$) and US $ (Exchange Rate as of June 30, 1976):

| | |
|---|---|
| Cr$1.0 | = US$0.0928 |
| Cr$10.78 | = US$1.00 |
| Cr$1,000,000 | = US$92,800 |

## WEIGHTS AND MEASURES

All weights and measures are in metric units except as noted:

| | |
|---|---|
| 1 Metric Ton (t) | = 1,000 Kilograms (kg) |
| 1 Metric Ton (t) | = 2,204 Pounds |
| 1 Kilometer (km) | = 0.62 Miles |
| 1 Hectare (ha) | = 2.47 Acres |
| 1 Cubic Meter($NM^3$) | = 6.19 Barrels |

## PRINCIPAL ABBREVIATIONS AND ACRONYMS USED

| | |
|---|---|
| ANDA | Associacao Nacional para Diffusao Adubos |
| BNDE | Banco Nacional do Desenvolvimento Economico |
| COFEN | Construccion de Fertilizantes Nitrogenados |
| DAP | Diammonium Phosphate |
| Fafer | Fabrica de Fertilizantes S.A. |
| FERTILIZANTES | Petrobras Fertilizantes S.A., the Company |
| K | Potash |
| $K_2O$ | Potassium Oxide Content in Fertilizers |
| MAP | Monoammonium Phosphate |
| N | Nitrogen |
| NFP | National Fertilizer Program |
| P | Phosphate |
| PETROBRAS | Petroleo Brasileiro S.A. |
| Petrofertil | Petrobras Quimica Fertilizantes S.A. |
| PETROQUISA | Petrobras Quimica S.A. |
| $P_2O_5$ | Phosphate Content in Fertilizers |
| RFFSA | Rede Ferroviaria Federal S.A. |
| TPD | Tons (Metric) Per Day |
| TPY | Tons (Metric) Per Year |
| Ultrafertil | Industria e Commercio de Fertilizantes S.A. |

## Brazilian Fiscal Year

January 1 - December 31

# BRAZIL - SERGIPE FERTILIZER PROJECT

## ECONOMIC COST AND BENEFIT STREAMS

| Year | Capital Costs | Operating Costs | Comparative Transportation Costs | Economic Value of Output | Net Benefit |
|---|---|---|---|---|---|
| 1 1977 | 16.6 | - | - | - | -16.60 |
| 2 | 35.2 | - | - | - | -35.20 |
| 3 | 69.2 | - | - | - | -69.20 |
| 4 | 37.2 | - | - | - | -37.20 |
| 5 1981 | - | 26.6 | 1.80 | 59.1 | 30.70 |
| 6 | - | 29.0 | 2.00 | 67.6 | 36.60 |
| 7 | - | 31.5 | 2.00 | 76.0 | 42.50 |
| 8 | - | 31.5 | 1.40 | 76.0 | 43.10 |
| 9 | - | 31.5 | .96 | 76.0 | 43.54 |
| 10-15 | - | 31.50 | .96 | 76.0 | 43.54 |
| 16 1992 | -19.3 | 31.50 | .96 | 76.0 | 62.84 |

Economic Rate of Return: 18.0

## SENSITIVITY TESTS ON ECONOMIC RATE OF RETURN

| | Economic Rate of Return | | | | |
|---|---|---|---|---|---|
| Economic Product Prices | -20% | -10% | Base Case | +10% | +20% |
| Costs: | | | | | |
| a) Base Case | 10.7 | 14.6 | 18.0 | 21.1 | 24.0 |
| b) Capital Costs down 10% | 9.3 | 13.0 | 16.3 | 19.3 | 22.0 |
| c) Capital Costs up 10% | 12.3 | 16.4 | 20.0 | 23.2 | 26.3 |
| d) Operating Costs down 10% | 8.9 | 13.0 | 16.6 | 19.7 | 22.8 |
| e) Operating Costs up 10% | 12.4 | 16.0 | 19.4 | 22.3 | 25.2 |
| f) Capacity Utilization down 10% | 8.5 | 12.3 | 15.6 | 18.6 | 21.4 |
| g) Delay of Completion (½ year) | 9.0 | 13.1 | 16.7 | 19.8 | 22.9 |
| h) Base Case, but use of Natural Gas assumed instead of Vacuum Gas Oil | 12.2 | 15.9 | 19.1 | 22.2 | 25.0 |
| i) Base Case without Shadow Exchange Rate | 5.3 | 9.4 | 12.9 | 16.0 | 18.9 |
| j) Growth Rate of Fertilizer Demand in the Northeast Down 50% | 10.3 | 14.1 | 17.5 | 20.5 | 23.3 |

Industrial Projects Department
December 1976

IBRD-12054
MARCH 1976

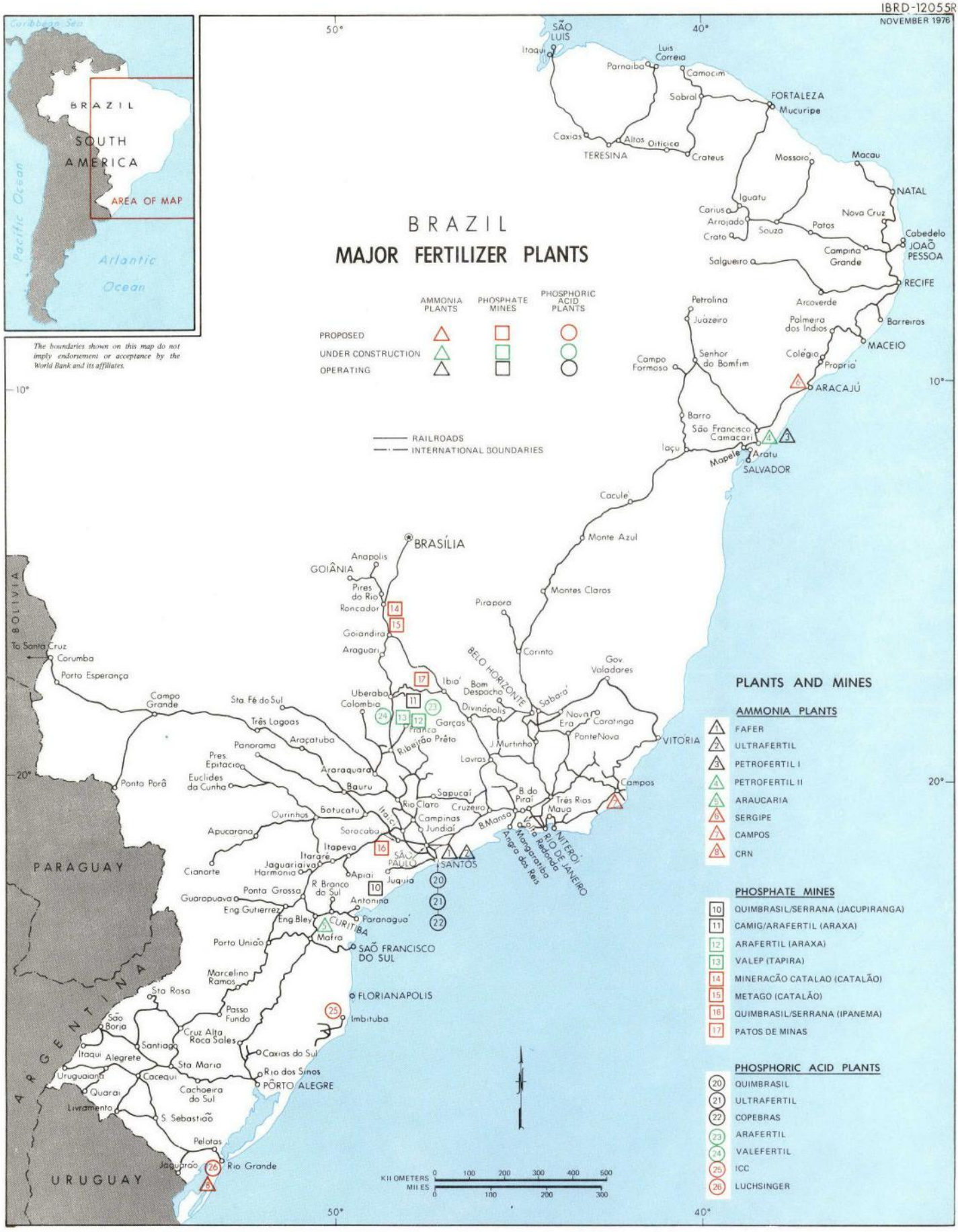
# BRAZIL
## FERTILIZER MARKETING REGIONS

National capitals
Natural region boundaries
State boundaries
International boundaries
Rivers

0 100 200 300 400 500 600 700 800
KILOMETERS
0 100 200 300 400 500
MILES

The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.

IBRD-12055R
NOVEMBER 1976



BRAZIL

# PHYSIOGRAPHIC ZONES AND FERTILIZER USE IN NORTHEAST REGION


*The boundaries shown on this map do not imply endorsement or acceptance by the World Bank and its affiliates.*

PARÁ
MARANHÃO
PIAUÍ
CEARÁ
RIO GRANDE DO NORTE
PARAIBA
PERNAMBUCO
ALAGOAS
SERGIPE
BAHIA
GOIÁS
MINAS GERAIS
FEDERAL DISTRICT
BRASILIA
ESPIRITO SANTO

São Luis
Fortaleza
Natal
João Pessôa
Recife
Maceió
Aracajú
Salvador

ARAGUAYA RIVER
TOCANTINS RIVER
PARANAIBA RIVER
SÃO FRANCISCO RIVER

ATLANTIC OCEAN

Fertilized Areas
- From 50 to 200 Hectares
- From 201 to 1000 Hectares
- More than 1000 Hectares

Physiographic Zones:
- Zona de Mata (Humid Littoral Zone)
- Agreste (Semi-Arid Transition Zones)
- Sertão (Semi-Arid Interior)
- Middle North (Transition to Amazon)
- Fertile Spots (Humid Valleys & Highlands
- Cerrado (Savanna Área)

- Rivers
- State Boundaries
- Disputed Boundaries between Ceara´ & Piaui´
- International Boundaries

0 50 100 150 200 250 300
KILOMETERS

IBRD 12412
SEPTEMBER 1976

Notice of Intention
to Negotiate/
Status of
Negotiations

International Bank for Reconstruction and Development

SecM77-187

FROM: The Secretary

March 15, 1977

STATUS OF NEGOTIATIONS

BRAZIL - FERTILIZER II - SERGIPE (AMMONIA) PROJECT

Negotiations have been substantially completed and loan documents will be submitted to the Executive Directors for consideration on a date to be determined.

The following is a description of the proposed loan:

| | |
|---|---|
| Borrower: | Petrobras Fertilizantes S.A. |
| Guarantor: | Federative Republic of Brazil |
| Amount: | US$64.0 million |
| Interest Rate: | Standard |
| Commitment Charge: | Standard |
| Term: | 15 years, including 4 years of grace |
| Purpose: | The Project consists of the construction of an ammonia plant at Laranjeiras, Sergipe, with a manufacturing capacity of about 907 metric tons per day and a urea plant with a manufacturing capacity of about 1100 metric tons per day, and all related ancillary facilities. It also includes facilities for the storage and transportation of ammonia and for the bagging, storage and transportation of urea. |

Distribution:

Executive Directors and Alternates
President
Senior Vice President, Operations
Executive Vice President and Vice Presidents, IFC
President's Council
Directors and Department Heads, Bank and IFC

Loan Committee/
V.P. Memoranda

WORLD BANK / INTERNATIONAL FINANCE CORPORATION

Black Book

# OFFICE MEMORANDUM

TO: Mr. Chauncey E. Dewey

DATE: July 30, 1976

FROM: Geoffrey Evans, Kurt Loos and Neithard Petry

SUBJECT: BRAZIL - Sergipe Fertilizer Project
Appraisal
Issues Paper

1. In accordance with our terms of reference, we visited Brazil between June 28 and July 22, 1976, to appraise the above project. A list of organizations visited and people met is attached as Annex 1.

The Project

2. The project involves the construction of a 907 MTD (1000 short tons per day) ammonia plant and an 1100 MTD urea plant on a grass-roots, 100 hectare site at Laranjeiras some 19 km northwest of Aracaju in the State of Sergipe. The owner of the project will be Petrobras Fertilizantes (Brasfertil), a 100% owned subsidiary of Petrobras, the national petroleum company of Brazil. The project will use natural gas as feedstock which will be supplied from the offshore and onshore gas and oil fields of the states of Alagoas and Sergipe. A gas collection and distribution system will be built by Petrobras independently of the project. Additional requirements of raw materials, vacuum gas oil and Bunker C fuel oil will be supplied from a liquid product storage terminal to be constructed by Petrobras adjacent to the plant site to serve the entire Aracaju area.

3. For supply of the required water, Brasfertil had planned to dam the Jacarecica river about 12 km northwest of the plant site to form a reservoir of about 9 million cubic meter storage capacity to be linked to the project by a pipeline. Recently, however, the Government has asked Petrobras to study the feasibility of installing a water pipeline between the San Francisco river and the city of Aracaju to meet the latter's fresh water requirements. If such a pipeline is indeed feasible, Brasfertil could meet its water requirements from this pipeline and would not have to dam the Jacarecica river which would result in lower water costs to the fertilizer plant. A decision on this is expected by the end of August this year.

4. The project site is served by the existing road Aracaju-Maceio and by the existing Salvador-Aracaju-Maceio railway passing within approximately 5 km. To meet the transport requirements of the project, Brasfertil has initiated discussions with RFFSA (the Federal railroad company) and tentative agreement has been reached that Brasfertil would finance the necessary railroad extension to link the project site to the main line and that Brasfertil would purchase and own the ammonia and bulk urea cars. Brasfertil would recover this investment through reduced tariffs. RFFSA would supply all the remaining rolling stock (locomotives and box cars for ~~bulk~~ urea).

BACACK

5. The preappraisal report on this project pointed out that the incremental railway transport requirements would be quite substantial and that a consultant had been asked to evaluate the railway system in the northeast. The consultant visited Brazil in June and his report indicates that the capacities of the lines should be sufficient and that, with some changes in the operations and the maintenance of the track, the system should allow Brasfertil to reliabily move its raw materials and finished products at an acceptable speed. The consultant's report has been made available to Brasfertil, RFFSA and the Bank's LAC transportation department. The recommendations have basically been accepted by RFFSA.

6. The foreign engineering contracts with Kellogg (USA) and Toyo (Japan) have not yet become effective as there are delays in obtaining Government clearance. Brasfertil now anticipates that contracts will become effective in August, 1-2 months later than expected. Meanwhile, however, the foreign and local engineering companies have agreed to start work on drawing up the detailed equipment list so that the overall schedule might not be affected.

7. In the preappraisal report we stated that the recently changed Brazilian requirements for obtaining import licenses could result in a prolonged procurement process. It now seems that Cacex (the government agency responsible for granting import licenses) agrees to the concept of issuing a global import license which would allow Brasfertil to order from a foreign supplier as soon as their evaluation of bids is completed. Brasfertil presently is negotiating with Cacex to obtain a global import license for the Araucaria project. We should know the outcome of these negotiations by the middle of August. However, as stated above, the mission believes that global import licenses will be granted and that the procurement process will not be prolonged because of the import license requirements.

8. During the appraisal mission, the capital cost estimate has been updated and the investment requirements now appear to be as follows:

| | (in million US $) Foreign Exchange[1] | Local Currency[2] | Total | % |
|---|---|---|---|---|
| Land and Site Preparation | - | 3.2 | 3.2 | 2 |
| Infrastructure | 1.6 | 9.1 | 10.7 | 6 |
| Civil Works | 2.0 | 11.5 | 13.5 | 7 |
| Equipment and Spares[3] | 56.7 | 45.7 | 102.4 | 55 |
| Erection | 1.2 | 21.5 | 22.7 | 13 |
| Engineering Services | 7.7 | 5.6 | 13.3 | 7 |
| Freight & Insurance | 2.6 | 7.9 | 10.5 | 6 |
| Preoperational Exp. | - | 6.4 | 6.4 | 4 |
| Base Cost Estimate (July 1, 1976) | 71.8 | 110.9 | 182.7 | 100 |
| Physical Contingency | 6.3 | 10.9 | 17.2 | |
| Price Escalation | 8.3 | 20.6 | 28.9 | |
| Installed Cost | 86.4 | 142.4 | 228.8 | |
| Working Capital | - | 12.3 | 12.3 | |
| Int. during Construction | 15.0 | 9.0 | 24.0 | |
| Total Financing Required | 101.4 | 163.7 | 265.1 | |

1/ Including about US$27 million in indirect foreign exchange derived by assuming that about 25% of the local equipment and 15% of the civil works is indirect foreign exchange.
2/ The exchange rate used is Cr $ 10.78 = 1 US$.
3/ Including US$8 million in railway cars.

9. The total investment requirement of US$265.1 million is high when compared to other gas based ammonia/urea projects which require between US$200-220 million. There are three reasons for this: (a) large infrastructure requirements for water supply and the railway extension; (b) the high cost of Brazilian equipment and services, which is estimated to be 40-50% above international costs; and (c) high charges for price escalation and interest during construction caused by the long implementation period (43½ months to mechanical completion) resulting from: (i) the fact that the plant will be built in an industrially underdeveloped region of Northeast Brazil; (ii) from the employment of local engineering firms inexperienced in designing ammonia/urea plants; and (iii) from the complicated coordination and procurement arrangements.

10. At the time of negotiations (November/December 1976) Brasfertil should have the definitive cost estimates of the engineering firms and it should be possible at that time to verify the above estimate. By that time the split between imported and domestically produced equipment will have been negotiated with Cacex so that the foreign exchange requirements can also be more accurately assessed.

11. Using conservative assumptions, the financial and economic rates of return are estimated at about 16% and 14% respectively. Using a shadow foreign exchange rate of 25% above the official rate would improve the economic rate of return by about 3 percentage points to 17%. Compared to the Araucaria project, which had an economic return of 24%, the return on this project is low. It compares to returns obtained on Indian fertilizer projects using heavy fuel oil as a feedstock. The reasons for this low return are threefold: (i) the high capital costs which are about the same as for the heavy fuel oil-based Araucaria project; (ii) the high feedstock and heating fuel costs. It appears that natural gas, which will be used as a feedstock, is not abundantly available in the Northeast and the use of gas will be restricted to petrochemical users. Other users, which could use it for heating purposes, have to switch to fuel oil. Therefore, the economic price of gas will have to equal at least the price of fuel oil on a heat equivalent basis. As a result, a gas price of about US$1.40 per thousand cubic feet (MCF) will have to be used assuming an f.o.b. crude oil price of US$11.50 per barrel and a heavy fuel oil price of around US$55 per ton. This gas price compares to US$0.5-0.6 per MCF which has been assumed in projects where gas is abundantly available. In addition, it is assumed that natural gas is consumed only as a feedstock and that vacuum gas and Bunker C oil will be used as a fuel. This penalizes the project further and reduces the return by about 1-2%; and (iii) without the project, the fertilizer requirements of the Northeast would be met by the existing and presently expanded Petrofertil plant in Camacari (close to Salvador, Bahia). With the project, the output of the Petrofertil plant will have to be shipped to the southern and central region of Brazil, while the project output will satisfy the needs of the Northeast. In effect, the project thus substitutes for imports of fertilizer to the South and Center. Since the fertilizer surplus from the Northeast will be moved by coastal shipping, port handling and local transport costs (totalling about US$30 per ton) of fertilizer are incurred with and without the project and can thus not be included in the benefits. The 10% difference between the returns of the Araucaria and Sergipe projects could, therefore, be explained by the higher feedstock and fuel costs accounting for about 6 percentage points of the difference and by the difference of about US$30 per ton in the benefits (as explained in (iii) above) which account for the remaining 4 percentage points.

Issues

12. The mission has identified six issues which are given below together with the respective recommendations:

A. Gas Reserves.

B. Financing Plan and Amount and Allocation of the Proposed Bank Loan.

C. Terms of the Proposed Bank Loan.

D. Marketing Expertise of Brasfertil.

E. Investment Planning in the Nitrogenous Fertilizer Sector.

F. Fertilizer Subsidy.

The first four of these issues are related to the project, the last two are concerned with the fertilizer sector as a whole.

A. Gas Reserves

13. For feedstock, the project will require about 210 million cubic meters per annum of gas. The information on the availability of gas for the project, given to the mission by Petrobras, was not sufficiently conclusive and therefore a consultant has been asked to study the supply and demand for natural gas in the Northeast in order to verify that there will be enough gas available for the project. The consultant started work on this on July 12, 1976, and his report is expected to be available to the Bank by early September. However, given the information obtained from Petrobras and the very preliminary findings of the consultant, there is a high probability that there is sufficient gas for the project.

14. It is therefore recommended that the appraisal of the project proceed as scheduled but that the yellow cover appraisal report not be issued unless it is clearly established that there will be sufficient gas available to run the ammonia/urea project for at least 15 years.

B. Financing Plan and Amount and Allocation of the Proposed Bank Loan

15. This issue contains a number of sub-issues but, since they are all interrelated, they are best dealt with under one heading.

16. During the mission's visit, Brasfertil proposed the following strategy for financing the project. First, the project will be financed by a debt/equity ratio of 59/41, with all the equity coming from Petrobras. As for the Araucaria project, a cash flow forecast for Petrobras has been obtained which indicates that Petrobras should be in a financially strong enough position to supply all the equity required by Brasfertil. Second, Brasfertil, with the concurrence of the Government, has decided that it will make an agreement with Cacex in which the equipment to be imported and to be purchased locally will be identified solely

on the grounds of the capability of Brazilian manufacturers. Brasfertil further decided not to open any part of the domestic equipment list for international competitive bidding although they realize that this could be done if the financing for these items would come from a foreign source with a loan maturity of 15 years or more, which would be the case under Bank financing. This decision of Brasfertil precludes the Bank from financing any equipment manufactured in Brazil (with the possible exception of railway cars) and this has to be understood in the light of the very severe pressure on all Brazilian companies to maximize Brazilian content and to cut down on foreign exchange expenditures. Third, Brasfertil proposes that the Bank finance all imported equipment and foreign engineering services and, as in Araucaria, part of the local engineering services, thus leaving no room for tied suppliers and bilateral credits. The justification given by Brasfertil for maximizing the Bank loan amount is that Bank terms are more favorable to the company and the country, and that procurement is made considerably easier if all imports are financed from one source. The company further explained that the sum total of suppliers' credits available to Petrobras will not be reduced but that Petrobras will be in a position to allocate more of these credits to other projects in need of foreign exchange financing. Fourth, to cover the foreign expenditures for interest during construction and some indirect foreign exchange, Brasfertil will obtain US$20 million in foreign exchange through a private placement with institutional investors in the US. During the recent months Brasfertil and Petrobras have been contacting investment bankers in the US and they will select one to negotiate a placement by the middle of next year. Details on the terms and conditions of this source of financing have not yet been determined. Fifth, the remaining local costs will be financed by a loan from BNDE. Sixth, Brasfertil is considering putting the required railway cars for ammonia and bulk urea out for international competitive bidding and would like the Bank to finance these. The number of cars required has not yet been determined in detail but it has been estimated that about 30 ammonia and 50 bulk urea cars would have to be purchased by Brasfertil, costing about US$5 million. Seventh, in addition to the railway cars required for the Sergipe project, Brasfertil will also have to purchase some cars for moving ammonia and urea from the Araucaria project. Such cars had not been included in the project originally and it is estimated that probably 50 cars would be required and an allowance of US$3 million is made in the capital cost estimate for this. A more detailed estimate of the requirements will have to be submitted by Brasfertil by September 15, 1976. This part, however, will only be included in the project if Brasfertil decides to put all the railway cars out for international competitive bidding and if the Bank agrees to finance this item.

17. From the above, the following financing plan will result:

| | (Million US $) |
|---|---|
| Equity | 108.7 |
| Foreign Loans | |
| IBRD | 65.7 |
| Other | 20.0 |
| Total | 85.7 |
| Local Loan - BNDE | 70.7 |
| Total Financing | 265.1 |

For the Bank loan, the following allocation would result:

| | (Million US $) |
|---|---|
| Equipment, Materials and Spares Procured through: | |
| International Competitive Bidding (including railway cars)1/ | 24.7 |
| Restricted Bidder's list because of criticality or long delivery time of item | 15.4 |
| International Shopping for items costing less than US$100,000 | 12.0 — high? |
| Total | 52.1 |
| Engineering Services | |
| Foreign | 7.7 |
| Local (65% of total) | 4.2 |
| Total | 11.9 |
| Erection (Vendor Services) | 1.5 |
| Total Bank Loan | 65.5 |

1/ Contingent upon Brasfertil opening the procurement of railway cars to international competitive bidding.

18. It should be noted that the small items category of equipment, materials and spares includes special fabrication materials of about US$3 million which Brasfertil intends to purchase for the use of Brazilian manufacturers. A similar arrangement had been made in the Araucaria project. It is anticipated that in addition to US$13 million advance contracting for services of the foreign and local engineering companies, advance contracting for equipment and materials will not exceed US$20 million. Consequent retroactive Bank financing of such expenditures are not expected to exceed US$3 million for services and US$2 million for equipment and materials. 4.5 million

19. It is recommended that the above financing plan allocation of the proposed Bank loan and the amount of advance contracting and retroactive financing be accepted.

C. Terms of the Proposed Bank Loan

20. The project is expected to start commercial production by the middle of 1980 and will operate at an estimated capacity utilization of about 70% during the first twelve months of operations. Assuming that the proposed Bank loan will be signed in January, the grace period should be 4½ years and the overall maturity of the loan 15 years. The loan would be made to Brasfertil with a shareholders' agreement from Petrobras and a guarantee agreement from the Brazilian Government. The interest rate for Brasfertil would be 10% with the difference between the Bank's standard lending rate and 10% being payable to the Brazilian Government. The foreign exchange risk would be with Brasfertil.

What grace period & loan maturity will be allowed for Brazil?

21. It is recommended that the above terms be accepted.

D. Marketing Expertise of Brasfertil

22. Up to now Brasfertil has relied on other agencies and the Government for projections of fertilizer demand and for general information regarding the Brazilian fertilizer market and marketing. Since Brasfertil will in the future hold the monopoly of ammonia/urea production in Brazil, it is imperative that the company develop its own market and marketing expertise as soon as possible.

23. It is recommended that Brasfertil be required by the Bank to establish a marketing department as soon as possible and prepare a work program for such a department for submission to the Bank at the time of negotiations.

E. Investment Planning in the Nitrogenous Fertilizer Sector

24. Forecasts of future nitrogen consumption in Brazil are very difficult and have in the past often proved to be wrong, i.e., either too low or too high. Fluctuations in fertilizer consumption have been very large, particularly for phosphatic fertilizers.

25. For the nitrogenous fertilizers a number of demand projections exist which are shown below:

| | 1980 N Consumption (million tons) |
|---|---|
| 1. National Fertilizer Plan (January 1975) | 1.40 |
| 2. World Bank (October 1975) | 0.90 |
| 3. "Syndicado" (Manufacturers' Association)(June 1976) | 0.75 |
| 4. "ANDA" (Fertilizer Association) (June 1976) | 0.78 |

26. It is quite clear that the target given in the National Fertilizer Plan has an extremely low probability of being met. Instead, it appears reasonable to project a likely consumption of about 0.8 million tons of N for 1980. Beyond that date there are no official forecasts, but the mission believes that an average annual growth of about 12% per annum is realistic and feasible and can be assumed between 1980 and 1985. N consumption could therefore be estimated at about 1.4 million TPY in 1985.

27. With respect to the production of N in Brazil, present production is about 210,000 TYP and one plant will be commissioned in 1977 with a production of about 225,000 TPY of N. In addition, the National Fertilizer Plan suggested the construction of four new ammonia/urea projects to be completed by 1980 with a total N production of about 1,100,000 TPY. Total production would then be 1,535,000 TPY of N which is clearly in excess of the requirements for 1980. It is, therefore, necessary to phase new investments in ammonia/urea plants according to the likely demand to avoid very heavy investments for a demand that is not likely to materialize as foreseen.

28. The authorities involved in planning the investments in the fertilizer sector have generally recognized that four ammonia/urea projects would result in excessive production and their plans now foresee only three of these projects. The resulting N demand-supply balance would be about as follows (for the period 1980-1985):

| | (in 1000 tons of N) | | | | | |
|---|---|---|---|---|---|---|
| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
| Likely Demand | 800 | 900 | 1000 | 1120 | 1260 | 1400 |
| Supply from: | | | | | | |
| Existing Plants | 435 | 435 | 435 | 435 | 435 | 435 |
| Araucoria | 245 | 295 | 295 | 295 | 295 | 295 |
| Sergipe | 75 | 185 | 225 | 245 | 245 | 245 |
| 3rd Plant | 90 | 220 | 270 | 295 | 295 | 295 |
| Total Supply | 805 | 1135 | 1225 | 1270 | 1270 | 1270 |
| Subtract Demand for other than Fertilizer Use | 125 | 135 | 150 | 165 | 180 | 200 |
| N Supply for Fertilizer | 680 | 1000 | 1075 | 1105 | 1090 | 1070 |
| Surplus (Deficit) of N | (120) | 100 | 75 | (15) | (170) | (330) |

The above analysis points out that there is a good chance that there could be an oversupply of N in 1981/1982.

29. The mission therefore recommends that the Government and Brasfertil should be made aware of the probability of an oversupply of N and should be asked to reconsider the timing of a third ammonia/urea plant. In general terms, a commitment should be obtained from the Government to consult with the Bank before deciding on any additional ammonia/urea project.

F. Fertilizer Subsidy

30. In April 1975, the Government introduced a 40% fertilizer price subsidy applicable at the retail level. At the same time a 15% p.a. interest charge was introduced for fertilizer credit. Previously, no interest had been charged on agricultural credit for fertilizer. Depending on the maturity of the credit, the effective subsidy is between 15-25%.

31. The objective of the subsidy was two-fold. First, since Brazil imports most of its fertilizer, the aim was to reduce fertilizer prices to the farmer from the very high world market prices at that time and to stimulate fertilizer consumption and, thus, agricultural production. Second, the subsidy is supposed to provide a mechanism by which fluctuations of fertilizer prices in the world market can be counterbalanced so that the Brazilian farmer can expect more stable fertilizer prices.

32. At present, the continuation of the subsidy does not seem to be any longer justified, since world fertilizer prices have come down dramatically during 1975 and, as a result, value/cost ratios to the farmer have significantly improved. The Government and the fertilizer industry is recognizing this, but is is likely that the subsidy will be continued until the end of the year when the fertilizer season and the elections are over. For next year, however, indications are that the subsidy will be reduced, abolished, or that the system will be changed to ease the burden of this subsidy on the country's budget.

33. The mission recommends that the Bank carefully observe the developments that take place with respect to the fertilizer subsidy but, that at this time the Bank refrain from making any specific proposals on this to the Government. The Bank should also ensure that this aspect is well covered in the market study which will get underway in October.

GE/KL/NP/mgm
Attachment

cc: Messrs. van der Tak (8), Fuchs, Kalmanoff, Moore, Thadani, Cash, Soncini, Jaffe, Jacob de Vries, Kenji Takeuchi, Segura, Aguirre, Skillings, Glaessner, Mole, Cabezas, Plant (IFC), Lorenz, Sheldrick, Iskander, Brown, Perram, Carpio, Venkataraman, Tixhon, McClure

ANNEX 1

# BRAZIL - SERGIPE FERTILIZER PROJECT

## People Met and Organizations Visited:

### SAO PAULO

Copebras

A. A. Pilnik (Director)

Syndicato da Industria de Adubos no Estado de Sao Paulo

Fernando Penteado Cardoso (President)

Ultrafertil

Julio Cesar de Barros Diehl (Sales Manager)
Eduardo Haberland (Manager, Agronomical Department)

Associacao Nacional Para Difusao de Adubos (ANDA)

J.A.T. Drummond Goncalves

Montreal Engenharia

Alcides de Medeiros Bethlem (Director of Projects)
Sergio Simon da Fonseca (Commercial Director)

Promon Engenharia

Ariel D. de Moraes (Director)
Affonso G. F. Chaves (General Manager)
Carlos Andres Herklotz (Commercial Manager)

### PORTO ALEGRE

Industrias Luchsinger Madorin

Elmiro Lindemann (Director)

Companhia Riograndense de Adubos

Erich H. Fudler (Director)
F. Bals (Financial Manager)

Companhia Riograndense de Nitrogenados

Roberto Pires Pacheco (President)
Missin Castiel (Project Manager)
Ariosto Jaeger (Director)
Roberto Eduardo Xavier (Director)

BRASTILTA

Ministry of Agriculture

Rubens Valentini (Assessor)
Andres Troncoso Vilas (Assessor)
Geraldo Pereira (Suplan)
Jose Aranias Coutinho Aguiar (Suplan)
Burnett (DICOF)

Planning Office (Seplan/Subin)

Guilherme Ozeric Camargos (Assessor)
Marilia Cleci Mandelli
Joao Evangelista G. Pereira

Banco do Brasil

Jose Rodolpho Hulse (Economist)
Rubens Massaro Saito (Economist)

Beipot

Francisco P. Magalhaes Gomes (Advisor)
Francisco Miranda (Project Manager for Fertilizer)

Embrater

Josemar Ferraz Rodrigues (Director)

Embrapa

Sidival Lourengo (Soil Advisor)

Conselho Nacional de Petroleo

Ozial Almeida Costa (President)

[illegible]

[illegible]

[illegible] de Magalhaes Botecho (Financial Director)
Leonel Minotti (Technical Director)

[illegible]

[illegible] Barreto (Project Manager)
[illegible] (Planning Supervisor,
[illegible] (Engineer)
[illegible] (Engineer)

RIO DE JANEIRO

Petrobras (continued)

Wilson de Santa Cruz Caldas (Procurement Engineer)
Aaron Hirsch Fayfman (Procurement Engineer)
Edimar Acho Cordeiro (Transport Manager)
Domingos de Saboya Barbosa Filho (Transport Analyst)
Cilzio Greco Moreira (Transport Analyst)
Luiz Carlos C. da Cunha Lima (Advisor)

Superintendencia Nacional da Marinha Mercante (SUNAMAN)

Auro Madureira (Navigation Director)
John Munro (Planning Director)

Divisao Industrial Carteira de Comercio Exterior (CACEX)

Namir Salek (Director)

Fertilizer Commission

Alberto Ramy Mansour (Executive Secretary)

Price Commission

Roberto Timotheo da Costa (Division Chief)

Banco Nacional do Desenvolvimento Economico (BNDE)

Celso Juarez de Lacerda (Chief of Priority Department)
Luiz Antonio Viana de Oliveira (Chief of Chemical Department)

RECIFE

Anda

Hermano Gargantini (Executive Secretary)

Profertil

Lamartine Lyra Cruz (Director)

Sudene

Tulio Barbosa (Economist)

Agrofertil

Paulo Figueiredo (Director)

Instituto de Alcohol y Acucar (IAA)

Antonio Augusto de Souza Leow (Director)

RECIFE (continued)

Planalsucar

Francisco Jelo (Coordinator)
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# OFFICE MEMORANDUM

→DEWEY o/r D-1050

TO: Those Listed Below

DATE: August 24, 1976

FROM: Eldon E. Senner, Acting Division Chief, LAC II

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SUBJECT: BRAZIL - Sergipe Fertilizer Project Decision Memorandum

1. A Decision Meeting to discuss the July 30, 1976 appraisal Issues Paper on the proposed Sergipe Fertilizer project was held on August 10, 1976. Those in attendance were Messrs. Skillings (Chairman), Senner, Knight and Aguirre (LAC II), Karman, Renger (LACP), Dewey, Sheldrick, Brown, Venkataraman, Petry, Loos and Evans (Industrial Projects). The following issues were discussed and decisions made.

Financial Plan

2. The financial plan proposed by the mission did not include utilization of external suppliers' credits in the financing of the project. Furthermore, the indirect foreign costs of the project related to locally procured equipment would have to be financed from local sources. As a result, the financial plan as now conceived would limit in real terms the transfer of much needed foreign resources to Brazil, and would have a negative impact on the balance of payments. The mission explained that from the information they had been able to gather from the company in Brazil, suitable suppliers' credits would not be available to the extent required by the project, particularly because of a significant increase in the use of suppliers' credit for the Araucaria fertilizer project. The Chairman proposed that in this respect discussions be held with the Government and the proposed borrower with a view to reach an agreement on the following alternatives: a) use of suppliers' credits for large packages of equipment that would have to be procured abroad provided such credits were available on favorable terms (as it was in the Araucaria project); b) increase untied cofinancing for interest during construction and some indirect foreign exchange costs from US$20 million to about US$25 million to cover the down payments for equipment and engineering services procured before loan approval, (see para. 7 below); c) adjustment of the amount of the Bank loan so that it would not cover equipment which could be financed with suppliers' credits on reasonable terms, but on the other hand, so that it would cover equipment now reserved for Brazilian procurement, but for which the Brazilians would agree to permit ICB, (see para. 4 below), whether won by foreign or local suppliers. It was noted that the amount of the Bank loan (as adjusted), plus suppliers' credits, would still fall short of the total foreign exchange content of the project. The meeting concurred with the Chariman's views that such a plan should be discussed with the Government and the company in mid-September. The matter would be considered again in the Bank if the discussions failed to produce agreement on the improved financing plans. The size of the Bank loan would be determined after the discussion to be held with the Government.

Project Cost

3. The Issues Paper indicated that the project cost appeared high when compared with other similar projects being considered for Bank financing in other parts of the world. The appraisal mission suggested three main reasons for such higher costs: a) procurement arrangements including a substantial list of goods reserved for local procurement; b) scope of the infrastructure works required because of the location of the project; and c) extended project implementation period resulting partially from the use of local engineering firms. The implications of each one of these points and the conclusions reached are discussed below.

Procurement Arrangements

4. The procurement arrangements proposed in the Issues Paper would exclude from international competitive bidding a substantial package of goods totalling about US$60 million. Local procurement for an important portion of the equipment (about US$30 million) for which procurement under ICB would be technically feasible, would increase the project cost by about US$10 million and reduce the economic rate of return by about 0.8 percentage points. Moreover, such procurement would cause an immediate drain on the balance of payments since indirect foreign costs of equipment procured in Brazil would have to be financed locally. In view of these facts, the Chairman expressed his reservations about the procurement arrangements proposed. The mission explained that the procurement plan suggested in the Issues Paper had been conceived by the company as a result of the increasing pressures from Brazilian manufacturers to maximize the utilization of locally produced equipment in projects executed in Brazil, a position which the company held despite the fact that government policy permits procurement through ICB of equipment financed by foreign loans with at least 15 years of maturity. The mission further explained that to facilitate the procurement process and the issuing of import licenses, during project execution, it is current practice in Brazil for the project sponsor to work out an agreement with Cacex (the government import licensing agency) at the beginning of project preparation, which specifies which items are to be imported and which to be procured locally. On the basis of an agreement reached with Cacex, Brasfertil had prepared the cost estimates for the project on the assumption that about 40% of equipment would be imported and 60% would be purchased locally . The mission had explained the disadvantages of the procurement plan proposed to representatives of the company and working level Government officials and had suggested to them an increase in the amount of equipment to be procured under ICB,

with financing through the Bank loan. The Company explored the possibility but decided to maintain the original plan to which the Government did not object. The Chairman proposed and the meeting agreed that discussions be held at a higher level with the Government and the proposed borrower to reach an agreement to keep in the reserve list only those items for which ICB would not be technically feasible. However, the Industrial Projects Department representatives at the meeting proposed that the Bank be prepared to accept a reserve list of the scope proposed in the Issues Paper if a different agreement cannot be reached with the Government. This issue will be faced again if the higher level discussions fail to arrive at a satisfactory conclusion.

Plant Location

5. The meeting reviewed the reasons for the location of the proposed plant in the Northeast Region of Brazil in light of the higher level of investment required. It was noted that even though the proposed location would require a higher investment cost and a longer project implementation period, it was justified on three grounds: 1) the plant would be located near its market and raw material sources thus offering comparative transport advantages with respect to other suggested plant sites (see para. 8); 2) the additional infrastructure works required by the project would have a positive spillover effect on the development of one of the poorest regions of Brazil; and 3) the proposed location would be in accordance with the Government's policy of industrial decentralization. Based on these considerations the meeting found the location proposed for the plant acceptable.

Engineering Services

6. As noted above, the use of local engineering firms (Promon and Montreal Engenharia) would extend the project implementation period, as a result of their lack of experience in the design of ammonia/urea plants. Furthermore, the fact that five main parties would be involved in the coordination of the engineering services for the project would also extend the implementation period. However, the mission explained that from a technical point of view the arrangement proposed was acceptable since local engineering services would be supervised by experienced foreign engineering firms (Kellogg (USA) and Tayo (Japan)) as in the case of the recent Araucaria fertilizer project in Brazil. The arrangements proposed are in line with PETROBRAS practice and have proven successful on various occasions. In view of the fact that the experience the Brazilians would derive from this project would be significant for the execution of future chemical undertakings, the meeting agreed that the use of local engineering services for the project should be accepted.

Retroactive Financing

7. The Issues Paper recommended including in the proposed loan US$5 million of retroactive financing: US$3 million for engineering services and US$2 million for equipment and materials. The Chairman believed that no retroactive financing would be justified in a project of this type in Brazil and that every effort should be made to find alternative financing sources for these items (see para.2). The Industrial Projects Department explained that the level of retroactive financing proposed was well within what they consider to be acceptable limits. This would be particularly so since much of the retroactive financing proposed would cover engineering services to review the existing capital cost estimate and reduce the risk of a cost overrun. The meeting agreed that the proposed amount of retroactive financing should be accepted in case no other suitable source of financing could be found.

Investments in the Nitrogenous Fertilizer Sector

8. The Issues Paper noted that in the past few years fluctuations in the fertilizer market in Brazil have been very pronounced and that as a result, any forecast of nitrogen consumption would have a high degree of uncertainty. The mission considered that a third nitrogen plant in addition to the Araucaria and to the proposed Bank projects would only result in a slight(less than 10%) oversupply in 1981/1982. The situation would be reversed in 1983 when a small deficit is again expected. However, in view of the uncertainties and the construction time required, the Brazilians were justified in going ahead with the proposed project now, delaying only for a few months the start of a third plant. The meeting agreed with the mission that the Bank should seek a commitment that it would be consulted before any additional plants are built. The third plant would probably be financed by the IDB and would be one of the three projects being studied in the South/Southeast: Rio Grande (RGS), Campos (RJ) and Paulinha (SP). A question was raised whether the proposed Sergipe Project was the most economical next stage in the expansion of Brazil's ammonia industry. The mission explained that for the economic evaluation, the proposed Bank project had been compared against the alternatives of supplying the Northeast market from the existing plant in Salvador (Bahia) when expanded, or through imports using forecasts of world fertilizer prices made by the Bank's commodities staff. The analysis showed that the Sergipe plant was the most economic solution. With the coming on stream of the proposed Sergipe project, fertilizer production of the existing Salvador plant would be shipped to the South/Southeast to substitute for imports.

Fertilizer Pricing Policy

9. The meeting reviewed the magnitude and implications of the subsidy being granted by the Government to the farmers to promote the use of fertilizers throughout Brazil. It was pointed out that the effective subsidy in real terms could be as high as 65% of the retail price for fertilizers. However, considering that the subsidy is likely to be substantially reduced by late 1976 or early 1977, the meeting agreed that, for the time being and until the Fertilizer Marketing and Distribution Study being undertaken in connection with the Bank's Araucaria project is ready, the Bank should accept the situation.

Grace Period and Final Maturity

10. The normal terms for loans to Brazil would be a 3 1/2-year grace period and a 17-year final maturity. However, since a 3 1/2-year grace period would severely strain the company's cash flow during the start-up of operations, the mission proposed and the meeting agreed to increase the grace period up to 4 1/2 years and to reduce the final maturity to 15 years which is compatible with the economic life of the project.

Conclusion

11. The meeting agreed that the project was appropriate for Bank financing, subject to an effort to secure the acceptance by the Government of the changes in procurement arrangements and the financial plan listed above. In the case that the proposed changes were not accepted by the Government and the company, a meeting will be held to discuss new courses of action.

Cleared with and cc: Messrs. Wiese, LAC II
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cc: Mr. McNamara's Office

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