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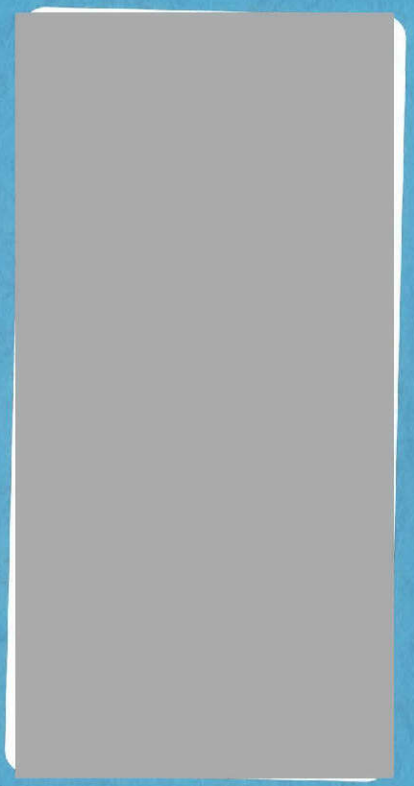
REPUBLIC OF INDONESIA

MINISTRY OF PUBLIC WORKS

DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT

INVESTIGATIONS ON EXISTING SWAMP DEVELOPMENT FOR UPGRADING IN JAMBI, SOUTH SUMATRA, CENTRAL AND SOUTH KALIMANTAN PROVINCES



Final Report, Volume I

EXECUTIVE SUMMARY

June 1984

NEDECO - EUROCONSULT

in association with IDC

REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT

INVESTIGATIONS ON EXISTING SWAMP DEVELOPMENT FOR UPGRADING IN JAMBI, SOUTH SUMATRA, CENTRAL AND SOUTH KALIMANTAN PROVINCES

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Investigations on existing swamp development for upgrading in Jambi, South Sumatra, Central and South Kalimantan Provinces

Volume I

Executive summary

Code 4.61.128
June 1984

Nedeco - Euroconsult, Arnhem, The Netherlands
in association with P.T. Indra Development Consultants, Jakarta, Indonesia

MINISTRY OF PUBLIC WORKS

INVESTIGATIONS ON EXISTING SWAMP DEVELOPMENTS FOR UPGRADING

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Jakarta-Selatan

y/ref. :

o/ref. : 1780/238/1984

jakarta, June 30, 1984

subject : Submittance Final Report

Dear Mr.Soedaryoko,

With pleasure we forward Volume I to IV of the final report on the Investigations on existing swamp development for upgrading in Jambi, South Sumatra, Central and South Kalimantan Provinces to you. Annexes (Volume V) are still being processed and will be forwarded to you soon, while Volume VI was sent last March.

Volume I contains the executive summary and covers main aspects of the studies and designs made under the project. The other Volumes deal with surveys, feasibility studies and designs. These Volumes are revised versions of earlier submitted draft reports, which were discussed with P3S staff prior to their completion.

It has been a pleasure to continue our involvement in your tidal swamp reclamation programme via the present studies, which went a significant step further than previous engagements. We are fortunate to notice an unbroken cooperation with the staff of P3S, both at the Jakarta headquarters and at the sub-project offices in Jambi, Palembang and Banjarmasin.

We hope the report will prove to be useful to you, and will gladly entertain any further comment or query which may arise.

Yours Sincerely,

for Nedeco-Euroconsult

W.Wolf
Project Director

RW/S.

This report consists of the following volumes :

Volume	I	-	Executive summary
Volume	II	-	Surveys, evaluation of project schemes
Volume	III	-	Feasibility studies, programmes
Volume	IV	-	Designs
Volume	V	-	Annexes
Volume	VI	-	Photographic record

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Nedeco-Euroconsult, 1981 — Tidal Swamp Land Development Project in Lampung, South Sumatra and Central Kalimantan Provinces, Volume III, Feasibility Study of the Karang Agung Area (40,000 ha).

UNLAM, 1983 — Pengembangan Lahan Pasang Surut Kalimantan Selatan dan Kalimantan Tengah; Ringkasan Laporan Penelitian Tim Peneliti Universitas Lambung Mangkurat (on cover : 1982).

UNSRI, 1983 — Pengembangan Daerah Pasang Surut Sumatera Selatan dan Jambi, Laporan Survai Sosial dan Ekonomi, Tim Lembaga Penelitian - UNSRI.

ABBREVIATIONS

AASS	Actual Acid Sulphate Soil
AWLR	Automatic Water-level Recorder
DPMA	Direktorat Penyelidikan Masalah Air; Directorate of Hydraulic Research
GS	Government-Sponsored scheme
HYV	High Yielding Variety
IBRD	International Bank for Reconstruction and Development
INSUS	Intensifikasi Khusus; Special Intensification
IPB	Institut Pertanian Bogor; Bogor Agricultural Institute
IRR	Internal Rate of Return
ITB	Institut Teknologi Bandung; Bandung Institute of Technology
LMG	Lembaga Meteorologi dan Geofisika; Institute for Meteorology and Geophysics
PASS	Potential Acid Sulphate Soil
PPL	Penyuluhan Pertanian Lapangan; Field Extension Worker
P3S	Proyek Pengairan Pasang Surut; Tidal Swamp Reclamation Project
P3SA	Proyek Perencanaan Pengembangan Sumber-Sumber Air; Project for Planning and Development of Water Resources
P4S	Proyek Pembukaan Persawahan Pasang Surut; Tidal Swamp Land Development Project
PRL	Project Reference Level
SP	Spontaneous/local scheme
SRI	Soil Research Institute, Bogor
UGM	University Gajah Mada, Yogyakarta
UNLAM	Universitas Lambung Mangkurat, Banjarbaru, South Kalimantan
UNSRI	Universitas Sriwijaya, Palembang, South Sumatra

GLOSSARY

Gogorancah	Cultivation method in which rice is seeded under dryland conditions, and is cultivated under wetland conditions in later stages
Kolam	Huge pond at the end of secondary canals
Palawija	Secondary, dry-season crop grown on ricefields after the wet-season rice crop
Repelita	Five-year Development Plan

CONCLUSIONS AND RECOMMENDATIONS

1. The low-cost/simple-technology concept of tidal-land development is well suited to prevailing conditions. It provides the possibility to adapt the development of an area to changing farming systems and locally adverse soil conditions.

2. The step-by-step development of tidal lands materialises at a far slower pace than anticipated when formulating this policy. Land use is still not intensive in project schemes which were opened ten years ago.

3. Tidal-land settlers enter into a situation which is not leading to such an intensified land use. Amply available land and off-farm income opportunities entice them to follow a low-risk path of income generation.

4. The main hydraulic infrastructure is hardly ever a constraint to an increased agricultural productivity. The latter can be enhanced by improving the water-management system, both for flushing of toxic elements and for water retention, at tertiary and field level.

5. Such improvements will become effective when combined with improvements in the field of agronomy, applying the gogorancah* cultivation method and growing short-duration, high yielding varieties of rice when applicable. The supply of inputs, notably that of certified, improved seed, has much scope for improvements.

6. Upgrading is understood to mean bringing the hydraulic infrastructure of a project scheme in line with its land potential. Measures which would imply a higher stage of development, like supply of irrigation, are not yet due.

7. Upgrading the hydraulic infrastructure appears to be an economically viable undertaking. The costs are in the order of Rp 300,000 to 400,000 per hectare, the results could be a doubling of the yield of rice (2 to 3 t paddy/ha) and coconut (1.5 to 2.5 t copra/ha/yr). The internal rate of return to capital ranges between 15 and 25%, and depends on the extent of farmers' response to the opportunities offered to them.

8. Within the surveyed project schemes, an upgrading programme could start with the Rantaurasau (partly), Simpang, Upang (SP**), Barambai and Belawang project schemes, followed by Telang (Unit V), Basarang and Tambanlupak (GS***). Farmers should receive an incentive to perform the on-farm works. An operation and maintenance section of the Provincial Public Works Offices should take care of the hydraulic infrastructure after construction.

---

* Cultivation method in which rice is seeded under dry land conditions, and is cultivated under wetland conditions in later stages

** Spontaneous/local scheme

*** Government-Sponsored scheme

9. The following recommendations apply to designing tidal-land development schemes:

- areas where water supply to the fields is possible require large canals close to each other, and a short connection to the river;
- in areas where wet-season salt intrusion is to be expected small canals would facilitate retention of fresh water and reduce salt intrusion;
- the evacuation of toxic elements is enhanced when canals are as dry as possible during ebb, which requires small canals sloping downwards to the main drainage system cum river;
- in areas where toxic elements appear in the canals, and supply to the fields is possible, a separate supply and drainage system is called for;
- in case of potential acid sulphate soils , a choice should be made between either water retention to prevent oxidation of pyrites, which is normally achieved by constructing small canals thereby preventing more than superficial drainage, or forced oxidation with flushing of resulting noxious elements, which is achieved by a dense network of deep drains;
- where peat in present, a choice should also be made; deep drainage to enhance oxidation of organic material or groundwater control to enable cultivation of tree crops;
- some areas are flood-prone due to high water-levels in nearby rivers. Canals connecting these rivers to project areas should be kept small or controllable;
- secondary and primary structures should not be implemented during the first stage of development;
- structures on tertiary level are most important in tidal-land agriculture.

10. As to agriculture, the following recommendations apply:

- rice should not be cultivated on reclaimed lands with peat-layers thicker than 0.5 m;
- agricultural support should comprise the availability of seed and credit;
- agricultural extension should also focus on water management;
- research on gogorancah and export-oriented crops under tidal-land conditions should be intensified.

11. Since swamp reclamation has a negative effect on fish resources by reduction of fish-recruitment areas, it is recommended that reclamation of tidal lands go hand in hand with the implementation of fisheries and aquaculture management strategies aimed at safeguarding the present resources or compensating the (future) reduction in present resources.

12. It is advisable to bring the insight in socio-economic conditions and processes in tidal lands at a level compatible with the present knowledge of technical features.

13. It is recommended that road communications within project schemes are actively developed.

1 INTRODUCTION

Nedeco-Euroconsult, the Netherlands, in association with Indra Development Consultants, Indonesia, were retained to assist the Government of Indonesia in its programme for upgrading existing swamp development schemes.

The project deals with agricultural and technical aspects, and is complementary to the studies on the socio-economic conditions undertaken by Palembang (UNSRI*) and Banjarbaru (UNLAM**) Universities for the Directorate General of Transmigration.

On behalf of the Government the Tidal Swamp Reclamation Project, Proyek Pengairan Pasang Surut (P3S***) of the Directorate General of Water Resources Development, Ministry of Public Works, liaised with the consultants. The project is assisted under IBRD (International Bank for Reconstruction and Development) loan no. 1958-IN.

The project started in April 1982. During the period July 1982 to July 1983, general field data on crop yields and prevailing soil, water and infrastructure conditions were collected in 18 project schemes. The selection of the three schemes in which feasibility studies were to be undertaken was based on these data. An interim report was published in June 1983. Since that time the project staff has discussed several aspects of upgrading the schemes with P3S on an ad-hoc basis.

Volume I summarizes the findings of the study. These findings, and the underlying information, are discussed in detail in a number of Volumes: Surveys, evaluation of project schemes (Volume II), Feasibility studies, programmes (Volume III), Designs (Volume IV), technical data per project scheme (Volume V). Volume VI contains an explanation to the photographic record made of the tidal-land development and the present surveys.

The Terms of Reference of the project and the composition of the staff are given in Appendices I and II. Nedeco-Euroconsult was to be responsible at two levels:

- task concept, this means that consultants were completely responsible for the final product.
- training concept, this means that consultants would provide training to project staff engaged by the Indonesian consultants to the best of their ability, but would not be held responsible for the results. Under this concept, consultants would initiate transfer of knowledge and experience and provide for on-the-job training in all fields related to consultants' tasks, including the survey and management.

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* Universitas Sriwijaya, South Sumatra
** Universitas Lambung Mangkurat, South Kalimantan
*** Formerly: Tidal Swamp Land Development Project; Proyek Pembukaan Persawahan Pasang Surut (P4S)

2 THE PROJECT

2.1. Objectives

The contract concerning the present project stipulates the objective of the study:

- to evaluate the effectiveness of different development systems applied in 18 existing swamp developments in Sumatra and Kalimantan, established under Repelita * I and II or even earlier. A systematic assessment of the first stage, low-cost/low-technology swamp development and a systematic comparison of spontaneous and government-sponsored schemes should provide valuable information to be taken into account in future project preparations.
- to identify constraints
  In studying areas of various time classes it would be possible to identify and evaluate time-related constraints and levels of development.
- to recommend profitable programmes for upgrading to be implemented in the Government's programme for Repelita IV.
- to prepare feasibility studies for upgrading of three project areas, viz. two government-sponsored and one spontaneous development area.

2.2 The project schemes

From the conceptual stage of the present project onwards, P4S intended to have supplementary data collected exclusively. Only those schemes with available general data on soil and topography were to be selected. Furthermore, close co-operation with the Universities carrying out the socio-economic surveys on behalf of the Directorate General of Transmigration was to be established, and our project was only to study schemes already investigated by these Universities in order to be able to analyse the project schemes in all their aspects.

During reconnaissance trips consultants endeavoured to map accurately the areas surveyed by the Universities. Appendix III contains a review of the schemes recommended for study by P4S (18), the schemes and villages selected during the workshop for socio-economic surveys (27), those which were surveyed by the Universities (39) and those which were studied under the present project (18). The location of the latter schemes is given in Figure 1.

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* Five-year Development Plan

LOCATION OF PROJECT SCHEMES

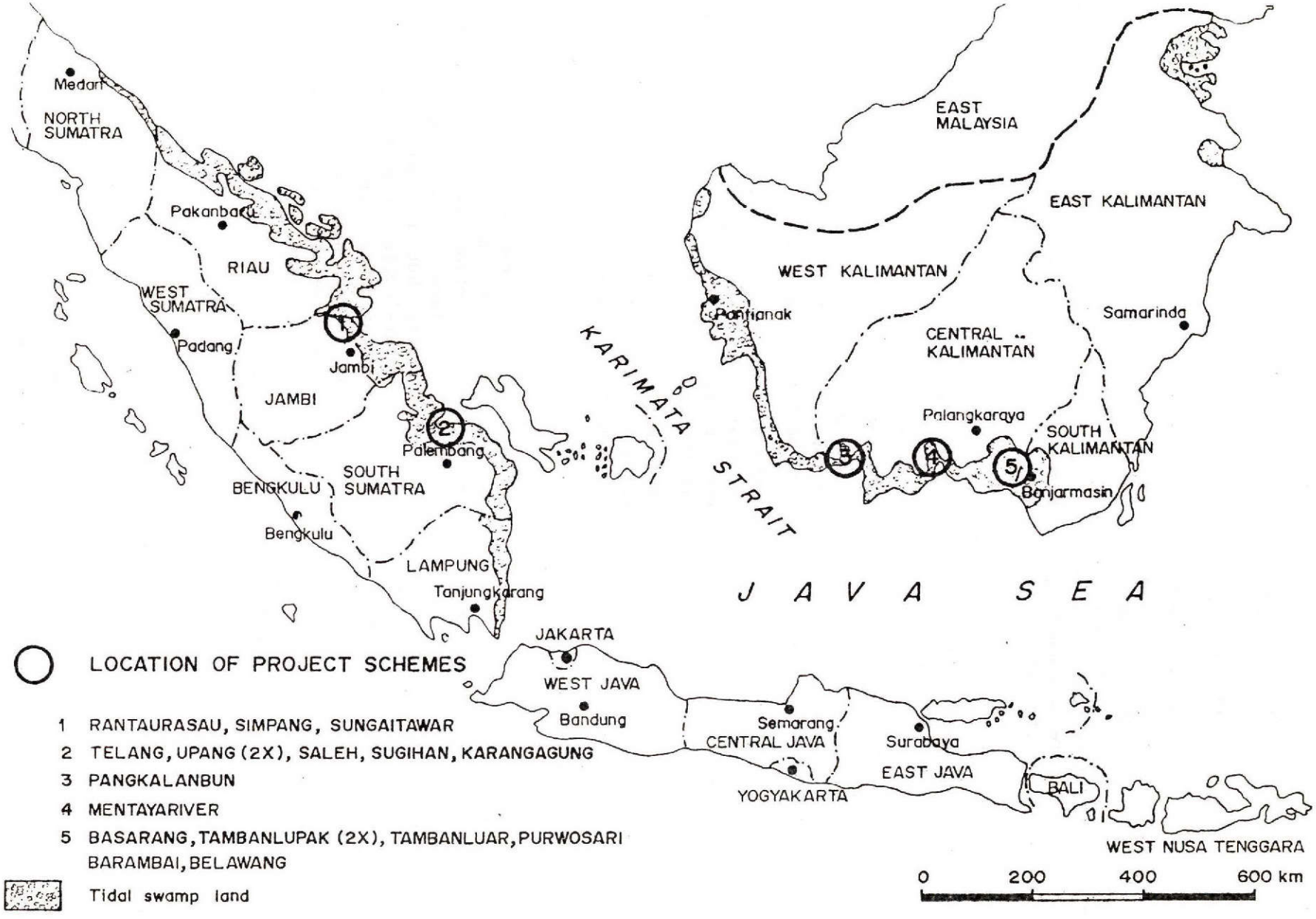

Figure 1

3 DATA COLLECTION

3.1 Project surveys

Regular hydrological surveys, covering one wet season and one dry season, were carried out during which the following features were monitored;Water-levels in rivers and canals, their relation to field-levels and the corresponding occurrence of tidal water supply and floods, and water quality in terms of acidity and salinity. The hydraulic infra-structure in each project scheme was described, and some cross-sections and longitudinal profiles were assessed.

Soil surveys were confined to determining peat depth, occurrence of potential acid sulphate soils (PASS), their oxidation product actual acid sulphate soils (AASS), and soil salinity. Crop water conditions were surveyed in terms of rainfall, level and quality (acidity, salinity) of groundwater or standing water. We followed the water-management practices of farmers in a number of project schemes.

The agricultural surveys dealt with land use, crop sample cuttings and interviews of the involved farmers, and yield surveys. The surveys were concentrated on the main tidal-land crops, rice and coconut.

In the framework of the present project and the concurrent Nationwide study of coastal and near coastal swamp land, a separate study assessed the present and future potential of fish resources in tidal areas. We refer to the relevant report (Euroconsult, 1983).

The complement the information made available by the Universities' surveys,some additional information on social aspects was collected by interviewing the authorities in almost all project schemes.

3.2 Other sources

Before 1977 hydrological surveys were executed project-wise when the need arose. It is rather difficult to collect all the information gathered in those years. Since 1977 data collection has been more centralized (DPMA*) and results more systematically recorded. Automatic water-level recorders (AWLR) are installed in most rivers, but in South Sumatra Province only in the Musi River. Canal water-levels are recorded by some testfarms. River and project surveys covering other hydrological aspects differ widely in intensity. Topographical surveys have been carried out in quite a number of project schemes. Subsidence and shrinkage of soils since the surveys diminish their present usefulness.

Soil surveys carried out in the 1970s mostly covered large areas either on reconnaissance or semi-detailed level. Such studies were done by IPB** in Jambi and South Sumatra, and by UGM*** in Kalimantan. The SRI**** also made some surveys. The reports proved valuable as they provided an overall picture of soil conditions, usually before reclamation started. The present project could, therefore, concentrate on specific features in selected areas.

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* Direktorat Penyelidikan Masalah Air; Directorate of Hydraulic Research
** Institut Pertanian Bogor; Bogor Agricultural Institute
*** Universitas Gajah Mada, Yogyakarta
**** Soil Research Institute, Bogor

It was understood that the socio-economic survey teams also surveyed soil properties. However, as the soil descriptions and samples were not identifiable on maps, we have disregarded this source of information.

Long-term rainfall records are available from many stations roughly covering the surveyed areas with exception of Sungaitawar and Pangkalanbun schemes. Such records are collected by LMG*, and data are obtainable at its Jakarta offices. Testfarms also operate rain-gauges.

Meteorological data covering a wide range of years were available for the stations in three provincial capitals, viz Jambi, Palembang (Talangbetutu) and Banjarmasin.

Available reports on the agronomic and socio-economic aspects of the tidal lands in general and the project schemes under review in particular were consulted. The most useful information was obtained from the surveys carried out by the Universities of Palembang (UNSRI) and Banjarbaru (UNLAM), the reports of the IPB/P4S and UGM/P4S testfarms in Sumatra and Kalimantan and a number of feasibility studies on the tidal-land projects.

The available fishery statistics, which are apparently partly gathered through interviews, differed from the findings of the present study and therefor only limited use was made thereof, viz supplementing data from the present project's interviews.

The attitudes, needs and activities of the people involved in tidal-land development were surveyed and reported upon by UNSRI and UNLAM. The findings of the Universities' surveys were incorporated in the present report where possible and applicable. However, the Universities' reports did not cover a number of relevant topics.

We also used other sources in the study of socio-economic aspects. The main documents in this category were those survey reports by IPB and UGM which covered parts of the present project schemes. These surveys were previously executed in the context of the feasibility studies undertaken for the Karang Agung, Lalan and Sebangau areas. Field notes on several projects written by P3S and Nedeco-Euroconsult staff during recent years were also used.

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* Lembaga Meteorologi dan Geofisika; Institute for Meteorology and Geophysics

4 THE OVERALL PICTURE

4.1 Life in tidal-land development schemes

4.1.1 General

Agriculture, the cropping of rice and coconut, dominates life in tidal-land development schemes. The cultivation of these crops is in turn determined by rainfall, the sparse tidal water supply, local floods, periods with stagnant water, and soil conditions, especially deep peat and soil acidity. Rice, the staple food, is grown everywhere. Government-sponsored transmigrants crop only limited areas to coconut, while spontaneous and local settlers prefer growing coconut to rice. Palawija* is not a major crop, and perennial crops other than coconut are exceptional.

Other sources of income are animal husbandry, viz chickens, goats and cows, fishery, labour in neighbouring land-reclamation projects and logging. Young government-sponsored transmigration schemes rely rather heavily on off-farm activities for their income and this often implies a slow development of the farm holding.

Rice mills are well distributed, and are practically the only processing plants found in the tidal-land schemes. Copra mills are concentrated in larger centres. Sawmills are located along major rivers in isolated spots without direct ties to farmers's villages. Produce is usually transported by water and within project schemes people travel by foot, bicycle or motorcyle. Subregional road connections, covering distances of 10 to 50 km, have only recently been improved.

Most social services are available to a reasonable extent, the serious exception being drinking-water. Its dry-season supply is an extreme problem virtually everywhere and occasionally most serious consequences result. Schools and primary health centres are well distributed over the project schemes and are greatly appreciated by the inhabitants. The civil administration is moving into the areas and many auxiliary Subdistrict offices are located in government-sponsored transmigration schemes.

The population development in the project schemes is usually positive, showing a quick increase in the first years and a gradual, more natural growth thereafter. In some areas the population size has decreased. This is certainly the case when one considers small sub-areas of a project scheme.

To summarize, the on-going development in tidal lands could potentially become a valid part of the overall national development even though there have been problem areas in the development to date.

4.1.2 Constraints to an increased agricultural productivity

The following factors were considered hampering present crop production and to be constraints to an increased agricultural productivity of tidal lands:

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* Secondary, dry-season crop grown on ricefields after the wet-season rice crop

- water stress to crops, the occurrence of rats;
- poor domestic water supply;
- soil properties, viz acidity and peat thickness;
- insufficient supply of agricultural inputs, other pests and diseases;
- shortage of labour, excess water.

Water stress

Crop losses due to water stress are reported to be up to 30% of a good yield. The rainfall pattern is erratic, its beginning, distribution and end being unpredictable. The storage on the highly permeable ricefields is negligable because impermeable clay bunds are absent. The water-levels in tertiary canals are not kept high enough to prevent drainage of the topsoil. In some project schemes farmers construct earthen dams in such canals. River water-levels allow for supplying water to strips of lands along properly dug canals in some project schemes.

Another reason for water stress is the need to use the first wet-season rains to remove toxic elements, caused by oxidation of potential acid sulphate soil during the dry season, from the topsoil. The subsequent late planting can result in extending the growing season of long-duration, local varieties of rice into the very dry months.

In the dry season, rainfall cannot meet the demands of rice and river water-levels are even less promising than in the wet-season. Low-lift pumping could be a solution, but salt intrusion into the rivers seriously reduces its applicability.

Rats

Crop losses due to rat infestation are also reported to amount to 30% of a good yield. Rats are so common that we could not differentiate their devastating influence between project schemes. Rat damage is closely related to the presence of bush and unreclaimed lands, and also to differences in cropping calendars in adjacent areas.

Domestic water supply

The people feel that the dry-season domestic water supply is extremely poor in all project schemes. One could differentiate between schemes, albeit less in the reality of the problem than in the cost of alternative supplies.

Soil acidity

Potential acid sulphate soils (PASS) are present throughout the surveyed area, but we have encountered only a few locations with actual acid sulphate soils (AASS). Farmers are well aware of the danger of soil acidity, and are developing defenses against it.

Peat thickness

Rice yields are low in reclaimed areas with more than 0.5 m peat.

Agricultural inputs

The still limited experience with the INSUS agricultural programme shows that farmers are prepared to apply inputs. Quite often did the programme stop because the promised HYV seeds did not materialize in time. Agricultural credit is closely related to the use of such inputs.

The role of agricultural field extension workers (PPL) varies, and we have to refer to the reports of the socio-economic surveys for this subject. However, it is possible that once the supply of physical inputs is improved, the qualitative lack of optimal guidance by the extension service will be less consequential.

4.1.3 Scope for upgrading

An analysis of the above constraints showed that effective action could be confined to the following aspects:

- agronomic aspects; selection of proper cultivation methods (dryland, gogorancah, wetland cropping), selection of proper crops and varieties (coconut, cassava, HYV rice) and supply of inputs.
- farm development; levelling and bunding of ricefields, flushing toxic elements from topsoil.
- tertiary system; canals with proper dimensions, construction and operation of water-management structures.
- secondary and primary system; improvement water supply, transport, flood protection.
- superstructure; domestic water supply.

4.2 The pattern of development

4.2.1 The development model

It is the policy of the Government to develop the tidal swamp lands in stages following a step-by-step approach, see Figure 2 which illustrates the idea graphically.

The first-stage development of tidal swamp lands primarily aims at expanding the area suitable for subsistence agriculture following the low-cost/simple-technology concept. Government intervention is mainly technical in nature; viz an uncontrolled drainage system, partial land clearing, houses, roads, bridges, and the provision of supporting services in agricultural extension, education and health care. The anticipated result of this intervention is a rainfed farming system on unlevelled fields without facilities for soil and water management.

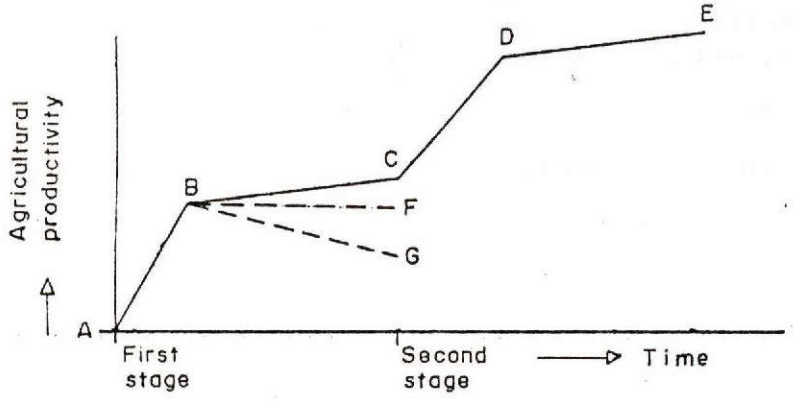

Figure 2

THE DEVELOPMENT MODEL

It was assumed that farmers would gradually change their virgin soils into agricultural lands in the period following government intervention, and that they would mobilize available labour and apply it to the development of their land holdings viz complete clearing, bunding, levelling and field drainage. The Government was to use this period to adjust agro-supporting services and the hydraulic infrastructure. The period would end when all production factors were optimally utilized and constraints to the full utilization of the now developed land potential would become apparent.

At such a period in time, the Government would again intervene with a second-stage development project aimed at creating conditions for a more intensive type of agriculture, enhanced by improved water-management structures at tertiary level. Flaws in the first-stage development could be repaired at this time as well.

4.2.2 The realised development

The schemes under review by the present project are in the period between the first and second-stage development. The Government intends to start with the next step soon, and the present project is one of the preparatory steps for it.

The present study reveals that the government-sponsored transmigrants are generally reclaiming their land holdings at a far slower pace than anticipated when formulating the policy described above. Referring to the graphical illustration of the development policy given in Figure 2, development is following line BF, sometimes even BG, but not line BC.

Both the intensification of land use by increasing the cropping intensity (e.g. double cropping) and the intensification of the agricultural husbandry by increasing the production per cropped area are still low. Inputs of improved seed, fertilizers, agricultural chemicals and labour are low. Most effort is put into rat control, but in an ineffective way.

In order to understand the present farmers' attitudes we have considered the settlers' backgrounds, their motives for coming to the tidal lands and their attitudes towards the resources. Most of the people from amongst whom government-sponsored transmigrants are recruited are operating at a subsistence level cultivating mini-ricefields, or work as farm labourers. These people have become skilled at avoiding risks because of the very small margins left to them. Such migrants prefer off-farm work because it provides them with an income independent of climatic conditions or the occurrence of pests.

Spontaneous settlers are not likely to intensify their land use either. Firstly, they start to operate in areas where land is plentiful. Secondly, intensification requires more labour and in this respect they know their limitations. Thirdly, they are often beyond the reach of an extension network that could stimulate the acceptance of intensification and the corresponding input package. Fourthly, extensive land use does not confine them to a particular location, leaving them the mobility which characterizes this type of settler.

We conclude that tidal-land settlers enter into a situation and are operating under conditions which do not confront them with land and subsistence constraints which would force them into intensifed land use. Moreover, the labour constraint is not leading to more intensive land use or to intensification of agricultural husbandry.

4.2.3 Timing of improvements

When population pressure increases and opportunities to generate off-farm income decrease, farmers could be thrown back upon their farms not only as source of food supply but also as a major source of cash income. Under such conditions one may anticipate a positive response from the farmers to an increased potential of the agricultural production. The reports of the socio-economic surveys support this view.

It is also possible that farmers could already be enticed into intensified agriculture when only the risks involved in farming are reduced. Such risk reduction may influence the competition between off-farm and cropping activities towards a preference for cropping. The available reports of the socio-economic surveys are not sufficiently refined to quantity or to verify this hypothesis.

The overriding feature is the farmers' response to any measure to be taken with regard to intensifying their farming system. The consultants feel that intensified farming could be stimulated by lifting constraints in areas with population pressure or with decreasing off-farm opportunities. Only decreasing the risks involved in farming without changing the competition which off-farm activities offer is less likely to succeed. Lifting constraints to intensification may yield sizeable returns especially when decreasing off-farm income would lead to a decrease in overall income.

Apart from an upgrading intervention, which fits completely in the envisaged development model, some project schemes deserve an upgrading project to repair flaws in the first-stage development. Calling such measures a rehabilitation would imply that the mistakes could have been prevented. The tidal swamp land development projects, however, are carried out when the exact type and magnitude of processes are initially not fully known. In such a situation, it must be appreciated that the reclamation of some areas fail to produce positive results. Such areas could be seriously affected, necessitating a second government project to remedy the situation even when the intensity of agricultural production is low.

4.3 Data matrix

After analysing several projects in detail, the consultants isolated those features which dominated the present cropping or were boundary conditions for an improvement in the production of one wet-season rice crop, see Table 1. Generally, A denotes a positive characteristic, B a neutral and C a negative characteristic. It will be appreciated, that an A for one feature may have a huge influence on crop productivity, while an A for another feature will influence yields only slightly, but still in a positive way. Similarly, the influence of a specific feature may differ from one project scheme to the other. The matrix reflects the situation during the survey period, 1982/1983.

Table 1. Data matrix

Province, type development-project scheme	Hydrology		Soil conditions			Crop water conditions			Agriculture			Socio-economy	
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
JAMBI PROVINCE													
GS Rantaurasau	B	C	C	B	A	B	C	A	B	C	A	B	A
Simpang	C	C	B	A	A	A	C	-	B	C	-	-	-
SP Sungaitawar	A	A	B	B	A	-	A	A	-	-	C	A	A
SOUTH SUMATRA PROVINCE													
GS Telang, Unit V	A	A	A	A	A	C	A	B	B	B	A	C	C
Upang	A	A	A	A	A	A	B	A	A	A	A	A	A
Saleh	A	A	A	B	A	B	B	-	C	B	B	C	C
Sugihan	A	A	A	A	-	A	A	-	C	B	-	C	C
SP Upang	A	A	A	A	A	A	B	A	B	A	B	-	-
CENTRAL KALIMANTAN PROVINCE													
GS Basarang	A	B	A	C	A	B	B	B	C	C	C	B	B
Tambanlupak	A	A	A	A	A	A	A	A	B	B	B	B	B
Tambanluar	A	A	A	B	A	A	A	-	A(1)	-	-	C	A
SP Tambanlupak	A	A	B	A	A	B	A	A	A	B	-	B	A
Mentayariver	B	A	A	A	A	A	B	A	C	B	C	A	A
SOUTH KALIMANTAN PROVINCE													
GS Purwosari Baru	C	A	A	B	A	B	B	A	A	A	B	B	A
Barambai	A	B	A(2)	C	C	C	B	C	C	B	A	C	B
Belawang	A	B	B	B	-	C	A	-	C	B	A	B	A

(1) 1982 main season (2) based on feasibility area

LEGEND:

Item	Description	A	B*	C
I	area which can be drained sufficiently (% total)	100	100 u/i 75	<75
II	wet-season tidal range in river (m)	≥1.5	1.5 u/i 1.0	<1.0
III	area with more than 0.5 m peat (% total)	≤10	10 u/i 25	>25
IV	occurrence potential acid sulphate soils (range 0-1)	≤0.1	0.1 u/i 0.2	>0.2
V	occurrence actual acid sulphate soils during surveys	no	----------	yes
VI	farmers who mention water shortage as constraint (%)	≤25	25 u/i 50	>50
VII	area, reportedly flooded (% total)	0	0 u/i 25	>25
VIII	area with acid water at field-level (% total)	≤10	10 u/i 25	>25
IX	realised rice-yield (t/ha)	≥1.5	1.5 u/i 0.75	<0.75
X	potential rice yield without government intervention (t/ha)	≥3.0	3.0 u/i 2.5	<2.5
XI	present cropping intensity (% area for field crops)	≥60	60 u/i 40	<40
XII	total income ('000 Rp/capita/year ; Source: UNSRI, UNLAM, 1983)	≥90	90 u/i 60	<60
XIII	off-farm income (% total income ; Source: UNSRI, UNLAM, 1983)	≤25	25 u/i 50	>50

* 100 u/i 75: 100 up to and including 75

4.4 An upgrading programme

In this study, upgrading is understood to mean to bring the hydraulic infrastructure in line with the land potential, and with the settlers' attitudes to land utilization. It is further understood that such upgrading would imply actions which are beyond the development capacities of individual farmers or a group of farmers and hence necessitates government interference.

The present project deals with the technical and agricultural aspects of tidal-land development. Suggestions for improving socio-economic aspects, health, education and drinking-water are not discussed here.

The Terms of Reference were understood not to cover higher-stage development projects which imply a major departure from the present stage of development and practices such as super-imposing an irrigation network on the existing drainage network. The economic implications of irrigation as a second-stage development were outlined in a previous study (Nedeco-Euroconsult, 1981). To summarize, it was found that two conditions must be met to successfully apply irrigation:

- The land should be sufficiently developed (levelled); this condition may have been met in some project schemes under review;
- A suitable source of irrigation water should be within the direct vicinity of the project; this may not always be the case.

Furthermore it was stipulated that the decision to irrigate an area had to consider an entire river-basin development in order to make optimal use of the scarce fresh-water resource. The present study provided insight into the general validity of an upgrading project and defined the conditions to be met before implementing such improvements.

The ranking of the surveyed project schemes, in respect to a future upgrading intervention by the Government, was based partly on the data as precipitated in the data matrix, partly on factors which were not covered by the data matrix but were, in the opinion of the consultants, also decisive in a specific project scheme. The ranking had the following result:

- immediate upgrading measures recommended: Rantaurasau, Upang (SP*) Barambai (for these three schemes short feasibility studies were made), Simpang and Belawang;
- upgrading measures are less urgent but still useful: Telang (Unit V),Basarang and Tambanlupak (GS**);
- upgrading measures are not or not yet necessary: Sungaitawar, Upang (GS), Saleh, Sugihan, Tambanlupak (SP), Mentayariver (Parebok) and Purwosari (Kalimantan);
- further monitoring is advisable: Tambanluar.

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* Spontaneous/local scheme
** Government-Sponsored scheme

5 THE FEASIBILITY OF GOVERNMENT ACTION

5.1 Selecting schemes for feasibility studies

Short feasibility studies were made for upgrading two government-sponsored schemes and one spontaneous development scheme selected from the 18 schemes under review.

In order to determine whether the water-management infrastructure of a project scheme should be brought in line with its land potential, the full utilisation of at least the initially cleared holding (usually 1 ha) and the future population pressure were taken as the first criterion.

It was proposed that a first government-sponsored project to be selected for a short feasibility study was to be characterized by full utilisation of the land, but with a relatively low input intensity. These features may be symptoms of technical problems which could be resolved in an upgrading programme. The second feasibility scheme was to be a government-sponsored project where holdings were fully cropped and the use of agricultural inputs relatively frequent. These features may be indicative of a need for increased farm income and consequently a fair degree of farmer response to technical improvements can be anticipated.

In the selection of a spontaneous/local scheme, the approach of P3S has been to include a Buginese scheme because such schemes contain useful solutions to tidal-land problems. A further consideration has been the desire to distribute government assistance more equally among different sectors of the tidal-land population.

5.2 Rantaurasau

In Rantaurasau the land potential is relatively well utilised but, to accommodate the growing population, the income per holding has to increase in future. An upgrading project may be well received. There are three distinct sub-areas.

In an area with low-lying mineral soils flood protection and water-retention measures will enable the cultivation of a HYV*, short-duration rice on 2,140 ha net, yielding 2.4 t/ha as compared with present yields of 1.0 t/ha. The costs of water-control structures at primary, tertiary and quaternary level, of bunding and levelling of fields and of enlarging some canals are estimated to be Rp 618 million. Depending on the degree of farmer response, the internal rate of return (IRR) will be 15 to 25 %.

In an area with 2,310 ha high-lying mineral soils the gogorancah** method of rice cultivation may yield 1.5 t/ha as compared with present yields of 1.0 t/ha. Changing the hydraulic infrastructure could lead to yields of 1.8 t/ha. However, these changes are not economically feasible because intensive farmer participation is not likely to be forthcoming as yet.

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* High Yielding Variety

** Cultivation method in which rice is seeded under dryland conditions, and in cultivated under wetland conditions in later stages

In an area with high-lying peat soils wet-season drainage will improve the conditions for coconut on 1,830 ha net, yielding 1.5 t copra/ha/yr as compared with 0.8 t/ha/yr at present. This requires changing its drainage base to another river. The costs of water-control measures and quaternary ditches are estimated to be Rp 292 million. The IRR of the project is around 25%.

5.3 Upang (SP)

The Upang (SP) scheme warrants government intervention if Upang Island is to attain a uniform agricultural productivity. A different cropping calendar in a neighbouring government-sponsored area has led to heavy rat infestation. Road connections are poor and there are few signs of a positive exchange of agronomic information between both areas.

The area is suitable for two farming systems; HYV, short-duration rice - palawija, yielding 3.0 t/ha and 0.8 t/ha respectively, and coconut monoculture, yielding 2.5 t copra/ha/yr. Present yields are 1.5 t rice/ha and 0.9 t copra/ha/yr. It is proposed that the farmers be consulted to determine how much rice and coconut they would like to cultivate along each tertiary canal. A water-control structure will be necessary at the interface of the two crops. Other works are similar to those in Rantaurasau. Road connections will be improved, and 945 ha bush and forest cleared.

The costs of improving the hydraulic infrastructure for 2,320 ha net (50% rice, 50% coconut) are estimated to be Rp 690 million. The IRR of the project is assessed at 15-20% depending on what the development will be without government intervention.

5.4 Barambai

The Barambai project scheme is faced with declining rice yields. These are especially disappointing in the Kolamkanan area. This is caused by a number of interrelated features such as soil acidity, poor internal drainage in the wet season and noxious elements originating in the topsoil under stagnant water. From both a social and economic point of view, government assistance is warranted.

It appears that HYV, short-duration rice, under a water-management system which flushes toxic elements out of the topsoil, is able to cope with the prevailing conditions in the Kolamkiri-west sub-area. The project aims at creating appropriate conditions for such a water-management system in an area of 1,760 ha net and at enabling water retention when desired. The average yields would be 2.4 t/ha as compared to present yields of 0.7 t/ha.

The costs of the works are estimated to be Rp 910 million. The IRR ranges from 17-28% depending on the degree of farmer response.

6 THE DESIGNS

6.1 General

Designs of the hydraulic infrastructure were made for Rantaurasau (Jambi Province), Upang (SP , South Sumatra Province) and Barambai (South Kalimantan Province) project schemes, see Figures 4, 3 and 5 (page 22) respectively. The designs were to provide a reasonable cost estimates for feasibility studies and to detail the proposed measures.

Cost estimates are presented. It is advisable to have the on-farm works, with the exception of structures, executed by the farmers themselves. The remaining works in each scheme can be built by contractors within one dry season, from April to November. The construction of the envisaged works will not pose new demands to the contractors as they are similar to those presently under construction. The majority of structures can best be made of timber, although concrete is advisable for the largest ones.

6.2 Rantaurasau

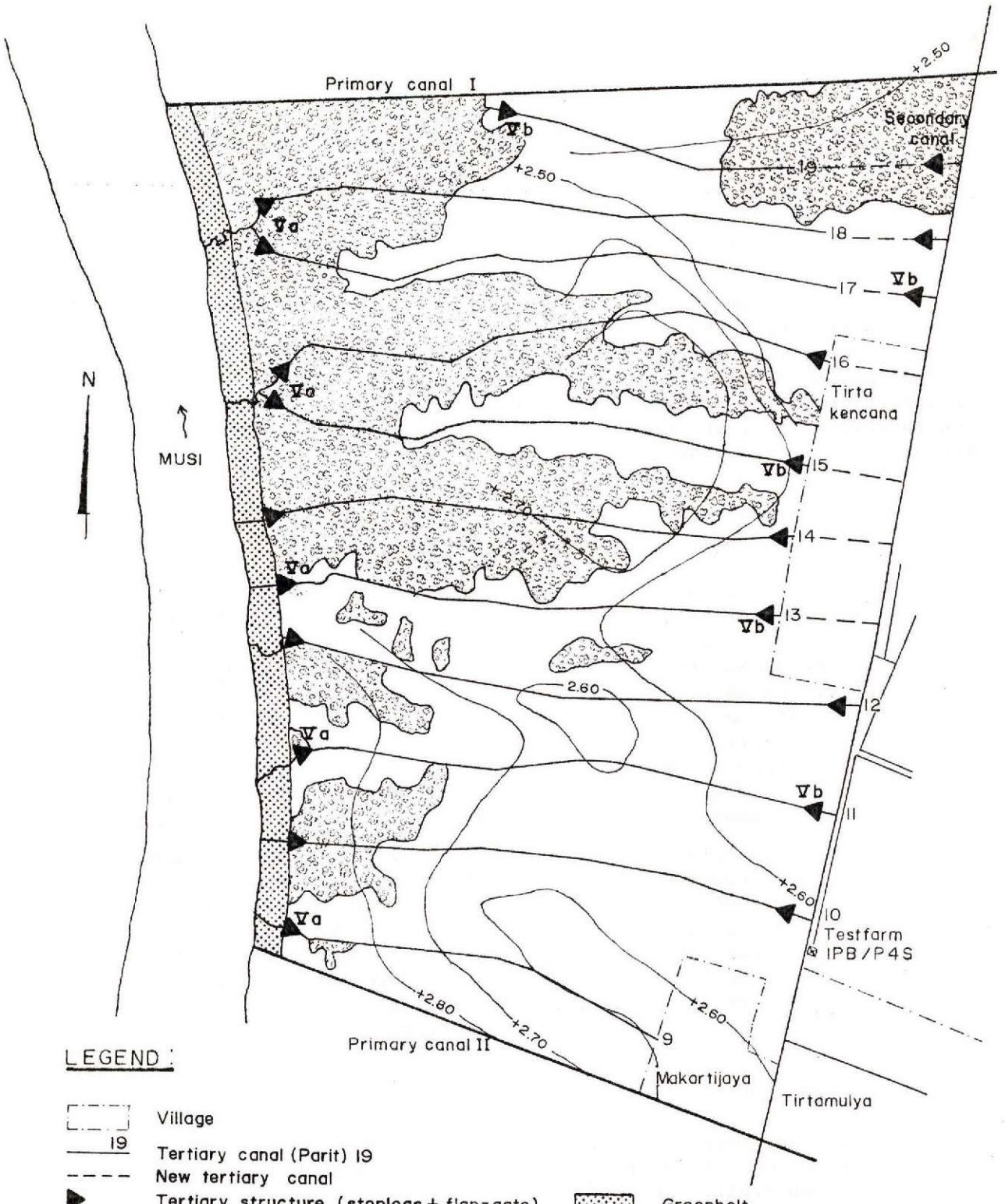
In Rantaurasau, the low-lying area with mineral soils will be made suitable for growing HYV wet-season rice by keeping floods from the Batanghari River out of the area, and by retaining rain-water on the ricefields and river water in the tertiary canals. Water-control structures are envisaged in primary canals FC I and FC II, and at both sides of tertiary canals. These canals will be cleaned and enlarged. On-farm works comprise clay bunds, farm ditches, outlet culverts, and land levelling (200 m^3/ha). During the wet season the system will add a total of 0.1 to 0.2 m of river water to the rain-water available at ricefields for flushing purposes. Some 200 ha forest will be cleared.

The high-lying area with peat soils will be made suitable for production of coconut by providing wet-season drainage, and by retarding the fall of the groundwater-table in the dry season. A water-control structure is envisaged in the main canal. The drainage base of the coconut area will then be the Berbak River, instead of the Batanghari River. Further water-control structures are envisaged at the junction of tertiary and main canals, as well as at each farm ditch. On-farm works further comprise drainage ditches.

6.3 Upang (SP)

In the Upang (SP) project scheme, the system will be able to provide 0.1 m of river water to the ricefield at peak spring-tides after cleaning and enlarging the tertiary canals. Again, water-control structures are required in the tertiary canals and at farm ditches. Further on-farm works comprise clay bunds and land levelling (250 m^3/ha). Some 940 ha is covered by forest and secondary bush. To maintain proper conditions for fisheries, a 200 m wide greenbelt is envisaged along the Musi River.

LAYOUT * HYDRAULIC INFRASTRUCTURE, UPANG (SP)



LEGEND :

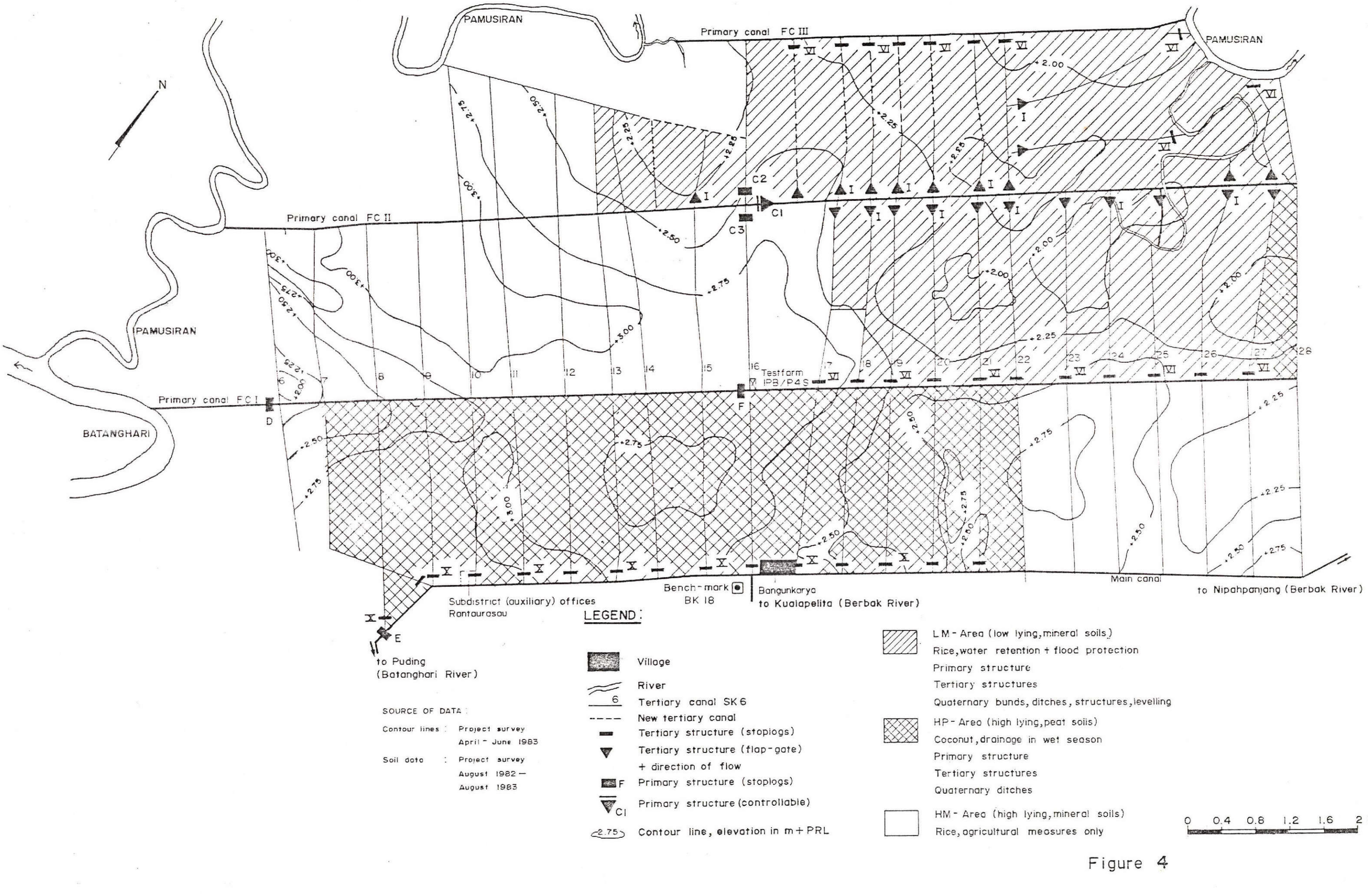
- Village
- 19 — Tertiary canal (Parit) 19
- ---- New tertiary canal
- ▶ Tertiary structure (stoplogs + flap-gate) Direction of flow through flap-gate
- Vb Type of structure
- (2.60) Contour line, m + PRL
- Greenbelt
- Forest and bush to be cleared

0 0.4 0.8 1.2 1.6 2.0 Km

* Farming system 100% rice; in case coconut is cultivated, the location of tertiary structures changes.

Figure 3

LAYOUT HYDRAULIC INFRASTRUCTURE, RANTAURASAU



SOURCE OF DATA :

Contour lines : Project survey
April - June 1983

Soil data : Project survey
August 1982 —
August 1983

LEGEND :

- Village
- River
- 6 Tertiary canal SK 6
- New tertiary canal
- Tertiary structure (stoplogs)
- Tertiary structure (flap-gate)
- \+ direction of flow
- F Primary structure (stoplogs)
- C1 Primary structure (controllable)
- 2.75 Contour line, elevation in m + PRL

- LM - Area (low lying, mineral soils)
  Rice, water retention + flood protection
  Primary structure
  Tertiary structures
  Quaternary bunds, ditches, structures, levelling
- HP - Area (high lying, peat soils)
  Coconut, drainage in wet season
  Primary structure
  Tertiary structures
  Quaternary ditches
- HM - Area (high lying, mineral soils)
  Rice, agricultural measures only

0 0.4 0.8 1.2 1.6 2 km

Figure 4

The draining of coconut areas during the wet season requires farm ditches and water-control structures in each ditch. It is possible to combine coconut and rice growing along one tertiary canal when the coconut is grown at the Musi River side, and the tertiary water-control structure is placed at the interface of the two crop-areas.

6.4 Barambai

In Barambai, on-farm works are of paramount importance to meet flushing requirements and later water-retention demands. Clay bunds are to keep external, possibly contaminated, surface water out of a farmer's plot, and to keep sparse rain or river water inside it. The flushing of the topsoil is enhanced by parallel ditches at short distances of some 30 m. Both water supply and water retention require water-control structures at the farm ditches. Land levelling (250 m^3/ha) will make all these measures effective and is therefore indispensable.

To enhance the removal of noxious elements out of the system, the presently combined canal system will be separated as far as possible into a supply and a drainage system. In this respect three alternative solutions were studied. The recommended alternative has separated tertiary canals, with a few supply canals still to be dug, a new secondary supply canal through the centre of the area and one secondary drainage canal (Kanan). The secondary canal Kiri and the primary canal, however, maintain their present dual functions. The separation of functions requires two secondary and a number of tertiary water-control structures.

Some 300 ha of bush has to be cleared, and the pond at the end of secondary canal Kiri will be closed. The presently designed infrastructure is compatible to a future addition of low-lift pumps should basin-wide studies reveal a priority to Barambai.

LAYOUT HYDRAULIC INFRASTRUCTURE, BARAMBAI

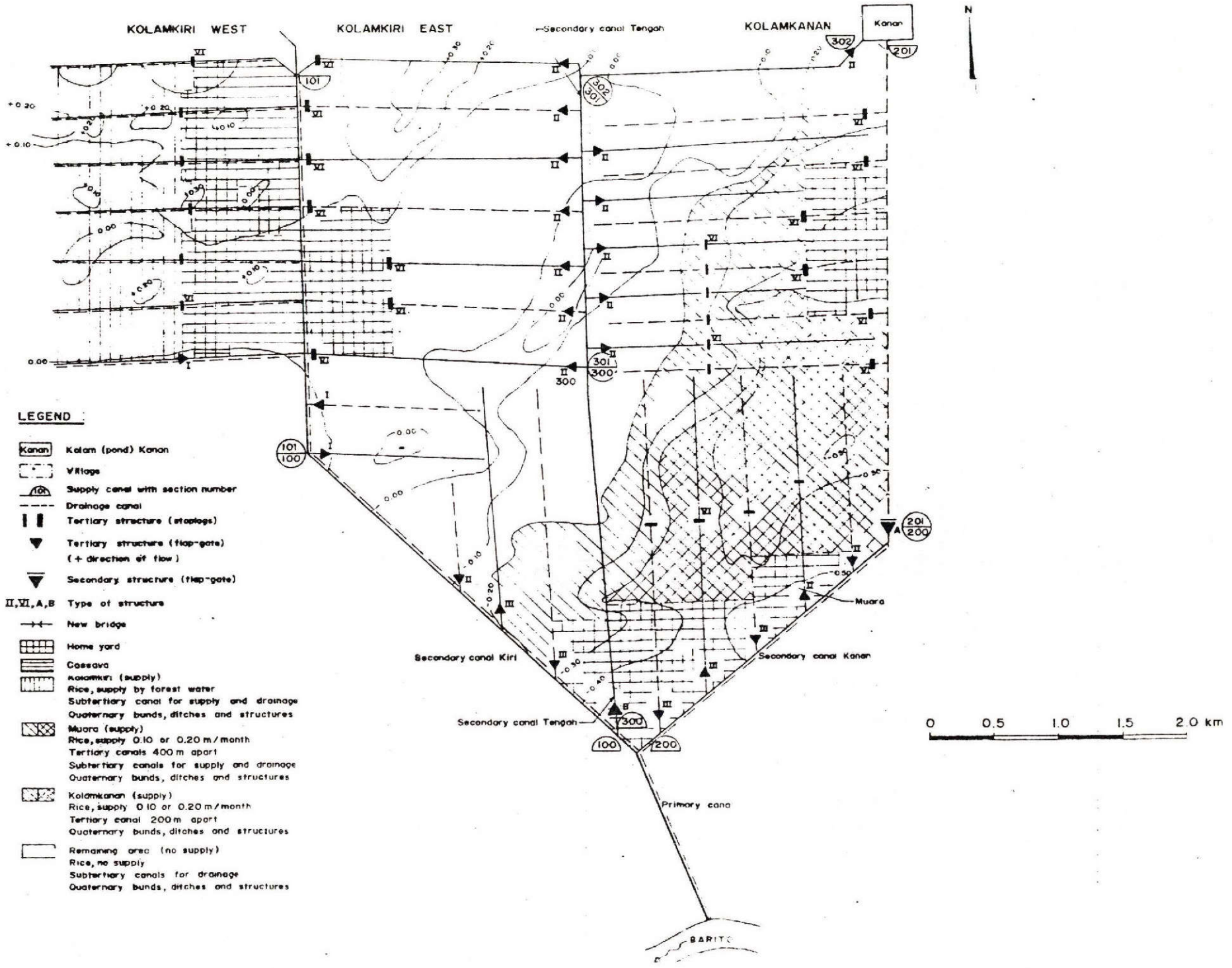


Figure 5

7 PROGRAMMES

7.1 Hydrology

It is anticipated that within 10 to 20 years the supply of irrigation water is an economically viable improvement. It is likewise to be anticipated that the availability of fresh river water for irrigation will be limited. This calls for a careful allocation of the scarce commodity. The required hydrological information to do so centres on upland flow, salinity intrusion and rainfall. As these phenomena show large variations from year to year, they should be recorded over a considerable period, say ten years. The coordinating agencies are DPMA and LMG.

7.2 Upgrading

The activities under this heading belong to the responsibility of P3S.

The present project determined the need for upgrading in a selected number of project schemes. The procedure should be repeated basicly in all existing project schemes, especially in the government-sponsored ones. The investigations per project scheme should be focussed on the land-use intensity, the use of crop inputs, yield-levels of rice, population dynamics since the start of the settlement and off-farm labour opportunities.

Usually, government-sponsored and spontaneous/local project schemes are separate hydraulic entities. Especially in Kalimantan, the same applies to different government-sponsored project schemes. When considering upgrading, it stands to reason to combine several entities if this would lead to a concise hydrological unit covering, for instance, one half of an island.

The constraints to an increased agricultural productivity have to be assessed, both agronomic ones (possibly input supply, rats), soil features (deep peat, acid sulphate soils) and those related to the hydraulic infrastructure (water shortage, floods).

In the consolidated blocks of tidal lands selected for upgrading the hydraulic infrastructure, topographic and soil mechanic surveys have to be executed, after which an outline of the improved hydraulic infrastructure has to be made.

Once the basic approach to improve the hydraulic infrastructure has been agreed upon, detailed designs, technical specifications and a bill of quantities have to be prepared.

Arrangements have to be made for the right of way to construction, compensation of damages to crops, and land titles may have to be checked.

Last but not least, the farmers have to be informed about the coming project and their assumed co-operation in it, viz the execution of the on-farm works as far as earthwork is concerned. The P3S advisors who are to assist the farmers in the implementation stage, have to become involved from this stage onwards.

8 EVALUATION OF TRAINING

Evaluating the training of Indonesian consultants by their expatriate counterparts, two features are worthwhile mentioning. The Indonesian consultants attached to the project, the junior ones even less so then the senior ones, were not permanent employees of a consulting firm . This makes it easy to change one's job, especially as the tidal-land conditions are also harsh for consultants. Further, it does not increase the preparedness of both parties involved for the professionally and mentally laborious process of training. A second observation was that it is very hard indeed to find the proper method to induce the trainees to stop depending on the trainers in the day - to - day decisions in survey and reporting work.

Although levels of skill vary widely between individuals, one of the major obstacles for the development of Indonesian consultancy is the lack of training in a multidisciplinary approach. The capability of a consultant to solve complicated multidisciplinary problems effectively prerequisites an ability to properly integrate the various individual expertises. Besides individual training and co-operation between Indonesian and expatriate specialists in a monodisciplinary manner emphasis was, therefor, put on techniques of multidisciplinary problem-approach and improvement of capabilities in that field.

The Indonesian consultants' staff were put in a position to actively participate in the process of analysing data and reaching conclusions via a series of consultations between the various disciplines during teammeetings. They were actively engaged in data collection and processing in a solution-oriented manner by reporting on issues and presenting them in teammeetings. A set of survey forms was developed and extensively discussed with the persons to use them.

It is felt that the focus on training in multidisciplinary teamwork activities has been successful in view of the increasing participation of the Indonesian professional staff in the team-meetings. The present study has been multidisciplinary and progress has been made, but at the same time it is noticed that the study had a relatively limited scope. The materialised training is considered to be but a few steps on the way to a full-fledged, mature Indonesian consultancy. It is advised to continue the process started and to extend it into more complex studies as the preparation of masterplans and regional planning studies.

To enhance the effectiveness of such training it is advisable to specifically allocate time to activities as class work and in - house training in future assignments of foreign consultants. Such formal training activities would complement the usual on-the-job training. At the end of the training period, a certificate could be issued stating the subjects of the training and the response of the trainees. Such a programme will have to be evaluated during its course and afterwards in close co-operation with P3S to enable an early detection of misconceptions and a corresponding change in procedures or subjects.

APPENDIX I TERMS OF REFERENCE

1. Objective of the Services

The objective of the study is to evaluate the effectiveness of different development systems applied in 18 existing swamp developments in Sumatra and Kalimantan, established under Pelita I and II or even earlier, to identify constraints and to recommend profitable programmes for upgrading to be implemented in the G.O.I.* programme for Pelita IV. A systematic assessment of the first stage low cost/low technology swamp development and a systematic comparison of spontaneous and government-sponsored schemes should provide valuable information to be taken into account in future project preparations. In studying areas of various time classes it would be possible to identify and evaluate time related constraints and levels of development.

For three project areas, viz two government-sponsored and one spontaneous development area, feasibility studies for upgrading should be prepared.

2. Scope of Services

The investigations would primarily focus on the infrastructure (drainage system, water management, structures, transport facilities etc.), cropping patterns, pest and weed controls, and yielding response to water management and other inputs. Characteristic and operational features and conditions of the hydraulic infrastructure (canals and related structures) should be examined in the selected schemes and deficiencies and upgrading requirements determined. To this end data on the extent and depth of inundations, resulting from tides, floods or rain-storms, should be collected and analysed; the quality of tidal water, of drainage effluents and the soil-pH should be monitored periodically, during the dry and wet season. The subsidence and oxidation of peats should be studied. Agricultural practices, past - and present cropping patterns and intensities, inputs and yields should be determined to assess factors which may constrain the attainment of higher yields.

Information on the socio-economic conditions in the selected areas in Kalimantan is being collected by the Lambung Mangkurat University of Banjarbaru and in Sumatra by the Sriwijaya University of Palembang. The Consultants should coordinate their activities with those of the Universities for data collections to avoid and to promote the exchange of information.

The Services should include the preparation of a work programme for follow-up surveys, designs and implementation, specifying data requirements and site specific methodologies for surveys and designs, and prepare in detail some typical tender documents for construction implementation based on the findings of selected schemes.

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* Government of Indonesia

In detail the Consultants would be required to carry out the following:

2.1 Collect information on original designs and on the existing hydraulic infrastructure in the selected areas; determine its effectiveness in respect of drainage, irrigation and transportation; identify constraints and make recommendations for improvements.

2.2 Analyse existing water management and operation practices and procedures in relation to yields and other inputs; identify constraints and prepare recommendations for improvement, if appropriate.

2.3 Collect and analyse information on maintenance requirements for various time periods after first construction; evaluate the maintenance requirements with respect to future design criteria.

2.4 Collect information on the frequencies and depths of inundations; determine their origin; evaluate the effectiveness of the original drainage design criteria.

2.5 Collect and analyse data on the subsidence of peats and unconsolidated mineral soils.

2.6 Monitor periodically the quality of the inundation water and of the drainage effluents in the various systems during the dry and wet season; determine the effectiveness of reservoirs, if any, constructed to prevent or to reduce toxicity.

2.7 Determine soil characteristics (pH) and hydrological conditions in typical areas.

2.8 Examine prevailing farm methods, cropping patterns and intensities, pest and weed control methods; measure yields of crops on various soil types.

2.9 Try to establish relations between yields and hydraulic infrastructure, quality and quantity of irrigation or inundation water, water management practices and soil types.

2.10 Formulate existing production constraints and prepare recommendation which should be implemented to overcome the deficiencies.

2.11 Assess the possibilities for and benefits of dry-season irrigation.

2.12 Prepare short feasibility studies for two (2) government-sponsored and one (1) spontaneous swamp development area.

2.13 Prepare a detailed work programme for follow-up surveys, designs and implementation for upgrading.

2.14 Prepare specifications on data requirements and methodologies for surveys and designs.

2.15 On the basis of the information collected prepare recommendations with regard to the planning and programming of and criteria for future swamp development projects.

2.16 Prepare for some selected areas detail designs and required tender document for construction implementation of upgrading the hydraulic infrastructures in such schemes.

2.17 Matters related to Consultants' work schedule and planning programme should be discussed with the Directorate of Programme Development (Direktorat Program, Sub Direktorat P2WS).

3. Concept of Services

The Consultant will be responsible at two levels:

3.1 Task concept,

this means that the Consultants are completely responsible for the final product in all respects. These aspects are given in detail in the Terms of Reference.

3.2 Training concept,

which means that the Consultant will give training to the best of their ability, but will not be held responsible for the results. The subject in the scope of this project which comes under the training concept concerns the transfer of knowledge to Indonesian Consultants. For training abroad only G.O.I.(P4S) staff will be recruited.

3.3 Expertise and the assignment schedule

It is estimated that the Consultants' services to the project as described in the Terms of Reference of this Contract will require 72 mm of expatriate expertise and 285 mm of Indonesian expertise. The required experts and the duration of their assignments are given in Appendix C.* The expertise as required assignment will be used for possibly required supplementary expertise or for extention of long term assignments if necessary.

3.4 Alternative assignment schedule

The Consultants may submit alternative proposals for the assignment schedule, showing the number and type of professional staff and assistance required for the Consultant's activities and Services to be given to the Project.

3.5 Consultants Services Duration

The duration of the Consultant's Services will be 25 months.

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* (of the contract)

4. General Remarks

4.1 In all aspects of this work the Consultants will make the greatest possible effort to initiate transfer of knowledge and experience and to provide for on-the-job training of Indonesian Project personnel.

4.2 The Consultants should also take into account the following.

4.2.1 One of the important aspects of the Consultants' work for the Project as mentioned also in paragraph 3.2 will be the transfer of knowledge to Indonesian staff in all fields related to the Consultants' tasks, including the survey and management. For this purpose the formulation of survey and design reports and specially designing works should be conducted as much as possible in the Project Office, not in the Home Office.

4.2.2 The Consultants' expatriate project personnel should adapt themselves as quickly as possible to the Indonesian situations and conditions, especially the local living and work conditions at the job site.

4.2.3 All reports and documents will be prepared in the English language.

4.2.4 The Consultants will purchase abroad survey equipment as mentioned in Appendix E8 on a cost plus commission basis.

4.3 The Consultants and their personnel will not be exempted from taxes and charges of any kind imposed under the laws and regulations in the Republic of Indonesia except as set forth in Article V and Appendix G *.

4.4 The Consultants' expatriate project personnel will be required to live in Jakarta.

4.5 The metric system shall be exclusively applied in all design works drawings and calculation. Technical reports shall be submitted in English. All description lettering, be it printed or written, shall be in English.

5. Reporting

5.1 The Consultants shall prepare and submit the following reports with clear identification on the source of information, data on counterpart contribution and a full bibliography:

5.1.1 An Inception Report, summarizing the initial stages and findings of the Consultants together with detailed work programme and supporting requirements within 3 months of the starting date (25 copies to the Government and 5 copies to IBRD).

5.1.2 A Progress Report at the end of each quarter, giving a description of the team activities during the previous reporting period, a summary of interim findings, and a brief indication concerning the planned employment of the team during the subsequent reporting period (25 copies to the Government and 5 copies to IBRD).

* (of the contract)

5.1.3 An Interim Report, which would provide the results of the dry-season survey and detailed programme for the wet-season survey (25 copies to the Government and 5 copies to the IBRD).

5.1.4 A Final Report, which summarizes the major findings and recommendations of the Consultants and contains the Feasibility Study Results of two government-sponsored and one spontaneous swamp development area (25 copies to the Government and 5 to IBRD).

5.1.5 During the implementation of the services the Consultants are responsible for transfer of knowledge and experience to the Indonesian participating Consultant . Therefore the Consultants have to submit Technical Notes describing major/essential aspects of their lectures and instructions within the framework of the transfer of knowledge (25 copies to the Government and 5 copies to IBRD).

5.2 The Consultants will arrange for a continuous photographic record on 35 mm colour slides and black and white photographs throughout the execution of the project.

5.3 The Consultants will be expected to provide all translation services necessary to provide the required Services.

APPENDIX II. PROJECT STAFF

Function	Name	Period(s) of assignment
EXPATRIATE CONSULTANTS		
Project director	Wolf	intermittantly
Land reclamation specialist, teamleader	Wiersinga	09.04.82-29.02.84
Soil and water management specialist	Voncken	29.04.82-03.10.83
Design engineer, hydrologist	Heun	21.06.82-29.02.84
Agronomist	Westerhout	29.09.82-19.10.82
		11.01.83-05.02.83
		11.06.83-13.07.83
		04.09.83-16.10.83
Social planner	Steenwinkel	18.10.82-06.11.82
		11.01.83-04.02.83
		14.02.83-04.03.83
Construction engineer	Wilschut	intermittantly
Economist	Vermeer	29.09.82-20.10.82
		11.01.83-04.02.83
		14.06.83-09.07.83
		05.09.83-21.10.83
		20.01.84-07.02.84
Training specialist	Hulsbos	intermittantly
INDONESIAN CONSULTANTS, PROFESSIONAL STAFF, SENIOR		
Land reclamation specialist, co-teamleader	Hardjono	20.04.82-31.03.84
Soil and water management specialist	Supardja	21.06.82-04.12.83
		15.12.83-31.12.83
		01.02.84-29.02.84
Soil and water management specialist	Mustardjo	23.06.82-13.08.83
Design engineer, hydrologist	Limanow	26.07.82-31.12.83
Design engineer, hydrologist	Siswanto	18.08.82-31.10.82
	Paulus W.	10.01.83-04.10.83
Topographer	Supriatna	04.04.83-12.07.83
Topographer	Nandir	11.04.83-23.07.83
	Rustandi	06.08.83-21.09.83
Agronomist	Mustari	26.07.82-28.02.83
	Sutama	14.02.83-20.12.83
Construction engineer	Sutrisno	20.09.83-19.11.83
Economist	Hudoro	01.06.83-31.10.83
INDONESIAN CONSULTANTS, PROFESSIONAL STAFF, JUNIOR		
Land reclamation specialist	Harryson	01.08.82-02.08.83
Land reclamation specialist	Dudut S.H.	20.08.82-30.11.83
Soil and water management specialist	Suprapto	01.08.82-02.08.83
Soil and water management specialist	Kirana	20.08.82-18.11.82
	Fachman	28.03.83-31.07.83

Function	Name	Period(s) of assignment
Design engineer, hydrologist	D.Hidayat	06.08.82-31.10.83
Design engineer, hydrologist	Yuschal	18.08.82-31.07.83
Design engineer, hydrologist	A.Rachman	06.08.82-22.01.83
	Sriharto	05.04.83-31.07.83
Design engineer, hydrologist	S.Bahri	18.08.82-18.02.83
	Sugiyanto	05.04.83-31.12.83
Agronomist	Hariyanti	06.08.82-09.11.83
Agronomist	T.Mulyani	23.08.82-04.10.82
	Hutapea	22.11.82-22.01.83
	Dedi H.	14.03.83-31.07.83
INDONESIAN CONSULTANTS, TECHNICIANS		
Topographer	Rusman	04.04.83-16.07.83
		06.08.83-19.09.83
Topographer	Yayat S.	11.04.83-31.07.83
Topographer	Yayat Sp.	23.05.83-16.07.83
		13.08.83-24.08.83
Draughtsman	O.Thahar	19.07.82-31.10.82
	Surdan	02.11.82-29.02.84
Draughtsman	Gondo	03.11.82-31.03.84

APPENDIX III REVIEW SCHEMES AND VILLAGES

PROVINCE	TYPE DEVELOPMENT	SCHEMES AS INDICATED BY P4S	SCHEMES WORKSHOP (NR OF VILLAGES)	SCHEMES/VILLAGES ACTUALLY SURVEYED BY UNIVERSITIES	REMARKS	VILLAGES/SCHEMES STUDY AREA, GENERAL DATA COLL.	CODE
JAMBI	government-sponsored	Rantaurasau	Rantaurasau (1)	Bangunkarya	different crops cultivated	Bangunkarya	A
		Simpang	---------	--------	requested by P4S, to be inserted	Rantaumakmur	B
	spontaneous/local	Lagan	Mandahara (2)	Sungaitembikar, east Sungaitembikar, west	only extensive coconut cultivation, to be deleted	------- -------	
				Sungaitawar, sawah		Sungaitawar	C
				Sungaitawar, parit 4		-------	
				Sungaitawar, parit 6	not selected	-------	
				Telukperigi		-------	
		-----	---------	Rantaurasau	pilot project, to be deleted	-------	
SOUTH SUMATRA	government-sponsored	Telang	Telang (2)	Telang I, unit I, Sumberjaya Telang I, unit V, Purworejo Telang II, unit V, canal 17	huge differences within one area and between areas	Sumberjaya and Purworejo -------	D
		Upang	Purwodadi (1)	Purwosari	water-control structure in Purwosari	Purwosari and Purwodadi	E
		Saleh	Saleh, canal 6,8,10 (1)	Saleh II, canal 6, Damarwulan Saleh II, canal 8, Bintaran	scheme just two years old, home-yard intensively cropped	Damarwulan and Bintaran	F
		Sugihan	Sugihan, canal 20 (1)	Sugihan, canal 20, block B Sugihan, canal 20, block A Sugihan, canal 20, block E	like Saleh	canal 20, block A and B -------	G
	spontaneous/local	Upang	--------	-------	requested by P4S, to be inserted	parit 10 - 12	H
		Karangagung	Sungaidua/Teluk(1) Penuguan (1)	Telukbayur, Karangagung Penuguan village		Penuguan and Telukbayur	I
				Sungaibunin Calik River, INPRES school	not requested by P4S, to be deleted	------- -------	
		-----	Sugihan (1)	Sungaisenang, Air Sugihan	depopulated in 1982, to be deleted	-------	
		-----	Saleh, canal 13 (1)	Sungaicawang, Air Saleh	not requested by P4S, to be deleted	-------	
		-----	Muaratelang (2)	Kampong III, Muaratelang parit Muaratelang	not requested by P4S, to be deleted	------- -------	
CENTRAL KALIMANTAN	government-sponsored	Basarang	Basarang (1)	Bungaijaya	differences in crop production	Bungaijaya	J
		Tambanlupak	Tambanlupak (1)	canal A 7	surrounds spontaneous/local scheme	canal A 7	K
		Tambanluar	Tambanluar (1)	Tambanluar		Tambanluar	L
		-----	Terusantengah (1)	?	not requested by P4S, to be deleted	-------	
	spontaneous/local	Tambanlupak	Tambanlupak (1)	Lupakdalam	surrounded by government-sponsored s.	Lupakdalam	M
		Mentayariver	Mentayariver (2)	Samudrakecil	detailed survey underway, to be deleted	------	
				Parebok	mainly coconut cultivation	Parebok	N
		Pangkalanbun	Pangkalanbun (2)	Kumpaibatu Tanjungputri		Kumpaibatu	O
SOUTH KALIMANTAN	government-sponsored	Purwosari	Purwosari (1)	Purwosari I	old scheme, different water management systems	Purwosari I and Baru	P
				Mekarsari	close to Tambanlupak schemes	-------	
		Barambai	Barambai (1)	Kolamkanan		Kolamkanan	Q
		Belawang	Belawang (1)	Belawang		Belawang	R
	spontaneous/local	-----	Marabahan (1)	?	not requested by P4S, to be deleted	------	
TOTAL SCHEMES/VILLAGES		18	27	39		18	

(R. Box)

Swamps I Rest Central.

9000 ha all treated
(mil. emptal soils)
land clearing
$6m US. fencing
water barrier
reallocated
roads.
+ additional research / reed inputs
- leaders. ent^n.

Settlers from cities perform badly.
~~$ 666/ha~~
~~6000 ppg~~
~~9000~~
= 1300 / settler.