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INDONESIATRANSMIGRATION PROGRAM REVIEWSUMMARY OF MISSION FINDINGSTABLE OF CONTENTS

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SUMMARY AND CONCLUSIONS

Background

Programs to wed the surplus labor of Indonesia's inner islands with the surplus land of her outer islands have figured in Government planning for the past seventy-five years. During this time over one million poor and landless farmers have been moved, mainly from Java, and at least two million Javanese now reside in the outer islands as a direct result of transmigration and associated population growth.

In recent years transmigration has come to be seen as an increasingly important tool for addressing a number of national objectives: providing opportunity to the landless, protecting critical lands, increasing food production and promoting regional development. For this reason, in 1978 the Government proposed a massively expanded transmigration program for its third five year plan (Repelita III) which called for the movement of 500,000 families between 1979 and 1984. In support of this program the Bank funded a second transmigration project to resettle some 30,000 families and tentatively committed itself to finance additional projects as they were prepared.

Following slow start-up in both Government and Bank-assisted projects, the World Bank sent a Transmigration Program Review mission to Indonesia in October 1979 to define the key constraints to an expanded transmigration program, to address general issues of program conceptualization and to make recommendations on the form of future Bank participation within the transmigration program. At the same time a separate team was deployed to investigate the special issues associate with swampland development for transmigration. This report is a summary of the mission's observations and recommendations on the upland or rainfed transmigration program. A list of working documents is appended as Annex 1 and a summary of the report on swampland development is attached as Annex 2.

Main Mission Findings

The main conclusions of the Transmigration Review team are as follows:

1. As expected, the team found a number of persistent problems associated with the overall transmigration program. These center on technical problems resulting from the chosen farm model and method of land development, and include problems of organization and staffing and questions of cost and scale.

2. In spite of the many problems entailed in this very difficult activity, however, it is fair that the significance of the national objectives to which the transmigration program is addressed, the very strong commitment of Government to it, and the improvement migrant settlers experience in their own lives justifies a significant Bank role on the Repelita III transmigration program.

3. At the same time, there appears to be little justification for Bank involvement focussed primarily on regionally specific projects. This is indicated by the fact that success in Bank projects depends on the same institution-building and innovative activities required in GOI financed projects, that an emphasis on Bank projects draws resources from GOI projects, and because the credibility of the program rests on the success of all projects, not those of the Bank alone.

4. For this reason it is recommended that the Bank shift its focus from regionally specific projects to more encompassing efforts including resettlement plus assistance for circumventing key constraints to program implementation, for promoting institution-building and for supporting the innovative work upon which program expansion will depend.

5. It is further recommended that this shift occur in the context of broad mutual agreement, particularly on the need for flexibility and experimentation on early projects, on the scale of the program, and on the general procedures for circumventing significant program constraints.

Key Constraints

Four major constraints to the expansion of the transmigration program in areas dependent on rainfed agriculture were identified: (a) the absence of agricultural packages suited to varying agroclimatic settings, management systems and input possibilities; (b) weaknesses in the newly established mechanisms of program coordination; (c) an overemphasis on uniform procedures for physical planning, land development and timber disposal; and (d) problems in the effective use of resources allocated for transmigration. Steps have already been taken by GOI to alleviate a fifth constraint noted by the mission, the absence of a pipeline of projects suitable for GOI or foreign financing.

The Agricultural Package. The low productivity of migrants dependent upon the cultivation of foodcrops in rainfed areas has cast doubt upon their ability to purchase the inputs required to sustain production once free supplies have ceased. Therefore to avoid the proliferation of very marginal transmigrant communities, GOI should: (a) in the course of project implementation explore a wide variety of farm models and management systems to promote income diversification and reduce risk; (b) strengthen agricultural support services in major receiving provinces; and (c) assure that the strategy for developing the entire farm holding is determined at settlement so that farmers can maximize the use of their land.

Program Coordination. Under Presidential Decree 26/78 responsibility for the implementation of transmigration has been taken from a single implementing agency, the Directorate-General of Transmigration and given to line agencies ordinarily responsible for activities in each sector. Under this new arrangement a large number of Directorates General are involved in the program and their integration has already become a major block to effective project implementation. In the short-run, therefore, it will be

necessary to strengthen coordinating mechanisms at every major level of operation - the Junior Ministers' Office, Project Coordinator's and Deputy Project Coordinator's offices and at the level of the various ministerial technical teams. Additional institution-building and manpower training will also be required within the involved Directorates. To this end, the following steps have been recommended: reorganization of TKTD and technical assistance in support of its data collection, screening and mapping functions; assistance to PTPT for training of land clearing supervisors and soil conservation teams; reorganization within DGT, plus full and immediate support of training programs for DGT staff and transmigrants. It has also recommended strengthening the agricultural technical team in Jakarta and provincial offices in main receiving provinces, formalizing and institutionalizing procedures for land alienation and compensation, and improving the ability of the Directorate General of Forestry to manage forest inventories and timber disposal.

Physical Planning, Land Development and Timber Disposal. At the present time, GOI has adopted uniform procedures for physical planning, land development and timber disposal. Field observations suggest, however, that this may be premature. The wide divergence of opinion on these topics reflects the fact that there is more than one answer to each of these problems. To ease constraints to physical planning, for example, attention can be given to: (a) developing farm models which are less slope specific and reduce preplanning requirements; (b) adopting different procedures for different types of terrain; and (c) experimenting with procedures which limit preplanning and increase the authority of on-site staff. A wide variety of land clearing operations using both contractors and migrants is also required to permit results in terms of speed and agricultural impact to be compared. Similarly, various methods of timber disposal should be tried before a single system is adopted. Given the desire for uniform models and procedures to simplify implementation, the GOI might wish to attempt innovative components in demonstration projects and explore alternate models for development primarily where special managerial resources exist.

Resource Use. The amount of money available for transmigration is for the moment a lesser constraint to program development than its appropriate use. Not surprisingly the proposed transmigration program has a more dramatic effect on the budgets and priorities of underpopulated provinces than on food production or population redistribution in the nation as a whole. For this reason efforts must be made to achieve high cost effectiveness in the transfer of benefits to transmigrants and to assure that these resources benefit local people as well as those who move. Cost effectiveness can be realized by improving quality control; by modifying project components; by increasing the emphasis on spontaneous migration as an adjunct to sponsored settlement; and by reducing the speed and scale of program implementation. Increasing benefits to local people can be accomplished by fully involving local and provincial authorities in decision-making, by regionalization of offices, by paying strict attention to the legal aspects of land alienation and compensation and by making project benefits available to local people. Without attention to these aspects of the program, transmigration could lose the provincial support on which its stability depends.

The Bank's Role in Transmigration

The mission has proposed further discussion with Government on the following topics:

Policy

1. Agreement in principle on increasing the range of acceptable project components in areas such as farm models, land clearing methods and management systems.
2. Agreement in principle on focusing program and slowing proposed rate of planning and implementation.

Institution Building

Discussion is required on the following subjects:

1. Procedures for developing project components to:
 - (a) strengthen the agricultural technical team;
 - (b) establish training centers for extension workers;
 - (c) provide technical assistance to DGT for reorganization and manpower training;
 - (d) strengthen TKTD's ability to coordinate other agency input into project preparation;
 - (e) support to PTPT for supervising land clearing and soil conservation activities in the GOI program;
 - (f) monitor land clearing;
 - (g) increase on-site coordination in GOI projects; and
 - (h) develop policies and institutional arrangements for land alienation and compensation.
2. Inclusion of these components within the project pipeline.

Support for Key Start-Up Activities and Demonstration Projects

Discussion is also required on:

1. The means of initiating agricultural activities in main receiving provinces.

- v -

2. Projects to demonstrate innovative approaches to farming systems, land clearing and the like.
3. The relationship between these activities and the proposed project pipeline.

1. BACKGROUND

Past Program Performance

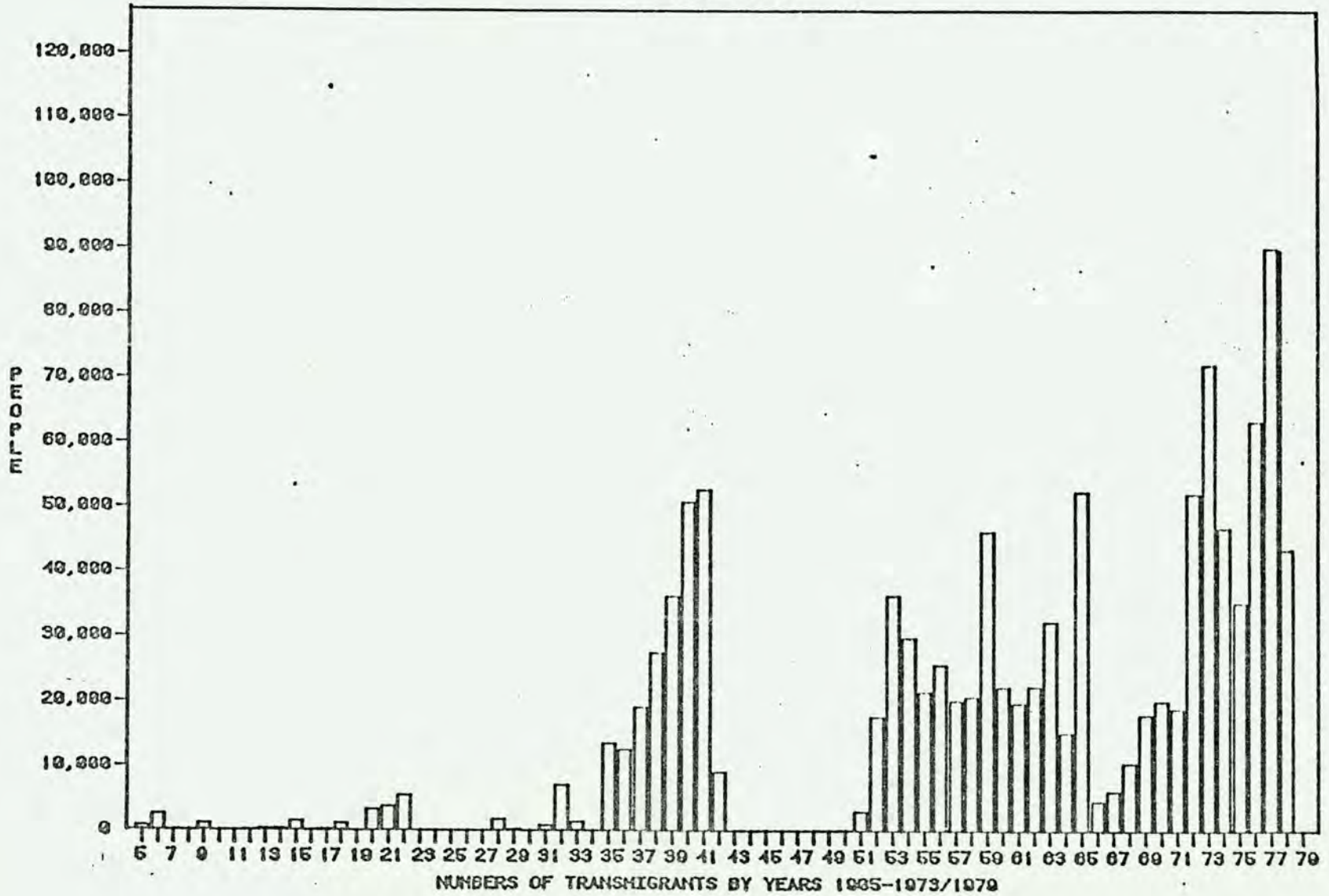
1.01 Indonesia, the fifth largest nation in the world, contains 142 million people, 92 million of whom reside in Java, an island with about 7% of the nation's land. Seventy percent of Java's total area is cultivated and population densities in irrigated areas rise to 2,000 people/sq km. At the same time vast areas of low fertility soil lie uncultivated in the outer islands and low population densities in some of these areas impede regional development and economic growth. These facts have been so striking for so long that programs to wed the underutilized labor of Java with the underutilized land of the outer islands have figured in the programs of Indonesian Governments for three-quarters of a century. Together these programs have resulted in the movement of more than one million poor and landless farmers and it is estimated that more than two million people are now in the outer islands as a direct result of transmigration programs and associated population growth.

Recent Program Developments

1.02 In recent years transmigration has come to be seen as an increasingly important tool for providing relief to a number of critical problems.

- (a) Providing Opportunity to the Landless. Over 80% of Java's people live in rural areas. Of these perhaps 40% are landless and another one-third live on less than subsistence-sized plots. The hunger for land and opportunity among Java's poor is so strong that 500,000 families have applied for the transmigration program and this has become a major element in the importance attached to transmigration in Repelita III.
- (b) Protecting Critical Lands. With increased pressure on the land poor farmers in densely populated provinces have begun to cultivate increasingly steep slopes in upper watersheds causing erosion and flooding. Transmigration is therefore seen as a part answer to the resettlement of farmers from such critical lands and to the relocation of people displaced by disasters and development projects such as dams and roads.
- (c) Increasing Food Production. Transmigration can potentially address the problem of food production in two ways: (i) by providing the opportunity for food self-sufficiency to those previously dependent on the lands of others, and (ii) by making surplus food production possible in some areas which have food deficits.
- (d) Promoting Regional Development. There remain in the outer islands regions with population densities so low that area development is economically unfeasible. In some of these cases transmigrants

GOVERNMENT SPONSORED MIGRANTS
TO THE OUTER ISLANDS
1905-1979



can provide the critical mass to attract infrastructure, services (such as extension, and clinics), labor and markets. For this reason transmigration has been given a growing role in regional development and in some sparsely populated provinces it now provides a major part of development funds.

Formulation of the Repelita III Program

1.03 In response to these developments the Third Five-Year Plan (Repelita III) proposed the settlement of 500,000 transmigrant families between 1979 and 1984. These families would be moved to 250 settlements located mainly in Sumatra, Sulawesi, and Kalimantan. Table 2 gives a breakdown of these figures, shows the type of settlements proposed and gives an indication of the extent of Bank participation originally anticipated by the GOI. It is noteworthy that in the initial stages of program formulation, Bank assistance was projected for up to 48% of proposed resettlement. To meet the cost of transmigration the indicative budget for Repelita III allocated Rp 1,240.7 billion (US\$2.0 billion) for manpower and transmigration (of which approximately 88% was for transmigration alone), and the program absorbed 5.7% of the projected development funds. In support of this program the World Bank has assisted a second transmigration project based on food crop production and intended to resettle 30,000 families and rehabilitate 4,000 others, and it tentatively committed itself to support of future transmigration projects as they were prepared./1

Table 2: TARGETS FOR REPELITA III
(Settler Families)

| | 1979/80 | 1980/81 | 1981/82 | 1982/83 | 1983/84 | Total |
|---|---------------|---------------|----------------|----------------|----------------|----------------|
| Tidal reclamation | 24,000 | 16,000 | 16,000 | 16,000 | 16,000 | 88,000 |
| Rainfed food cropping | 26,000 | 34,000 | 34,000 | 39,000 | 40,000 | 172,000 |
| <u>Total GOI projects</u> | <u>50,000</u> | <u>50,000</u> | <u>50,000</u> | <u>55,000</u> | <u>56,000</u> | <u>260,000</u> |
| Bank-assisted projects (rainfed and tidal) | - | 25,000 | 50,000 | 70,000 | 94,000 | 240,000 |
| <u>Total projects</u> | <u>50,000</u> | <u>75,000</u> | <u>100,000</u> | <u>125,000</u> | <u>150,000</u> | <u>500,000</u> |

/1 The first transmigration project was approved in 1976 and involved the rehabilitation of one community of 12,000 families and the establishment of a community for 4,500 others. Project components differed from Transmigration II in the provision of one hectare of block planted rubber.

1.04 Shortly after the beginning of Repelita III major problems in the start-up of the Transmigration Program became evident and it became apparent that the mechanism for producing a pipeline of projects suitable for Bank financing did not yet exist. For these reasons the World Bank sent a Program Review mission to Indonesia to define key constraints to an expanded transmigration effort, to evaluate ways to circumvent these constraints, and to make recommendations on the form of future Bank participation within the transmigration program.

Main Mission Findings

1.05 Status of the GOI Program. Between April 1, 1979 when Repelita III began and October 1, 1979 when the team visited Indonesia, Government had moved about 8,000 families virtually all of whom were counted against Repelita II targets.^{/1} About 100 of the 50,000 families targeted for movement in 1979/80 had been resettled. A list of areas for development during the third five-year plan had been approved by the interministerial policy making body (the BAKOPTRANS) but the precise designation of actual sites had not yet occurred. Given the short preparation period available to Directorates involved in planning, all sites for the 1979/80 GOI program were being developed on a plan-as-you-proceed basis^{/2} and the first GOI projects to be fully mapped were not expected to be implemented until 1981/82. PTPT, the agency within Public Works responsible for land clearing for transmigration, had cleared 34,000 ha in 13 sites by September 1979 and appeared confident of meeting its target of 79,000 ha before the end of the fiscal year (March 31, 1980). Due to a lack of coordination between agencies, however, very little of this land was likely to be settled in the first year of Repelita III. Of general significance in these figures were two facts, (a) that startup was much slower than anticipated, and (b) that physical planning, project preparation and project implementation were proceeding on the assumption that 500,000 families would still be settled in Repelita III. Efforts had been made to strengthen the coordinating mechanisms but the Office of the Junior Minister remained weak.

1.06 Scale. Of general significance in the above figures were two facts, (a) that startup was much slower than anticipated, and (b) that physical planning, project preparation and project implementation were proceeding on the assumption that 500,000 families would still be settled in Repelita III. While the mission recognized the importance of setting high targets as a means

^{/1} Repelita II targets must be met before Repelita III targets are addressed as funds allocated for this purpose have already been released to the line agencies.

^{/2} In plan-as-you-proceed projects, land clearing is done and then mapping occurs. Public Works officials view this as a transitional procedure necessitated by the need to settle migrants before standard physical planning can be completed.

of mobilizing institutions and staff for the transmigration program it was concerned that retention of these targets would overstretch existing institutions and cause consequent deterioration in standards of work. In addition, the mission felt that the number of technical and ecological problems involved in transmigration made it impossible to ignore the risks which might be associated with a program on the scale proposed.

1.07 Technical Problems. Most of the potential sites for transmigration settlement are in isolated areas, where soils are of low fertility and in many cases topography is undulating. Therefore, whether the land is under primary forest or *alang-alang*, the technical considerations when bringing it into permanent cultivation are considerable. The main sources of technical problems appear to center on the following topics each of which will be considered in more detail in subsequent chapters.

- Farm Model. Planning for upland transmigration settlements assumes the application of a uniform model for farm development, which gives priority to food crop production and requires continuous dependence on purchased fertilizers. In the mission's view, one of the most significant problems facing transmigration is that exclusive application of this model would lead to underutilization of some land and potentially expose farmers to serious risk if input supplies or sustained production failed.

- Methods of Land Clearing. Although PTPT (the agency within the Ministry of Public Works responsible for land clearing for transmigration) had cleared 34,000 by September 1979, field observations suggest that land clearing in some forested areas is causing soil damage which could lead to crop failure once the land is settled. The scale of clearing is also such that the wider ecological implications of land clearing primarily in forested areas are also of considerable significance.

- Low Recovery of Forest Products. The importance attached to speed and to mechanical land clearing, coupled with the lack of incentives for contractors and concessionaires to fully exploit forest resources, has led to the destruction of considerable timber at settlement sites being developed in forested areas, even though the estimated potential recoverable value of these resources frequently exceeds the cost of land clearing.

1.08. Problems of Organization and Staffing. While the transfer of program implementation responsibility from the DGT to the technical ministries as a result of Decree 26/78 will ultimately have the effect of vastly increasing the range of skills and number of people who can be deployed for transmigration settlement development, the short-term effects of the major shift in responsibilities have been disruptive. The main problems being encountered are the following:

- Shortage of Experienced Staff. All institutions lack staff with experience in transmigration and recruitment of suitably qualified staff is sufficiently difficult that important positions are unfilled (particularly in the Office of the Junior Minister).

- Coordination Problems. The divergent views of the various Ministries represented on the Central Coordinating Body for Transmigration (BAKOPTRANS) have led to prolonged discussion on many basic issues, including the selection of sites for settlement during the five-year plan period. However, both the authority and manpower accorded to the Junior Minister for Transmigration has thus far been insufficient to enable it to resolve such problems expeditiously.

- Centralization of Transmigration Planning. Although transmigration is assuming a major place in the development of many provinces in the outer islands, planning (because of staff constraints) and interagency coordination remains highly centralized. The lack of a formal means of involving provincial authorities in the transmigration program may potentially lead to difficulties in securing suitable land for settlement and in integrating the transmigration program with regional development plans.

- Time Constraints on Planning. Because of the lack of time to organize on-site surveys for the 1979/80 program, development at all GOI-financed sites has been initiated on a "plan-as-you-proceed" basis. While there is much to commend in this approach when there is an ample availability of experienced staff for on-site supervision and a reasonable knowledge of resources in the area, field observations suggest an emphasis on speed is currently resulting in low quality land clearing and poor agency coordination.

- Potential Problems in the Provision of Agricultural Services. The food crop farm model presumes the timely availability of agricultural inputs (seed, fertilizers, pesticides and extension) in areas of the outer islands which do not generally have these services available at present. This fact combined with erratic input delivery in Transmigration I sites, which are among the best managed and most accessible sites in Indonesia, leads to considerable concern about the viability of the farm model and the procedures for input delivery in the dispersed sites proposed for Repelita III.

1.09 Cost-related Problems. Although the high priority attached to the transmigration program has ensured that budgeted funds are not a constraint to its implementation, costs of settlement have been rising at a rate which must cause concern. Public sector investment for each transmigration family has risen (in real terms) by 16% per year since 1969/70. Major reasons for this are the Government's desire to ensure that all settlers' needs are provided for and the pressure to meet deadlines. Measures to involve the settler more fully in development of his own holding and to promote spontaneous migration would reduce costs, lead to a more equitable distribution of investment resources between the population and increase the identification of the settlers with the program.

Conclusions and Recommendations

1.10 Preliminary Conclusions. Based on mission findings, the Transmigration Program Review team concluded that the start-up period for the new Repelita III Transmigration Program was likely to be a protracted one, and one entailing frustrations for both Bank and GOI; but that in spite of its many problems, the program merited significant Bank support. The team felt that the significance of the national objectives to which the program was addressed, Government's strong commitment to the program as reflected in the massive reorganization of its administrative structure and the commitment of manpower and funds, and the satisfaction expressed by settlers in most transmigrant communities all appeared to justify significant Bank role in the Repelita III transmigration effort.

1.11 At the same time the team concluded that there appeared to be little justification for Bank involvement in the transmigration program on a site by site basis. The reasons are several: the success of Bank-assisted projects depends on the same institution-building activities required by GOI-financed projects; an emphasis on Bank projects takes personnel and attention from GOI efforts; and the success of Bank participation in the program is even now measured by the achievement of the objectives of the program as a whole, not of isolated Bank projects.

1.12 Based on these findings, the Transmigration Program Review team has recommended that the Bank shift its focus from regionally specific projects to more encompassing efforts including resettlement components and assistance to GOI to: (a) circumvent key constraints to program implementation; (b) to promote institution-building; and (c) to support the innovative work upon which future program growth depends. It also recommended that this shift occur in the context of broad mutual agreement on such matters as flexibility and experimentation in early projects, program scale, and procedures to circumvent key constraints. The ensuing chapters give more detail on these key constraints and give recommendations on options to overcome them. Chapter 6 makes recommendations for an expanded Bank role within the transmigration program.

2. KEY CONSTRAINTS: THE AGRICULTURAL PACKAGEThe Problem

2.01 In general, Indonesian soils with good agricultural potential are already in use. Remaining areas with more modest development potential include tidal and freshwater swamps and upland areas with soils of low natural fertility. These areas, consisting mainly of red-yellow podzolics and latosols, are widespread in Sumatra, Kalimantan and Irian Jaya, and the sheer volume of such land suggests the urgency attached to programs intended to bring some of these areas into agricultural production (see Table 4).

Table 4: DISTRIBUTION OF AREAS OF RED-YELLOW
PODZOLIC SOILS

| | ha million | % of region |
|--------------|-------------|-------------|
| Sumatra | 20.6 | 43.5 |
| Kalimantan | 16.1 | 29.9 |
| Sulawesi | 2.0 | 10.3 |
| Irian Jaya | 9.6 | 23.0 |
| <u>Total</u> | <u>48.3</u> | <u>29.8</u> |

2.02 Traditional food crop production on red-yellow podzolic soils produces low income levels, but research by CRIA (Central Research Institute for Agriculture) has suggested that improved cropping systems, fertilizer use and pest control in these areas can significantly increase food crop yields and incomes. Income on selected fields in Way Abung, a transmigrant community in Sumatra earmarked for rehabilitation under Trans I, were increased from Rp 210,000 (US\$336) with farmers practices to Rp 600,000 (US\$960) with unconstrained inputs and CRIA management; and in Baturaja, a new community in a nearby area they were increased even more dramatically.^{/1} Whether these results can be obtained on a large-scale and whether they are applicable throughout Indonesia are matters which are still subject to considerable dispute, nevertheless, this work together with national priorities stressing food crop production led directly to the adoption of a food crop model for all upland transmigration sites to be developed in Repelita III.^{/2}

^{/1} For details see the Working Paper: Cropping Systems for Red-Yellow Podzolic Soils - CRIA.

^{/2} This model involves an 0.25 ha houselot, 1.00 ha of clean cleared land for food crop production, and an additional 2.25 ha of land allotted for future agricultural development.

2.03 Recent work by Bank staff suggests, however, that the early promise of CRIA research may be difficult to realize in farmers fields. Reports by farmers and crop cuttings in Baturaja and Way Abung suggest that actual yields are both low and extremely variable. Of 592 farmers interviewed in communities dependent on rainfed agriculture only 9% reported obtaining more than one ton of rice per family per year (about subsistence for a family of five). Nearly two-thirds reported less than half this amount (Table 5). This was true even where free inputs were still being provided by the project. Low yields were due to some factors beyond human control - for example, erratic climate and poor soils, and to some amenable to influence - unreliable fertilizer supplies, manpower shortages, and problems of pest and weed control. Taken together, however, these data have cast doubt upon the ability of migrants to invest in the inputs upon which sustained food crop production depends, and they have raised questions about the appropriateness of a single farm model based on food crop production for all transmigrant communities.

Options

2.04 To avoid serious risk to farmers moved through the transmigration program, the following options merit attention: (a) increasing the range of farm models available and in particular developing farming systems less sensitive to the timely and sustained use of inputs; (b) improving the quality and coordination of agricultural support services in transmigration areas; and (c) assuring that the strategy for farm development is determined at settlement so that farmers can maximize the use of their land.

2.05 Principles of Farm Development. In pursuing these options it is necessary that the following principles be taken into account in planning for agricultural development in transmigration areas.

- (a) Land should be developed according to its capability.
- (b) The maximum amount of land with an economic potential for any type of agriculture should be developed within an area opened up for settlement and commanded by infrastructure.
- (c) Given severe managerial shortages in Indonesia, farming systems must assume farmer management, particularly in the early years of settlement.
- (d) Farming systems should be designed to ensure a supply of food crops to meet the subsistence needs of the settler family at least during the establishment period and preferably longer.
- (e) The individual farm should be developed to take fullest advantage of the allocated land and of the particular aptitudes of the settlers.
- (f) Farming systems, for application at the individual farm and community level, should involve diversified income opportunities as a means of reducing risks.

Table 5: YIELDS REPORTED IN FIVE TRANSMIGRANT COMMUNITIES /a

| Community | Number of years on site | Rice yield per family per year (kg) | Hectares under cultivation | Yield per hectare /b (kg) | % farmers using inputs | % families reporting | | | | |
|--------------------|-------------------------|-------------------------------------|----------------------------|---------------------------|------------------------|----------------------|-----------------|-------------------|-------------|--|
| | | | | | | No rice yield | 500 kg or under | 1,000 kg or under | Sample size | |
| <u>Rainfed</u> | | | | | | | | | | |
| Sitiung II | 1 | 314 | 0.60 | 526 | 100/c | 20 | 89 | 100 | (35) | |
| Sitiung I | 2 | 221 | 1.19 | 262 | 100 | 46 | 96 | 98 | (45) | |
| Baturaja I | 1.5 | 623 | 0.93 | 669 | 85 | 6 | 72 | 81 | (32) | |
| Rimbobujang II-V | 1.5 | 441 | 1.87 | 235/d | 98 | 18 | 75 | 96 | (178) | |
| Rimbobujang I | 2.5 | 992 | 1.66 | 597 | 71 | 4 | 26 | 72 | (114) | |
| Way Abung 9-12 | 4-5 | 504 | 1.05 | 484 | 29 | 16 | 68 | 96 | (70) | |
| Way Abung 7-8 | 5-6 | 757 | 1.47 | 514 | 22 | 6 | 50 | 92 | (36) | |
| Way Abung 4-6 | 7-8 | 585 | 1.39 | 420 | 9 | 7 | 59 | 91 | (44) | |
| Way Abung 1-3 | 9+ | 462 | 1.02 | 452 | 25 | 0 | 76 | 97 | (38) | |
| <u>Tidal /e</u> | | | | | | | | | | |
| Upang-Purwoharjo | 2 | 2,248 | 1.19 | 1,893 | 0 | 0 | 3 | 11 | (37) | |
| Upang-Tirtakencana | 4-5 | 2,371 | 1.80 | 1,312 | 0 | 0 | 0 | 3 | (37) | |
| Upang-Tirtamulia | 5-7 | 2,747 | 1.90 | 1,443 | 0 | 0 | 2 | 5 | (41) | |
| Upang-Purwosari | 7-8 | 1,865 | 1.85 | 1,006 | 0 | 0 | 11 | 12 | (63) | |
| Upang-Makarti | 9 | 2,664 | 2.30 | 978 | 0 | 0 | 2 | 29 | (41) | |

/a Farmer reports are typically lower than agricultural department statistics. This is due in part to the fact that agricultural department statistics are extrapolated from measured 5 meter-square plots on harvested fields, fields which fail are not measured and for this reason the statistics overstate aggregate yields. Harvests in the year of most of these surveys were also rather poor.

/b Farmers cannot judge the percent of a field which is cultivated, particularly in primary forest areas which have residual logs and stumps. For this reason, this statistic which represents the farmer's reported yield divided by the total area he reported cultivating is not comparable between villages.

/c In Sitiung, Baturaja and Rimbobujang, fertilizer is provided by the project. In many cases, however, poor timing has made it less effective than it might otherwise be.

/d Field area is overstated in this community. These fields are newly felled by migrants and have perhaps 0.50-0.60 ha of plantable land, thus distorting productivity on a per hectare basis.

/e Wet field padi. Upang Delta is one of the most successful of the tidal developments and may not be representative of all communities of this type.

- (g) Settlements should be established at relatively low cost to promote GOI's equity objectives.

Within these criteria, however, a wide range of farming systems may be viable and experimentation to explore alternatives should be strongly encouraged.

2.05 Developing Alternative Farming Systems. A single farm model based on 1.0 ha of food crops and 2.25 ha allotted for future farm development does not make good use of very poor soils or undulating land, nor does it assure adequate income or risk avoidance in marginal or remote areas. For this reason, the development of alternate farm systems suited to different agroclimatic conditions and different management and input possibilities must be given the highest priority by GOI and the Bank. These farming systems might be based on food crops, food crops followed by or intercropped with tree crops or possibly on tree crops or cash crops alone. Where food crop production is to be emphasized increased attention to income diversification and risk reduction through the introduction of large and small livestock, fuel and firewood components, subsidiary income earning activities and off-farm employment in the dry season should be encouraged and these components should be treated as an integral part of the design of projects largely dependent on food crops. However, in the majority of settlements where soils are poor, the land is undulating, climate is erratic or services remote, farming systems must be developed which minimize dependence on the timely delivery of and renewed investment in inputs. These farming systems are likely to be based on food crops in the establishment period followed by tree crops as soil fertility declines.

2.06 These two approaches are not the only ones suited to transmigration, and one of the most important conclusions of the Program Review is that farm models for large-scale transmigration will require more experimentation, more flexibility and more regional specificity than presently assumed.

2.07 Strengthening Agricultural Supporting Services. Extension workers in Baturaja, a Bank-assisted project, have reported seed with a germination rate of 13%, and the timely provision of fertilizer remains a constraint to agricultural development, in this area. This, in one of the most accessible and closely monitored communities in the transmigration program, leads to serious concern about the ability of the GOI to provide appropriate and timely inputs in the large number of dispersed sites proposed for Repelita III. Therefore, regardless of farm model, strengthening agricultural supporting services both in Jakarta and the provinces will be critical to program success. To do this the following activities should be given high priority.

- (a) The Agricultural Technical Team for transmigration (in the Ministry of Agriculture) should be strengthened in order to plan and monitor the provision of agricultural inputs, and to assist in the coordination of the preparation of agricultural components. This should be done by the provision of additional space, staff, and, if required, consultant services to assist in the definition and design of appropriate components and to evaluate their delivery and impact.

- (b) Agroclimatic conditions and research priorities for the areas to be developed should be defined and research should be initiated by the AARD which is regionally specific and focused on total farming systems. To the extent that this research strains the capacity of existing agencies, technical assistance should be provided to initiate studies and train counterparts.
- (c) When major receiving areas are identified, seed farms and seedling nurseries should be established as early as possible in the settlement process. These facilities should serve sponsored migrants, spontaneous settlers and locals, under various types of cash and credit arrangements.
- (d) Supplementary training of agricultural personnel for transmigration such as agricultural site managers and PPLs should be given very high priority. Training areas in the outer islands should be identified, facilities expanded, courses begun in extension for transmigration, and transmigration training materials developed./1
- (e) The agricultural staff in the main settlement provinces should be strengthened. To this end, consideration might be given to the formation of separate divisions within the appropriate agencies to deal exclusively with transmigration problems.
- (f) The delivery of agricultural inputs should be carefully monitored, possibly by the Agricultural Technical Team, and if substantial shortfalls occur under present national programs /2 consideration should be given to providing strong agricultural PMUs located in the regions to coordinate the provision of agricultural services for transmigration.

2.08 Early Definition of Projected Farm Development. In the tidal areas the productivity of 2.0 ha of land is sufficiently high that the tidal review team has recommended a two-stage development: a low-cost, low-input first stage and later improvements to introduce water control or tree crops. Both

/1 In pursuing these objectives maximum use should be made of the materials already produced by the UNDP/FAO project INS/72/005.

/2 At present it is assumed that agricultural support services for transmigration will be provided through national programs such as research, extension, seed production and the like. Since transmigrants require far more intensive and timely attention in the establishment period than cultivators engaged in ongoing cultivation and yet are located in areas where these services are least likely to be provided, one of the central issues facing the transmigration program is whether the diverse agencies charged with these large national programs will be able to provide appropriate and effective components for transmigration.

Review teams agree, however, that the yields from 1.25 ha under upland cultivation is too risky to justify appraisal based on 1.0 ha of food crops and an unspecified plan for future farm development. Migrants who are given one hectare of cleared land and are uncertain about the status or location of additional land will be unable to diversify their farms in the early years of development, and tree crops established at later stages will take years to mature. If field fertility declines in the meantime, there will be a hiatus in which subsistence on 1.0 ha may be precarious. For this reason, the development model for transmigration must specify projected farm development at the time of settlement. If reasonable evaluation indicates that the management capacity of the estate sector will not permit block-planted tree crops at a specifiable future date, alternate models must be proposed. Furthermore, if GOI intervention at a second stage of development cannot be assured, all land should be turned over to migrants as early as possible to promote rapid development by the farmer himself. Table 6 indicates the rapid land clearing and commitment to perennials among farmers with large plots of land adjacent to their house plots. This farm diversification has been accomplished without additional money and managerial inputs and reflects primarily a sound land allocation arrangement and clear knowledge on the part of the farmers about the location of their land.

Table 6: COMPARISON OF FARMING STRATEGIES
IN FOUR TRANSMIGRANT COMMUNITIES

| Community | Years on site | Land initially provided | Land cleared | Trees planted | Spontaneous mig/family |
|--|---------------|-------------------------|--------------|---------------|------------------------|
| <u>Communities with 2.0 ha or Less at Settlement</u> | | | | | |
| Sitiung II | 1 | 1.0 | 0.60 | 34 | 2.21 |
| Sitiung I | 2 | 1.0 | 0.96 | 27 | 0.03 |
| Baturaja I | 1.5 | 1-2 | 0.93 | 78 | 1.22 |
| Way Abung 9-12 | 4-5 | 2.0 | 1.05 | 69 | 0.93 |
| Way Abung 7-8 | 5-6 | 2.0 | 1.47 | 54 | 0.41 |
| Way Abung 4-6 | 7-8 | 2.0 | 1.39 | 46 | 1.26 |
| Way Abung 1-3 | 9+ | 2.0 | 1.02 | 61 | 0.64 |
| <u>Communities with 5.0 ha of Land Available at Settlement</u> | | | | | |
| Rimbobujang 1 | 2.5 | 5.0 | 1.88 | 930 | 2.94 |
| Rimbobujang 2 | 1.5 | 5.0 | 1.97 | 89 | 1.72 |
| Rimbobujang 3 | 1.5 | 5.0 | 1.83 | 578 | 2.75 |
| Rimbobujang 4 | 1.0 | 5.0 | 1.91 | 236 | 0.94 |
| Rimbobujang 5 | 1.0 | 5.0 | 1.77 | 514 | 0.94 |

Implications

2.09 There are not yet sufficient data to say with confidence that the technical package and organizational arrangements proposed for food crop production in the outer islands will work on the scale proposed. For this reason it is urgent that a wide variety of regionally adapted farm models and management systems be tried in the early years of Repelita III and that from these the most applicable be distilled. To this end the Program Review team recommends that GOI undertake the preparation and implementation of projects with innovative features possibly in conjunction with the FAO/IBRD Cooperative Program, and where strong management possibilities exist (as in East Kalimantan where a German technical assistance is available) GOI encourage experimentation with alternate agricultural systems which assume farmer establishment, initial food crop production and the early introduction of cash crops. At the same time, very high priority should be given to defining the areas to be settled and strengthening agricultural support services in these areas, preferably before settlement begins.

3. KEY CONSTRAINTS: PROGRAM COORDINATION AND INSTITUTIONAL CAPACITY

Program Coordination

3.01 To address earlier shortcomings in the implementation of the transmigration program, a Presidential Decree was issued on August 31, 1978. Under this decree the responsibility for transmigration implementation was taken from a single agency, the Directorate-General for Transmigration, and given to the line agencies ordinarily responsible for each sector. All told, 7 Ministries and 53 Directorates-General were involved in the transmigration program. To provide the required integration of these agencies a Junior Minister for transmigration was appointed by the President to oversee the coordination of implementation./1

3.02 These organizational arrangements are still in their infancy and are extremely difficult to evaluate. Two problems are already evident however. First, there are serious difficulties in identifying appropriately skilled mid-level managers to fill coordinating positions on Bank-financed projects and weak personnel are being placed in GOI projects for want of able people who will take positions on remote transmigration sites. Second, advanced planning and coordination of implementation is particularly poor between Directorates-General. At the present time, some 117,000 ha of land has been opened by Public Works Directorates under the swamp reclamation program but has yet to be settled by DGT and a similar problem in the upland program has led to a directive from the President urging closer cooperation between agencies.

3.03 Provision of Appropriate Personnel. Part solutions to the problem of personnel recruitment will have to be in the form of increased incentives, secondment, early training and increased use of the private sector.

- (a) Incentives. Very few people with the qualifications needed to manage a large and complex transmigration project are motivated to live in the remote areas where transmigrants settle. To

/1 The Decree also provides for several other levels of coordination. First is a Governing Board (BAKOPTRANS) consisting of involved Ministers and reporting directly to the President. This Board sets the policy guidelines under which the program operates and is chaired by the Minister of Manpower and Transmigration. Directly under the BAKOPTRANS is a body consisting of all the Directors General of the main implementing agencies (SATDAL). This Board is responsible for coordinating day-to-day implementation and is headed by the Junior Minister for Transmigration. Within each implementing agency the Decree also provided for a technical team responsible for the design and implementation of appropriate components for transmigration. Finally, to promote the integration of line agencies in the regions, the Governor and Provincial Committee for Transmigration are charged with the coordination of participating agencies in the provinces.

address this problem, incentives in terms of salaries and benefits must be improved. In the case of mid to high level managers, some may have to be hired as consultants rather than at GOI pay scales alternately site management might be contracted to the private sector. Permanent on-site personnel (teachers, nurses, extension workers) could be provided with an agricultural package similar to that of migrants in order to increase incentives and commitment.

- (b) Secondment of Personnel. In the short run, the effectiveness of personnel such as Project Coordinators, may depend upon the secondment of middle-level staff from developed Directorates. At the present time this is virtually impossible, as officials who leave their home agencies have their ranks and salaries frozen until they return. Provisions for secondment which recognize the experience gained in other agencies and which provide compensation accordingly upon return would open one avenue of recruitment which does not now exist.
- (c) Early Training. The likelihood that Project Coordinators and Deputy Project Coordinators could move easily into their administrative roles would be greatly increased by systematic on-site and Jakarta-based training and to this end a comprehensive manpower training institute for transmigration should be given very high priority by the GOI and full support by the Bank.

3.04 Between-Agency Coordination. This aspect of the program can be improved with better preplanning and coordination of budget requests and attention is now being given to these matters through the office of the Junior Minister. In addition, coordination can be improved by increased reliance on the private sector. For example, contractors doing land clearing could, at the same time, build houses and village infrastructure. The DGT would continue to design, supervise and pay for these components but they would be linked to land development activities in a single contract. Where contractors could be prequalified to do so, they might also be made responsible for the provision of agricultural inputs and possibly early on-site management. This is not too dissimilar from arrangements used successfully by FELDA in Malaysia and would be especially useful in sites remote from existing agricultural services. In any case, as with other components, the early years of Repelita III should be the time for a wide variety of experiments intended to clarify the advantages of alternate organizational arrangements.

3.05 Overall Coordination. The Junior Minister is handicapped by the fact that he stands outside the normal structure of the line agencies, which restricts both his scope of influence in areas such as staffing and budgeting and his authority over agencies with divergent aims and goals. In recent months the JMT staff has been increased and has assumed new coordinating functions. The office has also been relocated to the DGT complex which should improve an exchange of staff between these two groups. A management assistance team financed by UNDP and the Bank is now in place and is expected to make recommendations on further support. Should the scale of the

program and the resources of the Junior Minister prove entirely incompatible, however, consideration must be given to drawing the Junior Minister's Office under the umbrella of the Ministry of Transmigration or to re-establishing a strong land development authority for transmigration possibly the Tennessee Valley Authority or FELDA. In either case, the agency would need control over the project formulation and funding as a means of promoting coordination.

Institutional Capacity /1

Public Works

3.06 TKTD. TKTD, the Directorate for Urban and Regional Planning, has only recently been charged with the responsibility for physical planning for transmigration and for the preparation of feasibility studies for all projects - whether proposed for foreign or GOI funding. The response of its staff to this challenge has been little short of heroic; but much remains to be done. No structural changes have been made to facilitate the work of TKTD and no senior staff work exclusively on transmigration in spite of the fact that this program accounts for 62.5% of TKTD's budget and occupies about two-thirds of staff time. To circumvent constraints introduced by organizational factors, the Transmigration Program Review team has recommended that activities in support of transmigration be separated from other TKTD tasks and that division for transmigration be established with special teams for screening, mapping and village design. It is further recommended that teams working on these tasks be assigned work on a provincial basis in order to maximize the cooperation between provincial authorities and agencies in Jakarta.

3.07 PTPT. In spite of its newness as an organization PTPT has demonstrated an impressive ability to meet targets and to manage very large land development programs in remote areas. Its organizational structure, particularly the emphasis given to the appointment of on-site project managers appears to be appropriate for the type of program undertaken. PTPT has also been able to meet its staffing requirements thus far and to secure budget allocations commensurate with its projected program. The biggest problems faced by PTPT are in the areas of quality control and the development of soil conservation standards. The second World Bank loan for transmigration provides assistance to TKTD to supervise land clearing in both Bank and GOI projects and the immediate deployment of these consultants in Government projects should be given high priority by the GOI. The loan also provides for experts to assist in the implementation of soil conservation measures for Transmigration II, an activity which should be extended to the entire GOI program.

/1 Recommendations were made by the Program Review team on the subject of institution building within two of the major Departments associated with transmigration: Public Works and the Directorate General of Transmigration. The mission did not examine organizational or manpower issues in the third major agency, the Ministry of Agriculture, and this will now be done in the course of future project work.

Directorate General of Transmigration (DGT)

3.08 The massive reorganization of the transmigration program has left the Directorate General of Transmigration demoralized and disorganized. Therefore among the most critical tasks of the GOI in the near future will be (a) stimulating agency reorganization to bring Subdirectorates tasks in line with new agency mandates; and (b) increasing the numbers, qualifications and competence of DGT staff. These activities are so important that future program expansion cannot be envisioned without immediate and significant plans for strengthening this Directorate General.

3.09 In terms of organization, new Subdirectorates should be formed along functional lines. For example, a new Sub Directorate should be established to deal with housing and village infrastructure, since this is presently a major constraint to program implementation. Increased attention should also be given within the agency to the selection of highly motivated migrants and to determining the areas from which they will come. A proposed Directorate for spontaneous migration should be strongly supported. Monitoring migrant welfare and agency coordination on behalf of the Junior Minister is likely to be done by the DGT and if so the capacity to undertake this task must be greatly improved.

3.10 In view of planned program expansion one of the most important tasks facing GOI will be to improve the training of both Jakarta-based and on-site staff, and of transmigrants. At present DGT training is the responsibility of an in-house training institute (PLPT) which in 1979/80 trained 4,250 transmigrants and 200 staff. Apart from some outdated facilities in Pasar Minggu (Jakarta) and a training center in Lampung Province, DGT does not have its own training facilities but uses existing centers run by other agencies, mostly Vocational Training Centers (PLK) operated by the Directorate General of Manpower Development in the same Ministry. Instructors are also seconded from other Government agencies. This is insufficient and an increased and broadened training program is required. This should include the development of new courses and teaching materials, the provision of instructor training, and a permanent physical basis in the form of a national training institute for transmigration with regional subcenters. Total trainee numbers will be large enough to permit training courses to be undertaken throughout the year, hence justifying the expenses of specialized facilities and full-time staff. The proposed strengthening of the training institute could also include related research and development, data compilation and analysis, and monitoring and evaluation work. Proposals for such training have been made to FAO and the mission urges close cooperation between agencies in the identification of appropriate components and arrangements for their implementation.

3.11 Other Agencies. Most other agencies, Agraria, Health, Education, Forestry, for example do not report major institutional or manpower constraints in meeting transmigration demands because, in most cases, they are simply expanding services which make up their normal program. However, all agencies placing on-site staff (health, education, BRI, agriculture) face problems of appropriate incentives for personnel in remote areas. For this

reason it may be advisable for all support personnel who so desire be provided with land and support packages equal to those of the migrants. This will not only increase the performance of these personnel on-site, but will also aid recruitment, supplement income, and help improve ties between support personnel and the communities they serve.

Implications

3.12 Poor interagency coordination is defined by Indonesians at all levels of Government as the single largest constraint to program implementation, and managerial shortages and institutional limitations were viewed by the Program Review team as the major constraint to program expansion. In the short-run these constraints can be partially overcome by the use of consulting firms to aid in the preparation, implementation and coordination of projects. But even these tasks must be organized and supervised by agencies responsible for specific functions. It is recommended, therefore, that institution building be given as high priority as resettlement itself in the early years of the program. This will undoubtedly slow program development initially but it is one solution to a sustained transmigration effort which minimizes cost and is not heavily dependent on expatriate assistance for its continuance.

4. KEY CONSTRAINTS: PROCEDURES FOR PHYSICAL PLANNING, LAND DEVELOPMENT AND TIMBER UTILIZATION

Physical Planning

4.01 At the time of the Program Review Mission, GOI projects were being done without feasibility studies and preliminary physical planning, and no mapping was underway which would lead to a pipeline of projects suitable for Bank financing. In addition, poor topographic mapping for Transmigration II had become an obstacle to project implementation. Therefore, to ease bottlenecks in this area, the Program Review team recommended that Government explore (a) better use of consultant assistance in the physical planning process; (b) farm models which are less slope specific; and (c) procedures which could simplify preplanning.

4.02 Consultant Assistance. Since the October mission TKTD has prepared terms of reference for consulting firms which will lead to the screening of 144 sites in 13 provinces and to the preparation of feasibility studies on those suitable for development. This will greatly increase the knowledge of potential areas for settlement and facilitate the identification and prioritizing of projects, and for this reason this activity has been strongly supported by the Bank. At the same time, however, the fact that the responsibility for project preparation is now lodged in a single agency within the Public Works Department suggests the possibility that components may be devised which do not have the concurrence of the agencies responsible for implementing them. This in turn points to the need to strengthen TKTD's ability to coordinate planning in areas where it has limited expertise (agriculture, forestry, sociology, etc.) and to involve other agencies in the definition of appropriate components.

4.03 Farm Model. The importance of the interrelationship between farm models and physical planning cannot be overstated. The original farm model for Repelita III transmigration projects required the identification of 2.0 ha land under 8% slope for food crop production. There had to be sufficient land of this slope class within walking distance of each area of settlement and sufficient amounts of this land to allow several development units of 2,000 families (SKP) in each region in order to justify the requisite infrastructure. To circumvent serious constraints in the planning process, the requirement has now been reduced to 1.0 ha of land suitable for food production. If the land is flat and visible (as in some grassland areas) these criteria will not strain the planning process, but if the land is undulating and forested (as in Jambi Province) both topographic mapping and village design will still be time consuming and difficult. The answer to this problem involves the development of some farm models particularly for use in undulating areas which are less slope specific than the present food crop model and are more tolerant of error in the planning and implementation process. Such models might involve flexible farm models with food crops on land found to be flat, or on farm models which call for annuals replaced by perennials after the early years of cultivation.

4.04 Procedures for Physical Planning. Since October, a number of steps have been taken to reduce the manpower requirements for physical planning but procedures still call for detailed topographic mapping and village design to permit tendering for land clearing and house/lot allocation. In the past much of this activity has been done on site and the mission believes there may be merit in closely monitoring the present plan-as-you-proceed projects to see whether some compromise might be appropriate. The mission has also recommended that mapping techniques vary with land cover and terrain. This might involve:

- (a) substituting photogrammetric interpretation for topographic surveys in alang-alang areas;
- (b) concentrating detailed topographic surveys along proposed road alignments, village sites and service centers only in forested areas; and
- (c) adopting land clearing methods for which less detailed prespecifications are required and using on-site management to allocate farm land.

Land Development

4.05 The type of land clearing required for transmigration has been one of the most controversial issues associated with the program. This is not surprising as questions on proper land clearing methods are both technically and organizationally complex and evidence on methods, equivocal. For example, land clearing trials under controlled conditions have demonstrated the utility of mechanical methods when properly executed, but field observations suggest a number of disadvantages in the following areas:

- (a) Soil Conservation. The greatest liability of mechanical land clearing is that as presently practiced it is causing serious damage to the agricultural potential of the areas cleared. This is of particular concern as the food crop farm model requires minimal disturbance to the soil.
- (b) Labor Utilization. Large-scale mechanical land clearing is also inconsistent with the main thrust of Repelita III - employment generation.^{/1} Where labor is short, and migrants are deployed for land clearing, manual clearing has the advantage of providing income diversification in early years of settlement.

^{/1} It is commonly held that mechanical land clearing is required because labor is not available in the remote areas where sites are located. Mission findings do not confirm this impression. Land in tidal swamps which is equally remote and inhospitable is cleared by chainsaw gangs as are areas now being cleared for Nucleus Estates. In many areas, in fact, contractors with machines are "forced" to use manual methods to speed clearing because of downtime on machines and poor machines.

- (c) Tendering. Mobilization of heavy equipment confines bidding to large companies; requires the commitment of large tracts of land for long periods to a few contractors thereby reducing the leverage for quality control; it also increases the amount of preplanning which is required for bidding and entails long mobilization periods.

4.06 For all these reasons the Transmigration Program Review Mission has argued that manual clearing with chain saws is to be preferred to mechanical methods. Generally this means that settlers would assist skilled chainsaw gangs provided by the land development contractor. Alternate labor arrangements may be feasible but are at present less common. Government, however, maintains a strong commitment to mechanical clearing assuming that this is necessary to obtain land development with the speed and scale proposed. Under these circumstances, the mission has recommended that the mechanical land clearing done in the next six months in Transmigration II be carefully monitored for both speed and impact and that this evidence be used to determine future land clearing methods. It further recommended that alternate methods of land clearing be attempted in other sites and the results monitored, perhaps by FAO, in order that the best mix of efficiency and agricultural viability can be determined.

Site Identification and Timber Utilization

4.07 Because sites have been selected for low population densities and accessibility, a large number of potential Repelita III sites are to be located in areas of primary forest. There are, however, a number of reasons why these areas should be given lower priority for development than grasslands and forest regrowth:

- (a) forestry regulations prohibit the conversion of forest with more than 50 cubic meters of standing timber/ha;
- (b) the value of timber, which has risen three-fold in the past year, is in some areas conservatively estimated at US\$2,000/ha with tax;
- (c) mapping and surveying are more difficult in primary forest;
- (d) land clearing is ten times as costly in forest areas as grasslands; and
- (e) grassland rehabilitation appears to be more ecologically sound than forest removal.

For these reasons it is strongly recommended that less forested areas be given higher priority for transmigration development.

4.08 Where national priorities and regional development interests do result in land clearing in forested areas, appropriate methods of timber utilization must be assured. Present plans for timber disposal call for the land clearing contractor to stack all useable timber and for the forestry

department to arrange for its use. The incentives for efficient utilization under these arrangements are not yet certain. Should they result in limited timber disposal, however, there are alternatives to these procedures which could potentially reduce both land clearing costs and timber waste. These involve either contractors or the migrants themselves.

4.09 Contractor Clearing. To reduce land clearing costs and promote the effective use of timber, land clearing contractors can be given the right to dispose of all useable timber. Under these circumstances, the GOI should:

- (a) give high priority to soliciting land development proposals from companies which have demonstrated capacity to market timber - particularly lesser known species.
- (b) reinforce this preference, by imposing a tax on standing volume of timber rather than on timber utilized. (This would discourage bids from contractors who could not market timber and, in fact, reflect the loss to Government in the contract price if timber utilization were low).
- (c) undertake further activities to facilitate marketing, particularly of lesser known species.

The Program Review team in fact concluded that if timber were given to the contractor in Transmigration II and III there appeared to be no reason for GOI to pay for mechanical clearing, rather it should get paid by the contractor for timber sold (this should not be less than the royalty and taxes mentioned above).

4.10 Migrant Clearing. Alternately, appropriate timber utilization can profit the migrants themselves. In this case, migrants would have to be given the right to fell that timber remaining after logging. (This would be subject to Government tax.) To assist migrants in felling and processing timber it would be necessary that:

- (a) migrants be clearly told where their reserve land is, so they could exploit timber or control its use;
- (b) migrants be trained in chainsaw use and arrangements made for chainsaw rent or purchase; /1
- (c) sawmills be established in appropriate migrant villages; and
- (d) assistance be provided through sawmills or cooperatives for the marketing of forest products (shakes, fuelwood, fitches etc.).

/1 It was felt unwise to provide chainsaws free to migrants as it would result in their distribution to people who would not maintain them and might be unskilled in their use.

4.11 In conclusion, the value of timber is now so high that effective timber use must be a condition of the expansion of the transmigration program. There is probably no one way to assure this and the Directorate General of Forestry together with the land clearing Directorate within Public Works should undertake to experiment with different methods of timber disposal including stacking and sale, land clearing through contractors with marketing skills and use of the migrants themselves before a uniform system is adopted.

Implications

4.12 Diversity of opinion on procedures for physical planning, land development and timber utilization is to be expected in a program that encompasses projects with highly diverse terrain, land cover, and degree of remoteness from markets and roads. For this reason the transmigration program requires a variety of models for these activities which can be applied to these diverse situations, and agreement on this principle should be seen as a precondition for increased Bank participation in the transmigration program.

5. KEY CONSTRAINTS: RESOURCE USE

Allocation of Resources to Transmigration

5.01 Since the early years of Repelita I transmigration has developed from an activity of modest financial scale to a major recipient of Government development funds. It ranks eighth among 18 sectors in the 1979/80 development budget and absorbs 5.7% of the development budget proposed for Repelita III. In terms of attracting foreign aid, the share of transmigration was insignificant until 1977/78 (covering mostly technical assistance activities) when it increased to about 1% of the foreign aid budget.^{/1} The recurrent budget has not markedly expanded in relation to the other sectors and transmigration activities now absorb a negligible proportion (0.1%) of these funds.

5.02 Cost. The rise in the development budgets for transmigration over the period 1969/70 to 1980/81 - from Rp 850 million to Rp 434 billion was matched by an increase in settlement targets from less than 5,000 families to 75,000. During this period costs per family increased from about Rp 200,000 to Rp 5.8 million, an absolute increase of twenty-nine-fold or an annual increase of almost 36%. This escalation is due in part to inflation. Expressed in constant prices (basis 1971), transmigration costs per family increased from Rp 240,000 in 1969/70 to Rp 1,250,000 in 1980/81, a real increase of fivefold and an annual increase of about 16% (see Table 8). Much of this increase is attributed, in turn, to the present design of transmigration projects which contains many elements that were not part of the package in earlier years, such as roads, public buildings, or agro-inputs, while other components had been included but on a smaller scale. A comparison of specific items on a constant price basis suggests that a third factor contributing to cost escalation may have been the increasing size and complexity of the transmigration program and diminishing cost control.

5.03 Impact. While the share of transmigration in the total (domestic and foreign financed) development budget (about 5% in 1979/80) ranks well behind sectors such as communications/tourism (15%), agriculture/irrigation (12%), industry and mining/energy (11-11.5% each); the concentration of development funds on Java (63%) and the focus of transmigration activities in provinces without other large-scale investment possibilities means that the transmigration development budget plays a central role in the development planning of most of the settlement provinces. In fact, for 11 out of 18

^{/1} With the implementation of Trans I and II and ADB's Southeast Sulawesi project, however, the relative importance of the transmigration program as a recipient of external assistance will increase.

Table 8: TRANSMIGRATION DEVELOPMENT BUDGETS, RESETTLEMENT
AND UNIT COSTS, 1969/70-1978/79
(Rp million)

| Year | Development budget | Disbursements (10/11/79) | Resettlement | | Cost per family /b | |
|---------|-----------------------|-----------------------------|--------------|----------------------|--------------------|--------|
| | | | Targets | Actual (10/17/79) | Rp '000 | US\$/c |
| 1969/70 | 850 | 800 | 4,489 | 3,933 | 203 | 538 |
| 1970/71 | 1,040 | 1,006 | 3,865 | 4,438 | 227 | 600 |
| 1971/72 | 1,362 | 1,346 | 4,600 | 4,171 | 323 | 854 |
| 1972/73 | 2,317 | 2,306 | 11,200 | 11,314 | 204 | 519 |
| 1973/74 | 3,659 | 3,654 | 22,412 | 22,412 | 163 | 393 |
| 1974/75 | 6,652 | 6,634 | 11,000 | 11,000 | 603 | 1,453 |
| 1975/76 | 15,076 | 14,892 | 8,100 | 8,100 | 1,839 | 4,430 |
| 1976/77 | 27,298 | 25,379 | 13,910 | 13,910 | 1,825 | 4,396 |
| 1977/78 | 50,930 | 36,303/a | 21,090 | 22,949 | 2,415 | 5,819 |
| 1978/79 | 104,502 | 12,607/a | 27,000 | 7,306 | 3,870 | 7,835 |

/a Disbursement figures incomplete: for DGT through 10/11/79, for other agencies through 03/31/78.

/b Unit costs for 1977/78 and 1978/79 based on budget figures.

/c Rates of exchange used:

1969/70-1971/72: Rp 378 = US\$1

1972/73: Rp 393 = US\$1 (weighted average)

1973/74-1977/78: Rp 415 = US\$1

1978/79: Rp 494 = US\$ 1 (weighted average)

Note that the average rate of exchange used refers to the relevant budget year and not to the year of actual implementation.

Source: DGT.

Table 9: DISTRIBUTION OF CENTRAL GOVERNMENT DEVELOPMENT EXPENDITURE BY SECTOR FOR EACH PROVINCE 1978/79 /a (in percentages)

| <u>Province</u> | Agric. & irrigation | Transmi- gration/b | Elec- tricity | Communi- cations/c | Social /d | Other /e | Total |
|------------------------|---------------------|--------------------|---------------|--------------------|-------------|-------------|--------------|
| Jakarta | 15.2 | 2.4 | 2.9 | 6.4 | 36.6 | 36.5 | 100.0 |
| West Java | 40.0 | 1.0 | 8.4 | 19.0 | 15.5 | 16.1 | 100.0 |
| Central Java | 44.5 | 0.5 | 20.2 | 12.8 | 17.6 | 4.4 | 100.0 |
| Jogakarta | 25.2 | 1.7 | - | 16.1 | 44.1 | 12.9 | 100.0 |
| East Java | 36.6 | 2.9 | 20.0 | 16.1 | 19.7 | 4.7 | 100.0 |
| <u>Java</u> | <u>22.3</u> | <u>2.1</u> | <u>6.1</u> | <u>9.4</u> | <u>31.3</u> | <u>28.8</u> | <u>100.0</u> |
| Aceh | 15.8 | 16.8 | 7.9 | 41.2 | 12.6 | 5.7 | 100.0 |
| N. Sumatra | 24.2 | 4.0 | 14.3 | 39.6 | 11.0 | 6.9 | 100.0 |
| W. Sumatra | 21.3 | 14.5 | 10.5 | 29.7 | 17.2 | 6.8 | 100.0 |
| Riau | 27.7 | 29.1 | - | 23.3 | 11.7 | 8.2 | 100.0 |
| Jambi | 17.5 | 51.7 | - | 17.5 | 8.9 | 4.4 | 100.0 |
| Bengkulu | 29.8 | 30.1 | - | 26.3 | 10.0 | 3.8 | 100.0 |
| Lampung | 36.8 | 34.4 | - | 16.0 | 7.5 | 5.3 | 100.0 |
| S. Sumatra | 23.1 | 32.6 | 4.8 | 23.8 | 10.6 | 5.1 | 100.0 |
| <u>Sumatra</u> | <u>24.0</u> | <u>23.3</u> | <u>6.4</u> | <u>28.9</u> | <u>11.3</u> | <u>6.1</u> | <u>100.0</u> |
| W. Kalimantan | 21.2 | 26.7 | 2.9 | 25.9 | 14.4 | 8.9 | 100.0 |
| E. Kalimantan | 9.6 | 39.7 | - | 27.5 | 13.1 | 10.1 | 100.0 |
| C. Kalimantan | 16.1 | 26.8 | - | 18.6 | 22.3 | 16.2 | 100.0 |
| S. Kalimantan | 19.6 | 39.1 | 5.2 | 14.8 | 14.4 | 6.9 | 100.0 |
| <u>Kalimantan</u> | <u>16.9</u> | <u>34.4</u> | <u>2.5</u> | <u>21.9</u> | <u>14.9</u> | <u>9.4</u> | <u>100.0</u> |
| N. Sulawesi | 30.7 | 5.3 | 12.3 | 28.4 | 16.5 | 6.4 | 100.0 |
| C. Sulawesi | 26.5 | 40.1 | - | 15.5 | 12.8 | 5.1 | 100.0 |
| S.E. Sulawesi | 27.8 | 41.0 | - | 11.8 | 13.5 | 5.9 | 100.0 |
| S. Sulawesi | 8.9 | 21.7 | - | 4.7 | 28.2 | 23.6 | 100.0 |
| <u>Sulawesi</u> | <u>21.7</u> | <u>24.9</u> | <u>4.8</u> | <u>22.6</u> | <u>17.7</u> | <u>8.3</u> | <u>100.0</u> |
| Maluku | 11.2 | 26.5 | 10.7 | 24.4 | 18.0 | 9.2 | 100.0 |
| Bali | 20.3 | 3.3 | 11.1 | 32.2 | 22.9 | 10.2 | 100.0 |
| West Nusatenggara | 47.9 | 2.3 | - | 25.1 | 16.7 | 8.0 | 100.0 |
| East Nusatenggara | 22.5 | 1.0 | - | 40.4 | 21.3 | 14.8 | 100.0 |
| Irian Jaya /f | - | 88.4 | - | - | 4.6 | 7.0 | 100.0 |
| East Timor /f | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. |
| <u>Indonesia</u> | <u>22.4</u> | <u>8.0</u> | <u>5.5</u> | <u>14.2</u> | <u>26.6</u> | <u>22.9</u> | <u>100.0</u> |
| Java excluding Jakarta | 39.4 | 1.4 | 13.9 | 16.5 | 18.8 | 10.0 | 100.0 |

/a Figures refer to the Rupiah Development Budget excluding externally financed expenditures. Transfers to local Government Development Budgets are also excluded.

/b Includes manpower.

/c Includes tourism.

/d Education (68%), health and family planning (18%), housing and water supply (11%), and religious affairs (3%).

/e Industry and mining (14%), trade and cooperatives (3%), judiciary (5%), defence (21%) and miscellaneous (57%).

/f For historical reasons, most expenditure on Irian Jaya and East Timor does not pass through departmental budgets but are reflected in special programs handled by the Department of Home Affairs. Any items in the departmental budgets represent only small residual amounts.

provinces receiving transmigrants, the transmigration development budget is the largest single sectoral component (see Table 9). In five provinces - Jambi, Southeast Sulawesi, Central Sulawesi, East and South Kalimantan - transmigration absorbed from 40% to over 50% of Central Government development expenditures and was thus the principal vehicle of regional economic development.

5.04 The relative impact of the settler movements matching the flows of budget resources also varies greatly among provinces. For the group of 18 settlement provinces, the share of transmigrants during Repelita II was an insignificant 1% of the estimated population at the beginning of the plan (1974). For Repelita III, the high transmigration targets imply an addition of about 5% to the 1979 population of the recipient provinces. However, for a few provinces the increments are much higher: in the case of Jambi, Bungkulu and Central Sulawesi the addition to the population came to 4-6.3% during Repelita II and would amount to 23-44% during Repelita III if proposed targets were met.

Assessment and Recommendations

5.05 Cost. Transmigration projects originally projected from Repelita III would involve 5.7% of the total development budget, and if proposed targets were reached would directly benefit some 2,500,000 transmigrants or about 1.7% of the nation's population. Government believes that these costs are justified in order to reach a series of national objectives and in terms of benefits received. Recent figures make it clear, however, that individual components are becoming increasingly costly as each implementing agency acts to deliver better quality components requiring higher investments. It is therefore important that GOI explore ways to increase the cost effectiveness in the transmigration program. There are four main ways in which this can be done: (a) by improved quality control; (b) by modifying project components; (c) by increasing emphasis on spontaneous transmigration as an adjunct to fully sponsored settlement; and (d) by reducing the speed and scale of program implementation.

5.06 Quality Control. Increasing attention is needed in most agencies to quality control. This can be accomplished through (a) more precise specification of standards in contracts, (b) increased incentives for quality performance, (c) increased incentives for high quality supervision, and (d) sanctions against firms operating to low standards. To improve contracting and supervision, steps should be taken to strengthen those units dealing with tendering for large cost items such as physical planning (PTPT), land development (PTPT), road construction (DCH) and housing (DGT). This support would probably be in the form of technical assistance (local or expatriate) to both evaluate contracts and make recommendations for controlling costs.

5.07 Modifying Project Components. A reduction of standards in some components plus increased use of migrants labor in the establishment period can also lead to an increase in cost effectiveness. For example:

- (a) Housing. Suggestions for improved cost effectiveness include: constructing a larger high quality frame with less costly walls and roofs which migrants can modify as their resources increase; using migrant labor to construct houses and using locally available resources; giving funds for house construction to migrants who could then monitor the quality of construction themselves.
- (b) Land Clearing. Migrant involvement in land clearing has numerous advantages particularly in heavily forested areas where a slower rate of land clearing can improve timber utilization and increase cash flow to migrants. Migrant labor may also turn out to be cheaper and more dependable than mechanical clearing although trade-offs will exist to agricultural production.
- (c) Physical Planning. These costs can be reduced if different procedures for physical planning were used for different types of terrain and if easily planned sites (i.e., those in along along areas) were given priority. Costs could be further reduced if the tasks of consulting firms were staged in such a way as to maximize the effective use of labor rather than the speed of project execution.
- (d) Spontaneous Migration. Sponsored settlement used as the nucleus for further spontaneous development could significantly decrease the per family cost of resettlement.^{/1} Even a sites and services approach in which physical planning, roads, house lot clearing, and subsequent agricultural, health and educational services were provided, but in which charges were eliminated for house construction, field clearing and resettlement, would reduce the cost per family by up to one-third.^{/2}
- (e) Scale. Reducing the scale of the program would reduce costs by improving the ability of agencies to supervise quality control, by reducing dependence on expatriate assistance to meet manpower shortages, and by allowing a gradual evolution of competence under the new organization arrangements which would avoid costly mistakes.

^{/1} It is important to emphasize that spontaneous migrants would have to be recruited by families already in the nucleus settlements and they would have to be located sufficiently close by their relatives to be able to turn to them when they needed support.

^{/2} These options will be explored in greater detail by a Bank team on a second stage of sector work.

Impact

5.08 The proposed transmigration program has a more dramatic impact on development in under-populated provinces than on any other objective to which it is addressed (food production, alleviation of poverty or population pressures on critical lands). For this reason, it is imperative that transmigration benefit local people as well as transmigrants. This can be facilitated by (a) fully involving local and provincial authorities in transmigration planning and by institutional arrangements which foster clear working relationships between planning teams and specific provinces; (b) by strict attention to land tenure and land compensation questions; and (c) by directly transferring project benefits to local populations.

- (a) Provincial Involvement. To whatever extent possible, planning and implementing teams should be regionalized in order to promote close working relationships with provincial officials. In the short run this may mean no more than establishing teams in Jakarta with the responsibility for working with specific provinces but in the long run the objective should be to decentralize planning and decision making to the provincial level.
- (b) Land Alienation and Land Compensation. At present, arrangements for land alienation and compensation are being made with local authorities on a relatively ad hoc basis. These procedures must be formalized and land compensation activities given a sound institutional and financial base. The manner in which this is to be done deserves the earliest possible consideration by Government.
- (c) Project Benefits. At present local people may occupy 10% of the spaces in transmigrant communities. If local demand increases, this may not be enough. One of the easiest solutions to this dilemma is to increase emphasis on components for spontaneous migrants which either locals or transmigrants could obtain. In addition, more attention could be given to components which would directly benefit those local people within the transmigration area. In particular, care should be taken to extending the benefits of schools, clinics and education services to locals and to increasing their involvement in the definition of components which would benefit them.

Implications

5.09 During Repelita III transmigration projects are projected to involve 5.7% of the development budget and directly benefit 1.7% of the population. At the same time transmigration has a more significant impact on underpopulated provinces than any other sector to which it is addressed. For equity reasons it has therefore seemed important to keep the cost of benefits transferred directly to migrants low, and to pay increasing attention to the regional impact of transmigration and its benefits to local populations. Extending the program in this way as it presumes contractions elsewhere, but to avoid the implications of these figures is to risk losing the provincial support upon which the viability of the transmigration program now rests.

6. THE BANK'S ROLE IN TRANSMIGRATION

Main Mission Conclusions

6.01 Regarding the future Bank role in transmigration, the main conclusions of the Program Review team are as follows:

- (a) That Bank participation in the transmigration program should be shifted from localized projects to broad support for the transmigration effort, including but not restricted to funding for resettlement.
- (b) That this support should be expanded in context of broad agreement between Bank and GOI (i) on a de-emphasis on uniform models and increase in experimentation (particularly in farm models, land clearing methods and management systems); (ii) on the type of institution-building to be undertaken; and (iii) on the scale of the program to be pursued.
- (c) That this can best be accomplished in discussions with Government on the type of project pipeline envisioned in Repelita III and IV.

6.02 Uniformity. Although the pressures leading to the adoption of food crop farm models and uniform settlement patterns, land clearing methods and management systems are fully understandable and this idea once had wide acceptance within the Bank; recent experience indicates that efforts to apply a uniform development pattern to the diverse conditions of the outer islands will make a difficult task even harder. For this reason the Program Review team urges that Government avail itself of all possible opportunities to explore alternatives in components such as farm models, the use of migrant labor in house construction and land development, on methods of land clearing, lumber disposal and the like. This can be done by encouraging planning consultants in TKTD to recommend options which do not significantly increase managerial requirements or costs; by using existing resources such as the German Technical Assistance team in East Kalimantan to manage experimental efforts, for example, in farmer-established tree crops; and by using agencies such as the FAO/IBRD Cooperative Program to plan demonstration projects with innovative features. While this will increase the supervisory tasks of both GOI and Bank it is only from this range of efforts the best of the options can be found.

6.03 Institution-Building. Some institution-building activities have such high priority that the development of suitable components to advance them should be seen as a prerequisite of future project work. Among these are the following:

(a) Agriculture

- (i) support to the Agricultural Technical Team for management and monitoring the delivery of agricultural components in the overall program;
- (ii) the early establishment of one or two agricultural training centers to train extension workers for transmigration; and
- (iii) initiating start up agricultural services in key receiving provinces: seed farms, nurseries, supply depots, etc.;

(b) Transmigration

- (i) technical assistance, if requested, for agency reorganization;
- (ii) the development of an institute with regional subcenters for training migrants and DGT staff;

(c) Public Works

- (i) assistance to TKTD to supervise mapping, village design and the preparation of feasibility studies;
- (ii) technical assistance to PTPT to supervise land clearing and soil conservation measures throughout the transmigration program;
- (iii) monitoring of land clearing techniques and agricultural impact (possibly under FAO auspices);

(d) Agraria

- (i) support for the development of policies and institutional arrangements to handle land alienation and compensation.

A series of other activities of secondary importance are detailed throughout this report.

6.04 Scale. The need to reduce and focus the program cannot be over-emphasized. Present high targets so far exceeded realistic implementation rates that most participating agencies find it impossible to effectively plan for their future involvement in the transmigration program. High targets also emphasize speed over quality and result in poor work. Furthermore, a real danger exists that without realistic planning the Public Works Directorates will outstrip the capacity of the other implementing agencies to follow-up. The existence of 117,000 ha of cleared but unsettled tidal land is evidence of the problems entailed by lack of coordination in the planning, implementing and budgeting processes. Focusing the program, on the other hand, would provide the opportunity to improve the quality of the program without further

increasing costs, to improve the probability of adequate agricultural inputs, to coordinate agency efforts and to place more emphasis on innovation, regional specificity and components to benefit local populations.

6.05 Increased Program Focus. Although site selection and physical planning have been initiated in 13 provinces and 51 sites, the original projections for Repelita III suggest that there are only eight provinces in which large-scale settlement will occur. In addition to Jambi and East Kalimantan, where the World Bank is already involved in settlement, and Southeast Sulawesi where an Asian Development Bank Project is underway, only Riau, South Sumatra, West, Central and South Kalimantan are likely to be able to absorb large numbers of transmigrants (see Table 10). Several other provinces have settlement potential but will take smaller numbers of families. GOI will no doubt wish to settle migrants in more than eight provinces but the task of planning and coordination could be simplified if major settlement and institution building efforts were concentrated in these areas during Repelita III.

Table 10: RAINFED AGRICULTURE AREAS PROJECTED FOR SETTLEMENT DURING REPELITA III

| Province | SKP | No. of families | People |
|-------------------------|-----------|-----------------|------------------|
| Aceh | 6 | 12,000 | 55,200 |
| Riau | 19 | 38,000 | 174,800 |
| Jambi | 16 | 32,000 | 147,200 |
| West Sumatra | 4 | 8,000 | 36,800 |
| Bengkulu | 6 | 12,000 | 55,200 |
| South Sumatra | 22 | 44,000 | 202,400 |
| <u>Total Sumatra</u> | <u>73</u> | <u>146,000</u> | <u>671,600</u> |
| West Kalimantan | 15 | 30,000 | 138,000 |
| South Kalimantan | 12 | 24,000 | 110,400 |
| East Kalimantan | 16 | 32,000 | 147,200 |
| Central Kalimantan | 25 | 50,000 | 230,000 |
| <u>Total Kalimantan</u> | | <u>136,000</u> | <u>625,600</u> |
| <u>Total Sulawesi</u> | <u>37</u> | <u>74,000</u> | <u>340,400</u> |
| <u>Total Other</u> | <u>28</u> | <u>56,000</u> | <u>257,600</u> |
| | | <u>412,000</u> | <u>1,895,200</u> |

Bank Participation in the Transmigration Program

6.06 The World Bank has already committed itself to two activities in support of the overall transmigration program (a) a joint project with UNDP to improve the capacity to the Junior Minister for Transmigration to manage and monitor program coordination; and (b) financing for mapping and data collection activities in 51 areas in 13 provinces. This general support should now be expanded. Key activities will include institution-building, support for start-up agricultural services and demonstration projects.

6.07 Institutional Support. Institution-building activities of utmost urgency have been outlined in para. 6.03. To speed their development, the Transmigration Program Review team recommends that appropriate components be designed and prepared within the next year which would increase institutional capacity and these could be attached to the loan for Transmigration III, which is now localized in East Kalimantan.

6.08 Support to Key Start-up Sites. In addition, the Program Review team strongly recommends that the Bank support the start-up of key agricultural activities in major receiving provinces. These could benefit existing, incoming and future settlers whether financed by GOI or Bank. These components would include such things as seed-farms and nurseries, agricultural experiment stations, link roads and institution-building activities in support of the regular GOI program. Since these start-up activities would cut across regions and affect all consulting firms engaged in physical planning, they might be most expeditiously prepared in a single project which is proposed as Transmigration IV.

6.09 Demonstration Projects. Should Government find it difficult to include innovative components in a large number of projects, it might wish to confine itself to experimental efforts on selected sites. In Mamuju, South Sulawesi, for example, a project could be prepared which allocated one-half the sites to sponsored migrants and devised suitable components to accommodate spontaneous Buginese and Balinese settlers on the other half. Tree crop components could be expanded on demonstration projects on East or West Kalimantan, and grassland rehabilitation be expanded in Sumatra. Such projects could be prepared by consultants in the course of developing feasibility studies or be supplemented by experts from the IBRD/FAO Cooperative Program. In any case the Bank should be prepared to support innovative efforts in support of future program development.

6.10 Unrestricted lending for time-slice of the transmigration program appears premature. Seldom has the Bank undertaken a lending program with such promise or difficulties; and therefore in the short-run the dialogue between Government and Bank on the course of the program and its impact on the lives of the migrants may be one of the most important inputs which the Bank can provide. It must be clear within the Bank, however, that support to institution-building and innovative approaches will be much harder than preparation of resettlement projects and that both manpower and funding from the Bank must also be a prerequisite of this approach.

Actions to be TakenGeneral Discussions

1. Agreement in principle on increasing the range of acceptable project components in areas such as farm models, land clearing methods and management systems.
2. Agreement in principle on focusing program and slowing proposed rate of planning and implementation.

Institution-Building

Discussion is required on:

1. Procedures for developing project components to:
 - (a) strengthen the agricultural technical team;
 - (b) establish training centers for extension workers;
 - (c) provide technical assistance to DGT for reorganization and manpower training;
 - (d) strengthen TKTD's ability to coordinate other agency input into project preparation;
 - (e) support PTPT in supervising land clearing and soil conservation activities in the GOI program;
 - (f) monitor land clearing;
 - (g) increase on-site coordination in GOI projects; and
 - (h) develop policies and institutional arrangements for land alienation and compensation.
2. Inclusion of these components within the project pipeline.

Support for Key Start-Up Activities and Demonstration Projects

Discussion is also required on:

1. The means of initiating agricultural activities in main receiving provinces.
2. Projects to demonstrate innovative approaches to farming systems, land clearing and the like.
3. The definition of a possible project pipeline.

INDONESIATRANSMIGRATION PROGRAM REVIEWSUMMARY OF MISSION FINDINGSList of Annexes to Main ReportANNEX

- I Maps
- II Project Components
- III Working Papers on Agriculture
 - III/1 Soils - I. Maude
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 - III/3 Migrant Welfare in Five Transmigrant Communities - G. Davis
 - III/4 Upland Cropping Systems - A. MacMillan
- IV Working Papers on Physical Planning and Land Development
 - IV/1 Resource Inventories for Transmigration - J.P. Malingreau
 - IV/2 Standards for Physical Planning - A. MacMillan
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- V Working Papers on Organization and Manpower
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 - V/2 Organization and Functions of DGT and Organization and Functions of Other Agencies - H. Thias
- VI Working Papers on Costs
 - VI/1 Regional Aspects - R. Key

MAIN CONCLUSIONS OF THE SWAMPLAND DEVELOPMENT MISSION /1Main Conclusions

1. The report was written some four years after the first Bank involvement in swamp development projects in Indonesia and simultaneously with appraisal of its first loan for construction in the sector, and against a background of perceived lack of knowledge about the Government's swamp development programs and about the feasibility of swamp projects and desirable extent of Bank involvement. The report shows that the Government has been implementing a program of low-input swamp reclamation projects which has significantly contributed to transmigration both in quantity - some 15% total transmigration - and in quality. The report indicates that a low-input strategy has been correct, at least as a first stage, and should be supported by the Bank. However, many improvements could and should be brought about and Bank-financed projects can provide a suitable vehicle for these improvements. Second stage investments aimed at upgrading agricultural production in existing established projects should also be actively supported to optimize the use of existing infrastructure.

2. In contrast to the overall soundness of Government strategy, there is a short-term problem which needs to be solved. The report brings to light the existence of sites where canal infrastructure and land clearing have been carried out but settlement has not occurred. This situation slowly started developing in 1976 but has now taken on serious proportions: about 117,000 ha in March 1979 with a potential for settlement of some 25,000 families (see Appendix A). These project sites should be urgently reviewed to assess the viability of completing them to realize benefits expected initially and take advantage of sunk costs. Definite measures should be taken to improve coordination of the swamp development program and avoid the recurrence of a similar situation.

Summary

3. Swamp development is not a new activity in Indonesia but up to 1950 it was virtually all spontaneous development by Buginese and Banjarese settlers. Between 1950 and 1968 Government involvement was limited with little actual achievements when compared to stated targets. A first group of Government projects was initiated during the first five-year plan (1968-73);

/1 This summary of the Swamp Development Program Review Report is intended to be appended to the Transmigration Review Summary so that the entire transmigration sector may be discussed more comprehensively and meaningfully. Details which could not be included in this summary will be found in the original report.

these projects cover some 37,000 ha gross, have received some 7,800 transmigrant families and may now host some 9,000 families. A vast majority of these settlers are satisfied with their new locations and have experienced dramatic improvements in their incomes and life styles. P4S, the Government's swamp reclamation agency in the Ministry of Public Works, intends to monitor these projects and possibly provide them with infrastructure improvements. A full program for upgrading agricultural production would be more appropriate and should be supported by the Bank.

4. A second generation of projects was started during the second five-year plan, from 1975 onwards, in response to a high target of one million ha. A substantial amount of equipment was purchased and, for the last five years, nearly all canal infrastructure has been constructed under force account. The targets proved overly ambitious since only an additional 200,000 ha gross were served by drainage canals by the end of the second five-year plan (March 1979) of which about 60% is in projects which have received no settlers; in some cases quality may have been lower because of hastened project preparation.

5. During the second five-year plan settlement was limited to 9,350 transmigrant families, some 25% of the potential provided with drainage infrastructure. This was due in large part to the continuing problems experienced by the Directorate General of Transmigration (DGT) which was faced with excessively high targets in both swamp and upland transmigration and with difficult relationships with other Government agencies. Up to 1980 the impact of the 1978 reorganization of transmigration was mainly felt in the upland sector. Implementation has remained segmented between P4S, DGT and the land clearing agency PTPT; P4S has continued to take the lead in site selection and construction; coordination has been left to the good-will of the agencies and has been somewhat better between P4S and PTPT than between the latter and DGT.

6. The report reviews technical aspects of project preparation and construction and makes recommendations, in particular, for improvement of topographic mapping, review of canal design procedures, better use of existing equipment, more coordinated and integrated implementation schedules. Right of way acquisition should also be improved to avoid disputes with local residents and project delays. O&M organizations should be set up locally. For technical and economic reasons it is suggested that heavy primary forest areas be avoided at this stage. Systematic monitoring of environmental conditions should be conducted in at least one ecologically significant swamp development area.

7. Agriculture in Government schemes is based on one crop of long maturing, photosensitive rice. Rice is well adapted to the soil and water conditions and does not require sophisticated infrastructure. Soils are characterized by acid sulphate clays overlaid by varying thicknesses of peat; they should not be left to dry out and oxidize or long lasting toxicity will develop. Shallow opened field canals (tertiaries and quaternaries) usually provide acceptable water regimes on the fields but simple structures allow better water control and improved cultivation. Present practices use minimum inputs, usually no fertilizer. Support services are generally lacking,

especially extension. The main problems are pest damage and weed competition. Based on long established projects long-term average yields of 2 t/ha appear a reasonable estimate for low-input cultivation.

8. Apart from their rice fields, transmigrants intensively cultivate their homeyards. Other productive activities include logging, fishing, animal husbandry, trading, etc. Overall, however, labor is very seasonal with manpower shortages at land preparation and harvest times, and underemployment at other times. Although very variable transmigrant incomes are satisfactory by Indonesian standards; generally they are not better than those of traditional Buginese or Banjarese settlers. Traditional systems provide interesting insights, such as the Buginese method of gradually switching from rice to coconut; however, they may be difficult to extend to large-scale government programs.

9. Living conditions in the swamps of Indonesia (health, education, communication, etc.) are not markedly worse than in other areas of the country except where dry season drinking water supply is short. Markets and transportation are very active. Settlers appear to adapt well to their environment; many build new houses or extensions to the houses originally provided by DGT. Relations with local populations are generally good, but some community problems arise with Buginese.

10. While the contribution of swamps projects to transmigration has been significant, their contribution to rice production has been limited. This state of affairs is likely to continue and it is argued that Government insistence on rice-based projects could be relaxed. Economic analysis reveals, however, that there is no alternative which would be clearly and undisputedly superior to rice. It is therefore suggested that experiments be conducted, especially based on coconuts, and that means be investigated to maximize the transmigration potential of swamp projects.

11. To improve inter- and intra-agency coordination, improve cost effectiveness and maximize benefits, the swamp development program should be carefully planned, sufficiently in advance. Planning should pay more attention to cost-benefit criteria; emphasize projects providing year-round employment to settlers; and emphasize projects with high multiplier effects. The report discourages attempts to vest planning responsibilities with one of the implementing agencies, and recommends the institution of an office within the Junior Ministry for Transmigration to be in charge of overall coordination for swamp development. Project preparation responsibilities could be given to the Planning Subdirectoriate of DGWRD, a situation similar to that of TKTD for the upland projects. Each agency's internal planning should be simultaneously strengthened. In particular, in P4S, a position for Project Coordinator should be created, an inventory of swamp resources should be conducted and a policy should be established for conducting surveys, investigations and designs.

Extent of Development of Tidal Lands.

Government transmigration performance in Pelita II has been poor when compared to the statistics of gross areas opened. Gross area per Government sponsored settler is calculated: 22 ha/transmigrant in Pelita II compared to 4 ha/transmigrant in Pelita I and to standard farm sizes of 2 ha. Apart from some possible statistical optimism on the part of P4S this may be explained by clarifying the concept of gross area used by P4S and by examining the yearly settlement figures:

- (a) Gross areas, as used by P4S, refer to areas reserved for transmigration by the Ministry of Internal Affairs. Since the transmigration perimeters are determined at an early stage, they may include unsuitable areas which are not reflected in P4S figures (unsuitable soils or areas subject to land disputes).
- (b) Areas are called opened by P4S, and are referred to in this report under the term "Gross Areas Opened by P4S" when they have been provided with basic hydraulic infrastructure, i.e., navigation, primary and secondary canals and, most of the time, tertiary canals. Thus, areas opened are far from being ready for settlement.
- (c) P4S has determined average land use ratios in its projects and has adopted the following, for computational purposes:

| | |
|---|------|
| Gross area | 100% |
| Nonagricultural area (canals, roads, green belts and villages) | 40% |
| Agricultural area | 60% |

Furthermore, the agricultural area is to be allocated according to the following guideline:

| | | |
|-------------------------------------|------|---------------------|
| Agricultural area | 100% | (60% of gross area) |
| Government-sponsored transmigration | 70% | (42% of gross area) |
| Spontaneous and local settlement | 30% | (18% of gross area) |

Based on these figures, the Pelita I average of 4 ha gross area per transmigrant reflects a somewhat lower number of spontaneous and local settlers. P4S presently uses in planning a figure of 5 ha gross area per transmigrant.

- (d) The rate of transmigration was very uneven during Pelita II. The following Table shows that settlement in the first year was entirely on Pelita I projects and that nearly half of the Pelita II settlement occurred in the last year. Most Pelita II projects were not entirely settled by the close of the five-year period and many had received no settlers (see attached Tables): some 150,000 ha "opened" had received no transmigrants while on the remaining 90,000 ha the proportion of gross area allocated to transmigrants was only 24% (instead of the 42% guidelines).

PROJECT COMPONENTS1. Physical Planning

1. Identification of Regions for Transmigration Development. In order to integrate transmigration planning with other aspects of infrastructure development and regional planning Presidential Decree 26/78 gave the task of land identification for the transmigration program to Cipta Karya a Directorate General within the Department of Public Works. Within Cipta Karya site selection was allocated to the Directorate of Urban and Regional Planning TKTD (Tata Kota dan Tota Daerah)./1

2. The first planning activity undertaken by TKTD was preparation of five and twenty-year plans for transmigration. These plans, based in part on a regional development model already in use within the Public Works Department, specific fourteen major development regions within Indonesia and a large number of "partial development regions" (WPP) within each of these areas. Since the Repelita III plan gives high priority to settlement in areas with "regional development linkages and easy access to markets" the first task of TKTD was to identify those WPP which were both underpopulated (hence available for transmigration) and accessible. To determine this TKTD calculated the theoretical holding capacity of each WPP (amount of flat land allocated at 5 ha per family) minus its population (actual x growth rate) in twenty years./2 It then assigned priority to WPP with large settlement potential and access to existing or proposed markets. Those WPP with highest scores were assigned to the five-year plan and those in less accessible areas to the 20-year plan. Although some of the assumptions behind these calculations are questionable, this operation did provide the framework for the identification of 63 WPP with high priority for transmigration, WPP which could then be subject to further scrutiny (see Maps Annex 1).

/1 TKTD is involved in site selection for upland (rainfed) communities only. Site selection for the swamp reclamation program is handled by a separate Directorate for tidal development P4S (Proyek Pembukaan Persawahan Pasang Surut).

/2 Holding capacity was for the purpose of this exercise defined as the amount of flat land (under 8% slope) divided by a potential carrying capacity of one family for every 5 ha of flat land. To be conservative the actual holding capacity was assumed to be 50% of an area's theoretical holding capacity.

3. Early in Repelita III the list of the WPP proposed for settlement was submitted to the committee of minister's responsible for policy decisions on transmigration (the BAKOPTRANS). An approved list was needed to allow participating agencies to anticipate the regions where their services would be required and to permit them to make preliminary requests for budgets for their provincial, district and subdistrict offices. Discussions on this list which proceeded for several months is instructive.

- (a) Since holding capacity had been determined without reference to soils and climate, several agencies expressed concern that it could not give an accurate indication of the agricultural potential of the areas involved;
- (b) since sites had been designated without reference to existing land use or legal status, it was of particular concern to the Directorate General Agraria which is charged with land alienation for transmigration;
- (c) since high transmigration potential had been equated to low population densities it was feared that many sites would be by definition located either in areas of primary forest or low fertility soils; subjects of concern to the Department of Forestry and Agriculture respectively; and
- (d) since sites were determined largely without reference to earlier site identification done by DGT and the provinces it appeared that much of the earlier work might be lost.

A final list of general areas for settlement representing a compromise between TKTD areas and sites previously selected by the DGT was finally approved by the BAKOPTRANS on October 30, 1979 (see Annex 1, Table 1 for a list of approved sites).

4. Site Selection. The second stage of land identification for transmigration involves a "structural analysis" of each WPP to determine precisely where sites are to be located within these broad development regions. In theory, the identification of each specific site is done on 1:50,000 maps taking into account all relevant information on soils, land forms, land use, existing infrastructure and the like. In practice the lack of consolidated information on natural resources, the difficulty of transferring materials between agencies and the very limited amount of time available to TKTD has meant that most sites already identified have been delineated on small-scale maps without the use of this information. For this reason, boundaries so delineated must be considered very preliminary.

5. At the time of the Transmigration Program Review Mission in October 1979, five of 63 WPP had undergone structural analysis and 17 more were in process. (Maps in Annex 1 indicate those WPP completed and underway at that time). Following the delineation of these outline plans formal procedures call for the Directorate General of Agraria to alienate the land for transmigration and for other Directorates to undertake the collection of the relevant data on soils, standing timber, etc. In fact, however, both the tentativeness of the boundaries and sheer number of areas to be reviewed had, at the time, temporarily halted the activities of most agencies and left the execution of all aspects of site identification largely in the hands of TKTD's staff. In an effort to circumvent manpower shortages and speed site identification, in early 1980 TKTD drew up terms of reference for technical assistance for aid in the screening of WPP and identification of sites.

6. Mapping. Since the food crop model for agricultural production requires the identification of large blocks of land of under 8% slope, screening and mapping of proposed areas is a critical part of the land identification process. Procedures agreed upon between GOI and the Bank recommend the delineation of sites on the basis of existing information followed by aerial photography at 1/20,000 and topographical surveys at 1/5,000 scale. Slope associations, soil information and land use surveys are then to be overlaid upon the base map in order to provide the foundation for delineating village boundaries and planning farm layout. Bank consultants have estimated that it will take twelve months to move from outline physical plan through aerial photography, photometric interpretation and topographic mapping before maps are available for detailed village design, TKTD estimates indicate that this will take up to 18 months (see Table 2, following page).

7. Since the TKTD only assumed responsibility for physical planning in early 1979 there were, at the time of the review mission, no GOI projects which had been mapped to Repelita III standards. All projects underway at the time were being cleared by the land development directorate PTPT on a "plan as you proceed" basis. Under these procedures the general area to be developed is designated, major infrastructure networks (roads) blocked out, contracts let for land clearing, trees are felled and topographic mapping and village design are completed after the land is cleared. As of September 30, 1979, 34,000 hectares had been cleared in this fashion and Government anticipated that as many as 100,000 families might be settled in plan-as-you-proceed projects /1 before fully mapped GOI projects would be ready for implementation in 1981/82.

/1 This includes areas for the 56,000 families (28 SKP) yet to be settled from 1978/79 and 1979/80 targets and 52,000 families (26 SKP) from 1980.

Village Design

8. Detailed village design is intended to maximize the number of settlers which the land can hold, minimize the distance between the farmer's house and fields and provide a basis upon which land clearing costs can be estimated. At present village layouts are planned on the assumption of a uniform farm model consisting of 3.5 ha of land of which 2.0 ha is intended for food crop production (and therefore of less than 8% slope) and 1.5 ha is reserved for later tree crop development (i.e., under 15% slope); 1.25 ha is to be cleared at the time of settlement. At this time Public Works planners are designing village layouts which presume 0.25 ha houselots and 1.0 ha of cleared land in nearby blocks. The system for allocating the remaining 2.25 ha has not yet been clarified within Government. At the time of the Program Review mission most settlement was occurring without the benefit of detailed village design but when these activities are fully underway it is estimated that it will take approximately two months to complete detailed design for each SKP.

Physical Development

9. Land Clearing. Land clearing has been one of the most controversial components of the transmigration program. Impressed with the rapid rate of implementation achieved in Sitiung with heavy machinery, the World Bank and Government initially agreed that the scale of the program required mechanized land clearing. This assumption was sufficiently important that the reorganization of the transmigration program in anticipation of Repelita III was to a considerable extent conditioned by the need to place this activity in the hands of the ministry most technically able to manage it - Public Works.

10. Subsequent experience led World Bank staff to have increasing reservations about mechanized clearing and by the time of negotiations for Transmigration II the standards for land clearing were specified as follows:

- (a) cutting by hand or chain saw all trees 30 m and above (80% of the land must be cleared of residual stumps);
- (b) clearing the remaining forest at ground level disturbing the topsoil as little as possible;
- (c) windrowing jungle debris;
- (d) harrowing cleared land with heavy discs; and

(e) undertaking soil conservation measures.

11. Government assumptions have not shifted as rapidly as those within the Bank and most land clearing witnessed by the Program Review team in October 1979 was being done with mechanical equipment (often with bulldozers) with very uneven results. No land clearing had yet been done on Transmigration II sites. Owing in part to this experience, Bank staff now agree that Transmigration III should be based primarily on nonmechanized land clearing (both to preserve the soil and create employment) but this shift has yet to receive official support within Government.

2. Resettlement and Community Development

1. The Directorate General of Transmigration is responsible for settler recruitment, selection, training and transport. It also provides housing and subsistence packages and has the responsibility for integrating local settlers and spontaneous migrants into new settlements.

Standard Transmigration Package

2. Recruitment. In Repelita III project priority is given to applicants from areas: (i) which are ecologically threatened; (ii) where population densities exceed 1,000 persons/sq km; (iii) where soils are infertile; (iv) which are subject to recurring natural disasters; (v) where people are displaced by development projects (dams, watershed protection, etc.); and (vi) in the poorest areas of each administrative district (Kabupaten). To facilitate recruitment the DGT has _____ offices in sending areas and recruitment and selection accounted for _____% of the DGT budget for 197_/7_. In total, 500,000 families were registered by DGT offices in the months preceeding the start of Repelita III, and the demand to move far outweighs the ability of Government to respond.

3. Selection. DGT policy gives preference for resettlement to young married couples from agricultural backgrounds. In general household heads are between 18-35 and children are immature. This means that much of the mother's time is given over to child care, in the first few years on site and families are critically labor short during the establishment period. The DGT has experimented with selection procedures intended to create communities with a balance of farming and nonfarming skills. Most migrants, however, are former farm laborers. Some armed forces retirees do apply, but not the maximum allowed, and few skilled workers have been motivated to transmigrate. Urban recruits have not been found to make very stable settlers as they have already been uprooted from their rural environments and they are usually not willing to apply themselves to sustained agricultural activity. Even the young recruits from agricultural schools have been disappointing, as unmarried farmers do not have the labor to cope with farm demands effectively. For this reason Repelita III projects continue to concentrate on settling farmers with the expectation that the labor shortages created on family farms would bring additional settlers and skilled artisans through spontaneous migration.

4. In the past the risks associated with transmigration were sufficiently high that only the poorest and most motivated moved. For this reason the high quality of transmigrants has generally been assured. Recently, however, the attractiveness of the transmigration package and the publicity given to the program have widened the pool of migrants and concern now exists that some will be attracted into the program without full awareness of the hardships they will face. The focus on refugee populations - those displaced by disasters or development - also reduces selective pressures and self-screening and evidence is mounting that

compulsory migrants do less well in the receiving areas than those who have applied and waited to be moved. /1 Together these two points suggest that the larger the scale of the program and the more it focuses on refugee populations the more likely it is that the number of families who fail will increase, regardless of the quality of the package itself.

5. Transport. Most migrants are picked up in their home villages and moved to their point of embarkation by bus. There they are placed aboard ship for the journey to the transmigration site. Once in the receiving area they are again conveyed by bus to their new homes. This can often be an arduous trip, particularly for mothers and their young children and the GOI has recently purchased several aircraft to transport migrants directly to the remoter sites. This procedure is still costly, however, and will probably only be used for a small proportion of those moved during Repelita III.

6. Provisioning. Upon arrival in the settlement area migrants receive small houses made of plank and tile, and a standard settler package consisting of tools, clothes, sleeping mats and cooking supplies. The family also receives a subsistence package consisting of rice, fish, cooking oil, kerosene, sugar, salt and soap, for the first twelve months after resettlement (see Table _._.) Health and education components are also provided on the standard transmigration package.

Components for Local Settler and Spontaneous Migrants

7. Local Settlers. Upon the recommendation of provincial governments the GOI agreed in 1978 that 10% of all spaces in transmigration communities would be reserved for local people. Since these people are generally shifting cultivators and rubber tappers unfamiliar with the farming methods, language, or culture of people from Java, this necessitates particular attention to their integration within the community and the provision of project components appropriate for them. For example, the Transmigration II Project proposed that these farmers be settled in groups of no less than 30-35 households (one dukuh) reasoning that to scatter them among farmers from Java would place the burden of assimilation on local settlers, isolate them from cooperative work groups (work patterns are different between groups), and increase the likelihood that locals would lose interest and withdraw from the community when their subsistence packages ceased. To conform to local tradition, the project provides that houses for local settlers be elevated from the ground and have appropriate cooking areas and sanitary facilities.

/1 The reasons for this are several: the compulsory migrants are not selected for age or farm experience (they may be old or sick), they may be demoralized and discouraged, and they frequently lack the knowledge which encouraged the regular migrants in the first place.

Since so little is known of either the agricultural practices of the local people or the problems likely to be encountered while integrating them into the settlement, the project also requires research to evaluate problems of adaptation and make recommendations for future settlement. It is assumed that these components would be standard in both Bank and GOI projects.

8. Spontaneous Migrants. Previous experience in transmigrant communities suggests that spontaneous migrants do as well as those who are fully sponsored. This is related in part to selection factors - spontaneous migrants tend to be slightly older and have more labor in the family, and may have slightly higher incomes before transmigrating than the assisted migrants. It is also due to the fact that spontaneous migrants move to areas where they have relatives and friends who can provide them with economic and social support. Since spontaneous movement meets the ultimate goal of resettlement in a less costly, less cumbersome and perhaps less risky manner than full Government support, the Transmigration II Project assists spontaneous movement in the following ways:

- (a) Twenty percent of sites in five trial villages are to be cleared and planted with a cover crop. In the second year these plots would be opened to homesteading by relatives of settlers within the block. These settlers would not receive houses or subsistence support but would be eligible for the same agricultural package as sponsored immigrants. The progress of these settlers would be closely monitored with the objective of increasing the number of people settled through homesteading.
- (b) DGT would register all spontaneous migrants who arrive on site. After one year those who meet the settler selection standards (married agriculturalists from poor or landless families) would be eligible to move with full support into the next available settlement. A waiting period of one year would encourage families to bring relatives to relieve labor shortages and it would allow Government to adjust recruitment quotas in Java. It would also serve to weed out inappropriate settlers, and reduce the cost per family settled.
- (c) In all main villages at least 75 houselots would be cleared and made available to nonagricultural settlers. Land would also be made available near market areas in other villages. This land would be surveyed and the deeds transferred for a nominal administrative fee. Procedures would be developed to ensure that deeds would be given only to those who occupied land and that the area would revert to the community if the owner-operator left.

- (d) As one of its first research activities, the DGT would undertake a study of existing spontaneous migrants and the constraints to spontaneous movement. Special attention would be paid to problems of land transfer. At the same time DGT would also explore the location, construction and staffing of transitos for spontaneous migrants and submit plans and cost estimates for their construction and maintenance.

It is important to note that Transmigration II, and by implication the standard GOI projects, primarily address the needs of migrants who are attracted to agricultural communities already established by the Government.

Community Development

9. Once transmigrants are on site, the DGT coordinates community development. For example, DGT officials:

- (a) register new arrivals and settle them on their land;
- (b) register spontaneous migrants and, within the project area, arrange the transfer of appropriate lands to them;
- (c) disseminate information to the village heads and dukuh leaders;
- (d) coordinate record keeping;
- (e) supervise monitoring and evaluation of project impact;
- (f) supervise the organization and growth of village level administration;
- (g) prepare communities for the transfer to provincial authority within five years or less from the time transmigrants arrive on site; and
- (h) provide land titles to migrants in cooperation with Directorate General of Agrarian Affairs.

Titles are given to the migrants on the conditions that: the plot not be transferred; if the land is sold after five years, it cannot be subdivided; and if the owner dies, the land must be transferred as a unit to just one of his heirs.

3. Agricultural Components

Farm Plot

1. The farm model for Repelita III calls for food production on 2.0 ha of land (under 8% slope) and 1.5 ha of land suitable for tree crops (under 15% slope). Under present plans, Government will clear 1.25 ha for each migrant (0.25 ha for houselots and 1.0 ha for food crops) leaving the remaining 0.75 ha of land for food crops to be felled by the migrants themselves. It was agreed at the outset of Repelita III that 1.5 ha of migrant land would be planned to tree crops, with GOI assistance, at a later stage of development. Since division of the farm plot into three or four separate pieces (houselot, 1.0 ha food lot, 0.75 ha food lot and tree crop parcel) would make it more difficult to open and cultivate land the Bank Group obtained assurances from Government at the time of negotiations of Transmigration II that GOI would minimize fragmentation of the houselot and food crop areas. Controversy on this subject has yet to be resolved.

2. Seeds, Fertilizers and Pesticides. Both Bank-assisted and GOI projects supply the same package of agricultural inputs to migrants during Repelita III. Each farmer receives an initial package consisting of rice, maize and secondary food crop seeds plus appropriate seedlings such as coconuts, coffee and cloves. /1 Families also obtain a fertilizer allotment of urea and TSP for three years; (this, in addition to the rock phosphate laid down by the contractor at the time of land clearing). Migrants do not pay for fertilizer in Year 1 but repay 50% the cost of fertilizer in Year 2 and 75% in Year 3. This money is then used to establish a revolving credit fund in the farmers' cooperative or KUD. In addition to supplying food crop seed the Directorate General of Food Crops is also responsible for establishing plant protection brigades to monitor and fight plant pests and diseases and to distribute pesticides and poisons (for seed and fertilizer packages for Transmigration II, see Table 2.). Unlike Government projects, Transmigration II also contains a component to provide 8,750 head of imported cattle to the 34,000 families in Jambi province. These animals are intended less as draft animals than as the nucleus of an upgraded herd, which will provide draft power in the future.

/1 Food crop seed is to be provided by the Directorate General of Food Crops which is also responsible for seed farms for its multiplication and tree crop seedlings are supplied from nurseries established by the Directorate General of Estates.

Table . . : SEEDS AND FERTILIZER PACKAGES FOR TRANSMIGRATION II

| | <u>Seeding rate</u> (kg/ha) | <u>Total/family</u> (kg) | <u>Unit cost</u> (Rp/kg) | <u>Total cost</u> (Rp'000) |
|---------------------------------------|--------------------------------|-----------------------------|-----------------------------|-------------------------------|
| 1. INITIAL SEEDS AND PERENNIAL | | | | |
| <u>SEEDLING PACKAGE</u> | | | | |
| <u>Food Crop Seeds</u> | | | | |
| Upland rice | 50 | 50 | 220 | 11.0 |
| Maize | 10 | 10 | 150 | 1.5 |
| Cassava | - | 2,000 (cuttings) | 3 | 6.0 |
| Soybean | 30 | 3 | 500 | 1.3 |
| Peanut | 120 | 12 | 500 | 6.0 |
| Mung bean | 20 | 2 | 350 | 0.7 |
| Cowpea | 20 | 2 | 1,200 | 2.4 |
| Subtotal | | | | <u>29.1</u> |
| <u>Vegetable Seeds</u> | | | | |
| Chili | - | (g) 100 | (Rp/g) 10 | 1.0 |
| String bean | - | 200 | 3 | 0.6 |
| Miscellaneous | - | 75 | 3 | 0.6 |
| Subtotal | | <u>500</u> | | <u>2.2</u> |
| <u>Perennial Seedlings</u> | | | | |
| Jack fruit (plants) | - | (No.) 4 | (Rp/unit) 200 | 0.8 |
| Banana (suckers) | - | 15 | 250 | 3.8 |
| Rambutan (plants) | - | 4 | 500 | 2.0 |
| Papaya (plants) | - | 5 | 250 | 1.2 |
| Pineapple (slips) | - | 50 | 50 | 2.5 |
| Coconut (seedlings) | - | 15 | 700 | 10.5 |
| Clove (plants) | - | 4 | 350 | 1.4 |
| Coffee (seedling) | - | 30 | 250 | 7.5 |
| Subtotal | | <u>127</u> | | <u>29.7</u> |
| <u>Total Seeds</u> | | | | |
| <u>Package Cost</u> | | | | <u>61.0</u> |
| 2. FERTILIZER AND | | | | |
| <u>PESTICIDE PACKAGE</u> | | | | |
| | | (kg) | (Rp/kg) | |
| Urea | | 130 | 120 | 15.6 |
| TSP <u>/a</u> | | 130 | 116 | 15.1 |
| Pesticide (general) (liter or kg) | | 4 | 6,500 | 26.0 |
| Pesticide (seed dusting) <u>/b</u> | | 0.5 | 6,500 | 3.3 |
| Rodenticide | | 0.5 | 3,000 | 1.5 |
| <u>Total Cost</u> | | | | <u>61.5</u> |

/a Triple superphosphate.

/b This should be a systemic pesticide for treating seed before planting. Besides these two pesticides, a poison suitable against wild animals such as pigs and monkeys (0.5 kg/family) would be stored at the REC or kiosk. It would only be distributed to farmers if the PPLs considered it necessary.

3. Extension. Extension is nowhere more important than in transmigrant communities where farmers must learn an entirely new system of agriculture and be able to stand on their own when their subsistence supplies cease. In Repelita III programs the Directorate General of Food Crops is responsible for establishing Rural Extension Centers at each project site. Each extension center is to be staffed with middle-level agricultural personnel (PPMs) who train and supervise village-level extension workers (PPLs). The extension workers provide information both to new and existing settlers and local inhabitants. Recognizing that transmigration extension workers need more intensive training than they now have, Transmigration II proposes special training and technical assistance to design and upgrade the training curriculum. In spite of these provisions the overall quality of extension in GOI and Bank projects remain of considerable concern.

4. Farmer's Cooperatives. The greatest threat to agricultural production in rainfed areas is that farmers will fail to invest in the fertilizer required to sustain food crop production once free fertilizers cease. During Repelita III, the Government plans to supply inputs through BIMAS, a credit system developed for irrigated areas. Under BIMAS a farmer obtains credit for an appropriate package of inputs - seed, fertilizer and pesticides and repays his loan at harvest time. For wet rice this system enjoys moderate success but in rainfed areas the risks associated with production are sufficiently high that credit packages have not been well used on rainfed foodcrops. /1 For this reason the Transmigration II Project proposes the formation of professionally managed cooperatives in each migrant village to provide the required inputs. The cooperative is initially provided with warehouses for fertilizer and grain storage, a drying floor and small rice mill. Capital formation occurs from money "repaid" for fertilizers in Years 2 and 3. To assure the appropriate management of the cooperatives the Directorate General of Cooperatives has agreed to train managers who would form the cooperatives, distribute inputs and establish a system of revolving funds while training the farmers in cooperative activities. This experiment is to be closely monitored and if successful may be expanded to GOI projects.

/1 Surveys in Way Abung, a community of 12,000 families rehabilitated under Transmigration I show 5.6% of families use the credit package provided by BIMAS.

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4. PROJECT COORDINATION

1. To promote the coordination of the various agencies involved in transmigration, Presidential Decree 26/78 provides for:

- (a) A policy committee consisting of Ministers and chaired by the Minister for Manpower and Transmigration. This committee is called the BAKOPTRANS.
- (b) A committee to handle implementation issues consisting of the Director Generals of the major participating agencies. This committee is called the SATDAL and is chaired by the Junior Minister for Transmigration with the DGT as his Secretariat.
- (c) A provincial committee for transmigration charged with coordinating line agencies and chaired by the Governor of each province.
- (d) A project coordinator for each major project and a deputy project coordinator site. (A diagram of these relationships is given in Table 2. .)

2. The evolution of smooth working relationships within this complex organization arrangement is of the utmost concern to GOI and the Bank. This concern is focussed at two levels (a) the coordination of project preparation and (b) implementation in the central agencies and the coordination of services on site. To improve these working relationships the loan for Transmigration II provides funds for technical assistance to the Junior Minister for Transmigration to improve the coordination and implementation of the transmigration program. The project is financed by funds to be made available by the GOI from the proceeds of a World Bank/IDA credit for the Transmigration II Project and by funds made available from UNDP. These funds will be pooled and administered by UNDP/OPE.

3. The technical assistance would be provided by a single management firm with two separate but interrelated tasks. First, would be to provide assistance to a Management Development Team within the Office of the Junior Minister for Transmigration (JMT) to improve all aspects of the coordination and implementation of the transmigration program. Second, would be to provide management assistance to the Project Coordinator (in Jakarta) and the Regional Project Coordinator (in Jambi province) who are responsible for coordinating the implementation of Transmigration II, and to aid in establishing procedures for the monitoring and evaluation of this project. The linkage of these two components was deemed critical for the evolution of compatible management procedures within the Office of the JMT in Jakarta and in the field.

4. Within the Office of the JMT the selected firm would assist the Management Development Team in inter alia:

- (a) analyzing the structure of the transmigration program and existing lines of authority;
- (b) assisting in the establishment of paths of crucial information flow, and financial control;
- (c) identifying problem areas and weaknesses in the administrative system and formulating strategies for making the necessary improvements;
- (d) establishing a systematized information linkage among all of the agencies concerned with the transmigration program as specified in Presidential Decree No. 26;
- (e) developing a system to assure the timely preparation of work programs and submission of budgetary requests within the implementing agencies;
- (f) establishing a standardized reporting system as an aid to decision making and to monitor the status of implementation throughout the various projects;
- (g) establish procedures for periodically evaluating the actual results of project implementation compared with short-, medium- and long-term goals, identifying blockages, and making recommendations for their elimination;
- (h) establishing procedures for monitoring and evaluating benchmarks of social and economic development within settlements;
- (i) assessing the staffing needs and managerial requirements at all coordinating levels of the program with specific recommendations as to assistance and training required;
- (j) producing manuals of organization, financial control and coordinating procedures as required.

5. Within the Office of the Project Coordinator and Regional Project Coordinator to assist, among other things in:

Project Coordinator's Office - Jakarta

- (a) developing a system to assure the timely preparation of work programs and submission of budgetary requests by the various agencies involved in Transmigration II;

- (b) developing reporting procedures for monitoring rate of project implementation in the various Transmigration II sites and assuring their smooth coordination;
- (c) recommending appropriate reporting procedures and linkages between the coordinating bodies at all levels, and between the various line staff;
- (d) assessing the overall management system established within Transmigration II and making recommendations for improvement; and
- (e) undertaking ad hoc studies as required which would provide data to facilitate decisions about policies to improve transmigration implementation.

Regional Project Coordinator's Office - Jambi Province

- (a) establishing procedures for developing and coordinating agency work programs and monitoring their implementation;
- (b) developing systems for identifying implementation problems and procedures facilitating their resolution;
- (c) establishing benchmarks of migrant development and undertaking their periodic measurement on all Transmigration II sites; and
- (d) identifying problems in the course of benefit monitoring and arranging for ad hoc studies to clarify their source and promote their resolution.

6. The Technical Assistance Team is located in the Ministry of Manpower and Transmigration, reporting to the JMT. A new entity will be established within the Junior Minister's Office, namely a Management Development Team staffed by full-time national professionals assisted by internationally recruited and local technical assistants. The consulting firm and national staff will jointly carry out the task of formulating an effective management system for transmigration.

7. To monitor the progress of the project a Joint Management Committee (JMC) will be established, chaired by the JMT. It will be composed of a representative from BAPPENAS, representatives from each of the three Directorates to be designated by the JMT, the team leader from the consulting firm, and one representative each from UNDP, the World Bank and OPE. The duty of the JMC will be to facilitate the work of the Management Development Team. In making its determinations, the JMC shall keep formal minutes of its meetings and submit copies to UNDP/OPE and the Bank. This committee will be responsible for reviewing progress of the Management Development Team and assuring that a workable management system is established which can eventually be directed by national staff.

SOILS OF INDONESIA AND TRANSMIGRATION /1

I. M. Scott

Soils Still Available for Agricultural Development

1. General. In general, those soils which have above average properties for agricultural use have already been settled by farmers and are quite fully exploited in Indonesia. These comprise soils in the great soil groups of andosols, grumosols, mediterranean soils, those soils derived from volcanic ash and the regosols and latosols, and much of the riverine alluvial soils. Of the remaining groups some cover too small an area to be usefully considered. Others, although inherently fertile, are shallow, associated with steep terrain and/or located in areas with severe water shortages. Large tracts, particularly in Irian Jaya and Kalimantan, comprise steeply dissected or mountainous terrain and can be discarded from consideration on those grounds, regardless of the dominant soil group.

2. There remain however, very large areas of flat or only moderately sloping terrain where little settled agriculture has yet been established. These mainly comprise areas with the following characteristics:

- (a) coastal plains mantled by young marine alluvium (a subdivision of the alluvial soils), at or near sea level and usually covered by mangrove forest. These soils are found fringing many coastal tracts, but are particularly important in East Sumatera, West and South Kalimantan, and the southwest coast of Irian Jaya;
- (b) coastal swamp plains mantled by peats (organosols) and generally remaining under peat swamp forest. They cover a broader area than the first group but have similar distribution, as a coastal zone of mangrove clays usually grades inland into a broad peat swamp tract; and
- (c) uplands in which the dominant soils have low fertility, and if used at all they are largely farmed under shifting cultivation. The soils in these areas have a range of characteristics but most are classed as red-yellow podzolic soils. They are widespread in Sumatera, Kalimantan and, to a lesser extent, in Irian Jaya.

/1 Abbreviated from a report by I.M. Scott written for 1977 Identification of Transmigration II, III and IV.

3. Marine Alluvium Soils. These young marine clays commonly include areas of acid sulphate soils. These have accumulated soluble sulphides from sea water (many of them remain inundated by seawater at high tide), and in the presence of iron and microbial action, these are reduced to form pyrite. Following drainage and rapid aeration, sulphuric acid is formed and the pH may drop below 3. At these pH levels, plant growth is limited, some metallic irons become toxic, there is fixation of phosphates, and other nutrient imbalances occur. As most agricultural uses of these soils involve drainage, the chemical problems involved in bringing them into cultivation are complex. In addition to extreme acidity, nutrient levels are commonly low. Less nitrogen may be released; phosphate is strongly fixed by the high aluminum levels at low pH levels. Aluminum, iron and manganese may be toxic at low pH levels while molybdenum may be deficient in very acid conditions.

4. Large and usually uneconomic dressings of lime are required to "neutralize" the acidity of these soils after drainage. The alternative is to maintain the water table at such a level that drainage does not occur. Under such conditions they can be used for rice provided the fertility can be improved.

5. In many parts of southeast Asia, local farmers have reclaimed some of the swamp soils which have included acid sulphate soils by working progressively in from the river banks, but without controlled drainage yield expectations are low and erratic, and many such tracts have been abandoned after a few years. Some small-scale developments of such areas have been successful. Acid-sulphate soils have also been used for estate crops (coconut, cocoa, rubber, oil palm) in Peninsular Malaysia, but where the toxic layer is near the surface, control of the water table is essential. In the context of transmigration projects, however, development of such areas involves a large commitment of funds for drainage control with no guarantee that the acidity problems can be quickly and economically overcome.

6. Peat Swamp Soils. The problems attached to peat swamp reclamation initially hinge on the mechanics of drainage improvement, although the problems involved are rather different from those of acid-sulphate soils. The application of drainage to large basin peat swamps is likely to be ineffective unless an entire natural swamp unit is reclaimed. Attempts to drain isolated portions of a large swamp tract have generally proved inefficient. If effective drainage is achieved, subsidence of the peat occurs and cancels some of the gains. The degree of subsidence varies with a number of factors and cannot be accurately estimated in advance.

7. Mineralization occurs on drying. The deep peats are developed from tree debris rather than grasses; these are low in nutrients and are also very acid. Even when satisfactory drainage has been achieved, considerable amounts of fertilizer are likely to be required and lime may also be needed. Drained peat is an unstable medium for tree crops; such crops cannot be established until the initial subsidence rate has slowed and, once matured, they remain susceptible to wind-throw.

INDONESIAAPPROXIMATE DISTRIBUTION OF LAND POTENTIAL FOR AGRICULTURE IN INDONESIA
('000 ha)

| Capability class | Java/ Madura | Bali | Sumatera | Kalimantan | Sulawesi | Irian Jaya | Nusa Tenggara | Maluku | Total |
|-------------------|-----------------|------------|---------------|---------------|---------------|---------------|------------------|--------------|----------------|
| Suitable | | | | | | | | | |
| I | 275 | - | - | - | - | - | - | - | 275 |
| II | 344 | 19 | - | - | 275 | - | 94 | - | 732 |
| III | 969 | - | 631 | - | 806 | - | 138 | 25 | 2,569 |
| Marginal | | | | | | | | | |
| IV | 3,369 | 144 | 7,781 | 1,319 | 1,869 | 1,144 | 2,069 | 1,113 | 18,808 |
| V | 2,344 | 125 | 26,306 | 23,281 | 2,106 | 17,756 | 2,200 | 3,425 | 77,543 |
| Unsuitable | | | | | | | | | |
| VI | 3,312 | 206 | 5,206 | 13,263 | 3,425 | 6,688 | 481 | 1,206 | 33,787 |
| VII/VIII | 2,606 | 62 | 7,439 | 16,137 | 10,614 | 16,612 | 2,056 | 1,706 | 57,232 |
| <u>Total</u> | <u>13,219</u> | <u>556</u> | <u>47,363</u> | <u>54,000</u> | <u>19,095</u> | <u>42,200</u> | <u>7,038</u> | <u>7,475</u> | <u>190,946</u> |

Source: Muljadi and Soepraptohardjo, 1975.

8. The main attractions of peat swamp areas are that they comprise unsettled flatland. Reclamation is, however, a low process which is likely to involve costly investments in drainage and entail management problems which are not yet fully solved. Unless the peats are shallow (and some Sumateran peat swamps have organic layers 15 m thick), it can be assumed that any scheme established on these areas will have a limited life through continued subsidence of the peat surface. Subsidence will be accelerated by cultivation.

9. According to LPT, organosols cover approximately 24 million ha in Indonesia (Table 2). Polak (1952) has estimated "organic soils" in Indonesia at 16.5 million ha. The discrepancy is probably a question of definition but either figure indicates that there are very large areas of such land. The problems connected with developing them on a large scale for agriculture are great, however. It is likely that with present levels of technology, the bulk of the deep peat soil are best considered as timber areas, for which they are well suited.

10. Upland Soils. The relatively infertile upland soils which offer possibilities for large-scale agricultural expansion mainly comprise red-yellow podzolic soils. Most of the opportunities for upland transmigration settlement are in these areas and the red-yellow podzolic soils are therefore dealt with in more detail in the following sections. Passing reference is also made to the opportunities and constraints offered by areas of latosols, as one of the proposed project areas under review in this report (Rimbojangan) is located largely on these soils.

Red-Yellow Podzolic Soils

11. The Term. Podzolic soils are so called because they have developed largely through a podzolic soil-forming process. This involves the mobilization, and removal or translocation, of iron and aluminum and the relative accumulation of silica within the soil profile. The genetic process is not further discussed here, since in the present context interest centers on the physical and chemical characteristics which have resulted from it.

12. The description "red-yellow" applies to the color of the subsoil and specifically to that of the lower subsoil. Topsoils are normally brown, and the upper subsoil may be pale yellow or grey. The lower subsoil, however - and usually the whole subsoil - has colors in the range of brown, yellowish brown, reddish brown, yellowish red or reddish yellow. The term "red-yellow podzolic" covers all soils within this range. In discussing specific areas, however, the dominant color in this area may be used to replace the general terms, as in the yellow-brown podzolic soils reported in the Rimbojangan area. In some places (such as Sarawak) the term "red-yellow podzolic" has been used to distinguish these soils from "grey-white podzolic" soils which have developed similar morphology under similar processes but are derived from parent materials abnormally low in iron, and which never have strong subsoil colors even in well-drained locations.

13. Apart from subsoil color, the characteristics which qualify the soil to be classified in this group are those which support the conclusion that a podzolic process is dominant in the profile. These may be: development over siliceous parent material; acidity; a clay and/or sesquioxide content which increases with depth in the subsoil; or other features indicative of this mode of genesis. Such criteria may be evident in a wide variety of soils, however. Red-yellow podzolic profiles may, for example comprise sandy loams, or may be clay loams grading at depth to clays. The term has been used without qualification in contexts where the agricultural potential and constraints have been assumed to vary little regardless of the profile concerned. It must be emphasized that this is not correct. Soil groups in classification systems biased towards genetic divisions largely ignore agricultural considerations. These are dealt with in the lower categories of the system. While it can be said that most red-yellow podzolic soils have a low natural fertility, are very acid, and have high susceptibility to erosion, variations within the group in these and other respects are quite great and depend on many factors. These soils also occur on different terrain, which may impose its own restraints or allow greater than average opportunities for use.

14. Physical Characteristics. The classic form of red-yellow podzolic soils (Simonson, 1949; McCaleb, 1959) has the following physical features: Below a thin dark (generally loamy) topsoil, the upper subsoil is prominently bleached (pale yellow, light grey or almost white) and relatively light-textured (sandy loam to loam); this overlies (usually abruptly) a lower subsoil which has stronger colors (yellow to red) and higher clay content (generally clay texture grade); the lower subsoil has a moderately strong blocky structure and the faces of the structural blocks are partially or wholly coated with clay skins. The assumption is that clay (and sesquioxides) in the upper subsoil have been mobilized and moved downwards within the profile and have then, in part, been deposited on structural surfaces in the lower subsoil. This movement of clay and iron, involving losses from the upper subsoil and enrichment at greater depth, gives the contrast in color and texture described above. (This is only the simplest of the processes involved in the development of these soils, and the mechanics of their formation have been the subject of much debate; for the purposes of the present report they need not be explored further.)

15. This "classic" form is not necessarily found in the humid tropics, however. The concept of the group was originally created in northern latitudes to distinguish these soils from the grey podzolic soils of temperate climates and to isolate in the classification system soils which were initially recognized in the southeastern states of America. Related soils were then recognized in tropical areas and the term extended to include them.

16. Under a humid tropical climate the profile tends to be more uniform. Again, the mechanics of formation are somewhat arguable, but among the factors which can be more important in these areas than in other climates are:

(a) lack of structural expression due to the continual moist state of the subsoil; and (b) intense microfaunal activity to considerable depths in the profile, provided it is well drained. Lack of structural development implies fewer channels for downward migration and rather less clay movement (although lateral clay movement may still be important). The clay increase with depth may thus be gradual rather than abrupt, particularly in fine-textured soils, and may require confirmation in the laboratory. The bleached zone may be absent. Subsoil color may be uniform or a gradual reddening (for example from yellowish brown or brownish yellow to reddish yellow) may be observable. The tendency towards subsoil uniformity is usually due in part to the other factor mentioned: the microfauna. Microfaunal action mixes up the material, commonly brings clay towards the surface, generally acts against other processes which operate in only one direction and minimizes the degree of subsoil horizonation contrasts. Clay skins in the lower subsoil tend to be few, due to the lack of open structural faces on which they can form and to the destruction by the passage of worms and other fauna of many of the clay skins which have formed. The importance of faunal disturbance in Sumateran red-yellow podzolic soils is confirmed by the sections discussed by Dai et. al. (1975).

17. There is little structural development in the topsoil and subsoil structures are weak. In the topsoil and upper subsoil there is a high proportion of natural clay (clay which will easily disperse in water) and structural units have low stability. Surface soil therefore tends to erode easily under the impact of rainfall unless protected.

18. Instability depends to a large degree on texture, structure and organic matter levels; where the latter are very low through overcultivation and/or surface erosion and truncation, the relatively light-textured, poorly-structured topsoils are less stable than the more clayey subsoils. With a high concentration of surface organic matter, on the other hand, the reverse tends to be the case. This is illustrated by two profiles (a complete (1) and a truncated (2) red-yellow podzolic soil) from the Lampung area of Sumatera studied by Driessen and Soepraptohardjo (1974) and whose physical characteristics are quoted below.

| Profile horizon | Depth (cm) | Aggregates (%) | Instability index | Structural stability | Org. matter (%) |
|------------------|------------|----------------|-------------------|----------------------|-----------------|
| 1. Upper subsoil | 14-65 | 43.0 | 2.75 | Very poor | 0.30 |
| Lower subsoil | > 80 | 65.2 | 1.90 | Moderate | 0.30 |
| 2. Surface | 0-12 | 60.6 | 0.23 | Excellent | 3.10 |
| Upper subsoil | 12-40 | 55.1 | 0.83 | Very good | 0.54 |
| Lower subsoil | 40-68 | 48.5 | 1.87 | Moderate | 0.37 |

19. Bulk density increases with depth but in surface horizons varies with the cover and land use history of the site. Buurman and Dai (1976) found in Lampung profiles that bulk density was lower under manual cultivation or an alang-alang cover than under either machine cultivation or forest.

20. Latosols, in contrast, have uniform (and generally deep) profiles with high sesquioxide levels and generally strong yellow-red colors. A fine grade of structure has developed, and due to the high iron content, the structure is somewhat stable. The profile tends to be friable and porous, but to resist erosion to a greater degree than podzolic profiles. There are, however, many intergrade forms between the latosols and the podzolic soils. Many soils have been classified in the latosols largely on their prominent red subsoil color, although their structural properties, stability and texture profile are more akin to those of the podzolic soils.

21. Chemical characteristics. Red-yellow podzolic soils in the humid tropics generally have the chemical characteristics discussed in the following paragraphs.

22. As they are derived from siliceous parent materials (or from intermediate parent materials which are on old surfaces and which have been highly leached) they are strongly to very strongly acid. In the Tulangbawang and Rimbobujang areas, for example, the pH of all profile analyses is below 6 in both topsoil and subsoil, and can be as low as 4.2.

23. The clay minerals comprise iron oxides and 1:1 minerals such as kaolinite. Clay minerals with a 2:1 lattice, such as illite or vermiculite, may be present but are rarely found in significant amounts except where the profiles are juvenile and are developed over micaceous sedimentary rocks (and in such situations the crystallinity of the minerals is generally poor). The

cation exchange capacity (CEC) of these clays is therefore low (but not as low as in well-developed latosols). The CEC of the fine earth in profiles from the Tulangbawang area was within the range 3-12 m³/100 gm in the subsoil. Higher CEC levels were recorded in topsoil (and some upper subsoil) horizons but are related to the presence of organic matter. The one profile analysis from the Ribobujang area gave a CEC of 10 in the topsoil rising to 23 at depth. No details on method are given and the figures may not be comparable with the Tulangbawang area data. The high CEC at depth is unusual and requires explanation. The low CEC of red-yellow podzolic soils limits the degree to which they can retain added fertilizers and, in a high rainfall environment where leaching is strong, much wastage of fertilizer may be expected.

24. Due to the leaching environment the degree of base saturation is low and decreases with depth. Base saturations of 15-30% may be expected in topsoil horizons where organic matter is present (although this is highly variable in areas which have been used in the past for cultivation) but generally average about 10% in the subsoil. Calcium and magnesium are usually present in greater quantities than potassium and sodium, although the total levels are so low that the ratios have little significance. Exchangeable aluminum may take up a high proportion of the exchange complex. The low level of bases present and available for plant use in natural conditions means that no sustained agriculture can be envisaged on these soils without fertilizer.

25. As the activity of the clays and the degree of base saturation of the exchange complex are both low, the amounts of bases available in the soil for plants and the degree to which the soil can retain added bases in fertilizer additions for plant use depend largely on the percentage of clay in the profile and the base-absorbing qualities of organic complexes. While organic matter levels may be moderately high in natural conditions, this situation changes quickly once the soil is brought into cultivation unless good management is practiced. Clay content on the other hand, varies widely because the red-yellow podzolic group ranges from sandy loams to clays. The clay fraction may thus be 10% of the fine earth, or over 50%, and if data from the Tulangbawang area are correct, may exceed 70% in some profiles. Judgments on agricultural potential therefore depend on the profile under consideration and can only be made at a very general level for the group as a whole.

26. Studies in Lampung (Buurman and Dai, 1976) suggest that, within the range of brown to yellowish-red podzolic soils, there are no contrasts in CEC and no clear correlations between color and base saturation. The level of exchangeable aluminum, which at high percentages may become toxic to plants, was higher in brown profiles than in yellowish brown or yellowish red soils. They were also more acid. The contrast in these respects was not marked, however.

27. Latosols are equally poor in chemical characteristics required for plant growth. due to the dominance of 1:1 clay minerals and the high proportion of oxides, they have even lower CECs than the red-yellow podzolic soils and are likely to require higher levels of fertilizer application.

28. Nutrient Levels. Nitrogen is likely to be one of the most important plant nutrients limiting crop growth as it is largely in organic forms, levels are highly sensitive to changes in the vegetation cover, and it is very susceptible to leaching in the tropical environment. Levels in analyzed profiles in the Tulangbawang and Rimbobujang areas were generally below 0.1% in all horizons, including the topsoil. Topsoils under a mature forest cover may be expected to have higher levels but are unlikely to exceed 1% at many sites. The natural nitrogen level will be quickly exhausted once forest is cleared and the land cultivated. Cultivation practices must therefore include return-inc crop residues to the land, using leguminous crops in rotations for annual foodcropping, and supplying nitrogen as fertilizer additions.

29. Little phosphorus is lost by leaching but there are high losses through erosion, as phosphorus is concentrated in the surface horizons. Total phosphorus levels in topsoils of red-yellow podzolic soils do not usually exceed 200 ppm. Little of this amount is available. Extracted phosphorus in soils from the Tulangbawang area (by mild extractants giving indications of the available fraction) suggested that available phosphorus for plants is less than 20 ppm in most topsoils. The levels will quickly be further reduced by cropping, and fertilizer applications will be required. Phosphorus availability can be increased by liming but it is uncertain whether this will prove economic in smallholder transmigration projects. In both red-yellow podzolic soils and latosols the fertilizer requirements for phosphorus are likely to be high due to the amount which is fixed in unavailable forms within the soil. There are conflicting data on the soil fixing power in these areas, however; Buurman and Dai (1975) found that in some Lampung profiles there was a considerable residual effect from phosphorus applications.

30. Potassium is likely to be least limiting for agriculture under traditional methods, but, together with nitrogen and phosphorus, will quickly become critical under sustained annual cropping. Potassium obtained from the Tulangbawang area profiles by mild extractants was between 26 and 101 ppm in topsoil horizons. Losses through leaching and crop extraction once cultivation is initiated will quickly reduce these levels.

31. The natural levels of the main plant nutrients under a forest cover will probably support annual crops for the first and perhaps, second seasons. Beyond the second season, however, it can be assumed that these reserves will be largely exhausted. Sustained annual cropping will then depend on heavy fertilizer applications, accompanied by good soil management, the inclusion of legumes in the rotation, and the return of crop residues to the land.

32. In land which is cleared from alang-alang (as will be the case in much of the Tulangbawang and Pematang Panggang areas) heavy fertilizer additions will be required in the first year, as these soils are already exhausted and have few nutrient reserves.

33. Land Use Possibilities. At present red-yellow podzolic soils in many parts of southeast Asia are extensively used for rubber or oil palm, crops such as pepper, and a variety of annual crops; however, rubber is the only consistently satisfactory crop on estates, where good management and the required fertilizer applications are both available and economic. Pepper vines, other than poor-yielding, semiwild vines, are only planted by farmers (such as Chinese smallholders in Malaysia) who have sufficient capital backing to supply the heavy fertilizer investment needed. With this crop soil characteristics (other than good drainage) are less important as nutrient needs are very high and have to be largely added even on relatively fertile soils. Annual crops are almost invariably planted on a shifting cultivation system, except where household trash is available near the homestead. Some crops, such as cassava, are grown intensively by commercial groups, but with high fertilizer additions and usually the intention of using the land for only a limited number of years. In all cases, the sandier ranges of the red-yellow podzolic soils are avoided as far as possible because of their droughtiness, erodibility and lower fertility.

34. Within the context of transmigration projects, it can be said in general that projects based on rubber are likely to have moderate success, while those based on oil palm can only be recommended on specific soil types within the group (and on specific terrain categories) and would be best confined to those soils which are intergrades towards latosols. Projects with a large component of sustained annual cropping are likely to have many problems, however, especially the high fertilizer requirements and the need for good soil management to combat erosion. It remains to be proven whether or not adequate fertilizer can be supplied economically within a transmigrant smallholder project context, and it is unlikely that the migrants will be capable of the necessary land management, at least in the early years of project establishment.

35. Maintaining a traditional system of cultivation and establishing projects based on a shifting cultivation model is theoretically practicable, but in parts of the region where the dry season is less severe (and regrowth is therefore more rapid) a cycle of 15 years is still generally required to avoid land and vegetation degradation. In the environment of southern Sumatra, a 20-year cycle may be needed. Cycles of 9 years have led immediately to alang-alang taking over in the Tulangbawang area. Too few data are available to suggest an optimum cycle in these areas, but it is undoubtedly so large that too few families could be incorporated into such projects on this kind of model to make a significant contribution towards helping transmigration. It is also difficult to see how it can be satisfactorily applied to

areas which are under alang-alang at present, or to envisage settlers from Java being able to clear a sufficient area of forest each year to give an adequate crop to support themselves.

36. Upland Area Still Available for Agricultural Development. LPT have estimated (Driessen and Soepraptohardjo, 1974) that red-yellow podzolic soils are distributed in Indonesia as follows:

| | ha million | % of region |
|--------------|-------------|-------------|
| Sumatera | 20.6 | 43.5 |
| Kalimantan | 16.1 | 29.9 |
| Sulawesi | 2.0 | 10.3 |
| Irian Jaya | 9.6 | 23.0 |
| <u>Total</u> | <u>48.3</u> | <u>29.8</u> |

Nusa Tenggara and Maluku are not explicitly mentioned in the above figures but are presumably included in Sulawesi.

37. The red-yellow podzolic soils have developed the reputation in certain quarters as the main hope for agricultural expansion in Indonesia and various hectarages between 40 and 48 million have been quoted by different sources as being available for such development. These figures are presumably based on estimates such as that of LPT.

38. It cannot, however, be assumed that all areas of red-yellow podzolic soils (the figures for which are very approximate) are both available and suitable for further agricultural development. Soils which are too poor for agriculture without costly amelioration are included, as are soils on steep slopes where only limited development confined to tree crops and requiring terraces, can be envisaged. This soil group covers some terrain with at least moderate fertility levels and with slopes such that it does not require expensive investment in soil conservation measures, but such areas have generally been utilized already for settled agriculture and are not available for further development in the context of transmigration programs.

39. An estimate of the land available for consideration in this negative context must allow for these facts and this has been attempted on a broad scale by FAO (Harrop, 1974). An appraisal was made on the available data relating to soils, terrain, land use and other relevant factors, and Indonesia

was classified into development units on a scale of 1:2.5 million. For each unit ratings were given for soil capability for upland and wet rice cropping. Estimates were made of the percentage of the unit which qualified for the rating given. The extent to which the unit was already known to be used for agriculture has been noted, although no percentages were estimated.

40. The FAO study was based on data of greatly varying quality, with soils and land use information being of a rather low level in many areas. The study does, however, represent the closest approach to a realistic assessment of the opportunities available at present. Given below are broad estimates of hectarages which are largely available for agricultural expansion and which have generally moderate potential for development with adequate conservation measures and improvement in nutrient status.

| | Steep land, much of which has potential for rubber but limited potential for annual crops | Less steep land, much of which has potential for annual tree crops | Bottomland, much of which has potential for wet rice | Total |
|---------------|---|--|--|-------------|
| Sumatera | 1.8 | 9.5 | 0.8 | 10.3 |
| Kalimantan | 0.2 | 1.1 | 3.3 | 4.4 |
| Sulawesi | 0.1 | 0.5 | /a | 0.5 |
| Nusa Tenggara | /a | 0.2 | /a | 0.2 |
| Maluku | /a | 0.9 | 0.1 | 1.0 |
| Irian Jaya | 0.5 | 4.8 | 1.8 | 6.6 |
| <u>Total</u> | <u>2.6</u> | <u>17.0</u> | <u>6.0</u> | <u>25.6</u> |

/a Less than 100,000 ha.

It can be taken that most of the uplands considered in the first two columns comprise land with red-yellow podzolic soils. These figures cannot be taken as firm estimates. Much more detailed information is needed regarding land use. The 3.3 million ha quoted as available and suitable for wet rice in Kalimantan, for example, largely comprise bottomlands along major rivers. Even if they are not fully used for agriculture at present, they may well be largely encumbered with ownership claims. The figure of 4.8 million ha in Irian Jaya for general agriculture requires further investigation as it is based on relatively limited data on soils. Offsetting this to some extent, the scale of appraisal must be borne in mind. There may be many small tracts

of moderately reasonable (and available) agricultural land which cannot be considered in a review of the situation at 1:2.5 million scale but which could nevertheless form the nucleus of a transmigration project and which, within the context of planning for the district concerned, might merit consideration for this purpose.

41. It is likely, however, that the total of some 19.6 million ha of land available for agricultural expansion based on dryland crops which has been derived from the FAO appraisal is much closer to the truth than the figures of 40 or more million ha quoted in some other sources.

42. The location of the development units which appear to deserve priority interest in locating further projects based on dryland farming are shown in Figs. 2-9. Figs. 2-5 locate the units where opportunities for general farming, including sustained annual cropping with appropriate fertilizers, are believed to exist. Figs. 6-9 locate additional areas on steeper terrain where opportunities for rubber development can probably be found. In all cases, individual tracts of land shown on these figures may prove to be already under settled cultivation but an attempt has been made to exclude known tracts of cultivated land within the unit.

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- (a) coastal plains mantled by young marine alluvium (a subdivision of the alluvial soils), at or near sea level and usually covered by mangrove forest. These soils are found fringing many coastal tracts, but are particularly important in East Sumatera, West and South Kalimantan, and the southwest coast of Irian Jaya;
- (b) coastal swamp plains mantled by peats (organosols) and generally remaining under peat swamp forest. They cover a broader area than the first group but have similar distribution, as a coastal zone of mangrove clays usually grades inland into a broad peat swamp tract; and
- (c) uplands in which the dominant soils have low fertility, and if used at all they are largely farmed under shifting cultivation. The soils in these areas have a range of characteristics but most are classed as red-yellow podzolic soils. They are widespread in Sumatera, Kalimantan and, to a lesser extent, in Irian Jaya.

/1 Abbreviated from a report by I.M. Scott written for 1977 Identification of Transmigration II, III and IV.

3. Marine Alluvium Soils. These young marine clays commonly include areas of acid sulphate soils. These have accumulated soluble sulphides from sea water (many of them remain inundated by seawater at high tide), and in the presence of iron and microbial action, these are reduced to form pyrite. Following drainage and rapid aeration, sulphuric acid is formed and the pH may drop below 3. At these pH levels, plant growth is limited, some metallic irons become toxic, there is fixation of phosphates, and other nutrient imbalances occur. As most agricultural uses of these soils involve drainage, the chemical problems involved in bringing them into cultivation are complex. In addition to extreme acidity, nutrient levels are commonly low. Less nitrogen may be released; phosphate is strongly fixed by the high aluminum levels at low pH levels. Aluminum, iron and manganese may be toxic at low pH levels while molybdenum may be deficient in very acid conditions.

4. Large and usually uneconomic dressings of lime are required to "neutralize" the acidity of these soils after drainage. The alternative is to maintain the water table at such a level that drainage does not occur. Under such conditions they can be used for rice provided the fertility can be improved.

5. In many parts of southeast Asia, local farmers have reclaimed some of the swamp soils which have included acid sulphate soils by working progressively in from the river banks, but without controlled drainage yield expectations are low and erratic, and many such tracts have been abandoned after a few years. Some small-scale developments of such areas have been successful. Acid-sulphate soils have also been used for estate crops (coconut, cocoa, rubber, oil palm) in Peninsular Malaysia, but where the toxic layer is near the surface, control of the water table is essential. In the context of transmigration projects, however, development of such areas involves a large commitment of funds for drainage control with no guarantee that the acidity problems can be quickly and economically overcome.

6. Peat Swamp Soils. The problems attached to peat swamp reclamation initially hinge on the mechanics of drainage improvement, although the problems involved are rather different from those of acid-sulphate soils. The application of drainage to large basin peat swamps is likely to be ineffective unless an entire natural swamp unit is reclaimed. Attempts to drain isolated portions of a large swamp tract have generally proved inefficient. If effective drainage is achieved, subsidence of the peat occurs and cancels some of the gains. The degree of subsidence varies with a number of factors and cannot be accurately estimated in advance.

7. Mineralization occurs on drying. The deep peats are developed from tree debris rather than grasses; these are low in nutrients and are also very acid. Even when satisfactory drainage has been achieved, considerable amounts of fertilizer are likely to be required and lime may also be needed. Drained peat is an unstable medium for tree crops; such crops cannot be established until the initial subsidence rate has slowed and, once matured, they remain susceptible to wind-throw.

INDONESIAAPPROXIMATE DISTRIBUTION OF LAND POTENTIAL FOR AGRICULTURE IN INDONESIA
('000 ha)

| Capability class | Java/ Madura | Bali | Sumatera | Kalimantan | Sulawesi | Irian Jaya | Nusa Tenggara | Maluku | Total |
|-------------------|-----------------|------------|---------------|---------------|---------------|---------------|------------------|--------------|----------------|
| Suitable | | | | | | | | | |
| I | 275 | - | - | - | - | - | - | - | 275 |
| II | 344 | 19 | - | - | 275 | - | 94 | - | 732 |
| III | 969 | - | 631 | - | 806 | - | 138 | 25 | 2,569 |
| Marginal | | | | | | | | | |
| IV | 3,369 | 144 | 7,781 | 1,319 | 1,869 | 1,144 | 2,069 | 1,113 | 18,808 |
| V | 2,344 | 125 | 26,306 | 23,281 | 2,106 | 17,756 | 2,200 | 3,425 | 77,543 |
| Unsuitable | | | | | | | | | |
| VI | 3,312 | 206 | 5,206 | 13,263 | 3,425 | 6,688 | 481 | 1,206 | 33,787 |
| VII/VIII | 2,606 | 62 | 7,439 | 16,137 | 10,614 | 16,612 | 2,056 | 1,706 | 57,232 |
| <u>Total</u> | <u>13,219</u> | <u>556</u> | <u>47,363</u> | <u>54,000</u> | <u>19,095</u> | <u>42,200</u> | <u>7,038</u> | <u>7,475</u> | <u>190,946</u> |

Source: Muljadi and Soepratohardjo, 1975.

8. The main attractions of peat swamp areas are that they comprise unsettled flatland. Reclamation is, however, a low process which is likely to involve costly investments in drainage and entail management problems which are not yet fully solved. Unless the peats are shallow (and some Sumateran peat swamps have organic layers 15 m thick), it can be assumed that any scheme established on these areas will have a limited life through continued subsidence of the peat surface. Subsidence will be accelerated by cultivation.

9. According to LPT, organosols cover approximately 24 million ha in Indonesia (Table 2). Polak (1952) has estimated "organic soils" in Indonesia at 16.5 million ha. The discrepancy is probably a question of definition but either figure indicates that there are very large areas of such land. The problems connected with developing them on a large scale for agriculture are great, however. It is likely that with present levels of technology, the bulk of the deep peat soil are best considered as timber areas, for which they are well suited.

10. Upland Soils. The relatively infertile upland soils which offer possibilities for large-scale agricultural expansion mainly comprise red-yellow podzolic soils. Most of the opportunities for upland transmigration settlement are in these areas and the red-yellow podzolic soils are therefore dealt with in more detail in the following sections. Passing reference is also made to the opportunities and constraints offered by areas of latosols, as one of the proposed project areas under review in this report (Rimbobujang) is located largely on these soils.

Red-Yellow Podzolic Soils

11. The Term. Podzolic soils are so called because they have developed largely through a podzolic soil-forming process. This involves the mobilization, and removal or translocation, of iron and aluminum and the relative accumulation of silica within the soil profile. The genetic process is not further discussed here, since in the present context interest centers on the physical and chemical characteristics which have resulted from it.

12. The description "red-yellow" applies to the color of the subsoil and specifically to that of the lower subsoil. Topsoils are normally brown, and the upper subsoil may be pale yellow or grey. The lower subsoil, however - and usually the whole subsoil - has colors in the range of brown, yellowish brown, reddish brown, yellowish red or reddish yellow. The term "red-yellow podzolic" covers all soils within this range. In discussing specific areas, however, the dominant color in this area may be used to replace the general terms, as in the yellow-brown podzolic soils reported in the Rimbobujang area. In some places (such as Sarawak) the term "red-yellow podzolic" has been used to distinguish these soils from "grey-white podzolic" soils which have developed similar morphology under similar processes but are derived from parent materials abnormally low in iron, and which never have strong subsoil colors even in well-drained locations.

13. Apart from subsoil color, the characteristics which qualify the soil to be classified in this group are those which support the conclusion that a podzolic process is dominant in the profile. These may be: development over siliceous parent material; acidity; a clay and/or sesquioxide content which increases with depth in the subsoil; or other features indicative of this mode of genesis. Such criteria may be evident in a wide variety of soils, however. Red-yellow podzolic profiles may, for example comprise sandy loams, or may be clay loams grading at depth to clays. The term has been used without qualification in contexts where the agricultural potential and constraints have been assumed to vary little regardless of the profile concerned. It must be emphasized that this is not correct. Soil groups in classification systems biased towards genetic divisions largely ignore agricultural considerations. These are dealt with in the lower categories of the system. While it can be said that most red-yellow podzolic soils have a low natural fertility, are very acid, and have high susceptibility to erosion, variations within the group in these and other respects are quite great and depend on many factors. These soils also occur on different terrain, which may impose its own restraints or allow greater than average opportunities for use.

14. Physical Characteristics. The classic form of red-yellow podzolic soils (Simonson, 1949; McCaleb, 1959) has the following physical features: Below a thin dark (generally loamy) topsoil, the upper subsoil is prominently bleached (pale yellow, light grey or almost white) and relatively light-textured (sandy loam to loam); this overlies (usually abruptly) a lower subsoil which has stronger colors (yellow to red) and higher clay content (generally clay texture grade); the lower subsoil has a moderately strong blocky structure and the faces of the structural blocks are partially or wholly coated with clay skins. The assumption is that clay (and sesquioxides) in the upper subsoil have been mobilized and moved downwards within the profile and have then, in part, been deposited on structural surfaces in the lower subsoil. This movement of clay and iron, involving losses from the upper subsoil and enrichment at greater depth, gives the contrast in color and texture described above. (This is only the simplest of the processes involved in the development of these soils, and the mechanics of their formation have been the subject of much debate; for the purposes of the present report they need not be explored further.)

15. This "classic" form is not necessarily found in the humid tropics, however. The concept of the group was originally created in northern latitudes to distinguish these soils from the grey podzolic soils of temperate climates and to isolate in the classification system soils which were initially recognized in the southeastern states of America. Related soils were then recognized in tropical areas and the term extended to include them.

16. Under a humid tropical climate the profile tends to be more uniform. Again, the mechanics of formation are somewhat arguable, but among the factors which can be more important in these areas than in other climates are:

(a) lack of structural expression due to the continual moist state of the subsoil; and (b) intense microfaunal activity to considerable depths in the profile, provided it is well drained. Lack of structural development implies fewer channels for downward migration and rather less clay movement (although lateral clay movement may still be important). The clay increase with depth may thus be gradual rather than abrupt, particularly in fine-textured soils, and may require confirmation in the laboratory. The bleached zone may be absent. Subsoil color may be uniform or a gradual reddening (for example from yellowish brown or brownish yellow to reddish yellow) may be observable. The tendency towards subsoil uniformity is usually due in part to the other factor mentioned: the microfauna. Microfaunal action mixes up the material, commonly brings clay towards the surface, generally acts against other processes which operate in only one direction and minimizes the degree of subsoil horizonation contrasts. Clay skins in the lower subsoil tend to be few, due to the lack of open structural faces on which they can form and to the destruction by the passage of worms and other fauna of many of the clay skins which have formed. The importance of faunal disturbance in Sumateran red-yellow podzolic soils is confirmed by the sections discussed by Dai et. al. (1975).

17. There is little structural development in the topsoil and subsoil structures are weak. In the topsoil and upper subsoil there is a high proportion of natural clay (clay which will easily disperse in water) and structural units have low stability. Surface soil therefore tends to erode easily under the impact of rainfall unless protected.

18. Instability depends to a large degree on texture, structure and organic matter levels; where the latter are very low through overcultivation and/or surface erosion and truncation, the relatively light-textured, poorly-structured topsoils are less stable than the more clayey subsoils. With a high concentration of surface organic matter, on the other hand, the reverse tends to be the case. This is illustrated by two profiles (a complete (1) and a truncated (2) red-yellow podzolic soil) from the Lampung area of Sumatera studied by Driessen and Soepraptohardjo (1974) and whose physical characteristics are quoted below.

| Profile horizon | Depth (cm) | Aggregates (%) | Instability index | Structural stability | Org. matter (%) |
|------------------|------------|----------------|-------------------|----------------------|-----------------|
| 1. Upper subsoil | 14-65 | 43.0 | 2.75 | Very poor | 0.30 |
| Lower subsoil | > 80 | 65.2 | 1.90 | Moderate | 0.30 |
| 2. Surface | 0-12 | 60.6 | 0.23 | Excellent | 3.10 |
| Upper subsoil | 12-40 | 55.1 | 0.83 | Very good | 0.54 |
| Lower subsoil | 40-68 | 48.5 | 1.87 | Moderate | 0.37 |

19. Bulk density increases with depth but in surface horizons varies with the cover and land use history of the site. Buurman and Dai (1976) found in Lampung profiles that bulk density was lower under manual cultivation or an alang-alang cover than under either machine cultivation or forest.

20. Latosols, in contrast, have uniform (and generally deep) profiles with high sesquioxide levels and generally strong yellow-red colors. A fine grade of structure has developed, and due to the high iron content, the structure is somewhat stable. The profile tends to be friable and porous, but to resist erosion to a greater degree than podzolic profiles. There are, however, many intergrade forms between the latosols and the podzolic soils. Many soils have been classified in the latosols largely on their prominent red subsoil color, although their structural properties, stability and texture profile are more akin to those of the podzolic soils.

21. Chemical characteristics. Red-yellow podzolic soils in the humid tropics generally have the chemical characteristics discussed in the following paragraphs.

22. As they are derived from siliceous parent materials (or from intermediate parent materials which are on old surfaces and which have been highly leached) they are strongly to very strongly acid. In the Tulangbawang and Rimbobujang areas, for example, the pH of all profile analyses is below 6 in both topsoil and subsoil, and can be as low as 4.2.

23. The clay minerals comprise iron oxides and 1:1 minerals such as kaolinite. Clay minerals with a 2:1 lattice, such as illite or vermiculite, may be present but are rarely found in significant amounts except where the profiles are juvenile and are developed over micaceous sedimentary rocks (and in such situations the crystallinity of the minerals is generally poor). The

cation exchange capacity (CEC) of these clays is therefore low (but not as low as in well-developed latosols). The CEC of the fine earth in profiles from the Tulangbawang area was within the range 3-12 m³/100 gm in the subsoil. Higher CEC levels were recorded in topsoil (and some upper subsoil) horizons but are related to the presence of organic matter. The one profile analysis from the Ribobujang area gave a CEC of 10 in the topsoil rising to 23 at depth. No details on method are given and the figures may not be comparable with the Tulangbawang area data. The high CEC at depth is unusual and requires explanation. The low CEC of red-yellow podzolic soils limits the degree to which they can retain added fertilizers and, in a high rainfall environment where leaching is strong, much wastage of fertilizer may be expected.

24. Due to the leaching environment the degree of base saturation is low and decreases with depth. Base saturations of 15-30% may be expected in topsoil horizons where organic matter is present (although this is highly variable in areas which have been used in the past for cultivation) but generally average about 10% in the subsoil. Calcium and magnesium are usually present in greater quantities than potassium and sodium, although the total levels are so low that the ratios have little significance. Exchangeable aluminum may take up a high proportion of the exchange complex. The low level of bases present and available for plant use in natural conditions means that no sustained agriculture can be envisaged on these soils without fertilizer.

25. As the activity of the clays and the degree of base saturation of the exchange complex are both low, the amounts of bases available in the soil for plants and the degree to which the soil can retain added bases in fertilizer additions for plant use depend largely on the percentage of clay in the profile and the base-absorbing qualities of organic complexes. While organic matter levels may be moderately high in natural conditions, this situation changes quickly once the soil is brought into cultivation unless good management is practiced. Clay content on the other hand, varies widely because the red-yellow podzolic group ranges from sandy loams to clays. The clay fraction may thus be 10% of the fine earth, or over 50%, and if data from the Tulangbawang area are correct, may exceed 70% in some profiles. Judgments on agricultural potential therefore depend on the profile under consideration and can only be made at a very general level for the group as a whole.

26. Studies in Lampung (Buurman and Dai, 1976) suggest that, within the range of brown to yellowish-red podzolic soils, there are no contrasts in CEC and no clear correlations between color and base saturation. The level of exchangeable aluminum, which at high percentages may become toxic to plants, was higher in brown profiles than in yellowish brown or yellowish red soils. They were also more acid. The contrast in these respects was not marked, however.

27. Latosols are equally poor in chemical characteristics required for plant growth. due to the dominance of 1:1 clay minerals and the high proportion of oxides, they have even lower CECs than the red-yellow podzolic soils and are likely to require higher levels of fertilizer application.
28. Nutrient Levels. Nitrogen is likely to be one of the most important plant nutrients limiting crop growth as it is largely in organic forms, levels are highly sensitive to changes in the vegetation cover, and it is very susceptible to leaching in the tropical environment. Levels in analyzed profiles in the Tulangbawang and Rimbobujang areas were generally below 0.1% in all horizons, including the topsoil. Topsoils under a mature forest cover may be expected to have higher levels but are unlikely to exceed 1% at many sites. The natural nitrogen level will be quickly exhausted once forest is cleared and the land cultivated. Cultivation practices must therefore include return-inc crop residues to the land, using leguminous crops in rotations for annual foodcropping, and supplying nitrogen as fertilizer additions.
29. Little phosphorus is lost by leaching but there are high losses through erosion, as phosphorus is concentrated in the surface horizons. Total phosphorus levels in topsoils of red-yellow podzolic soils do not usually exceed 200 ppm. Little of this amount is available. Extracted phosphorus in soils from the Tulangbawang area (by mild extractants giving indications of the available fraction) suggested that available phosphorus for plants is less than 20 ppm in most topsoils. The levels will quickly be further reduced by cropping, and fertilizer applications will be required. Phosphorus availability can be increased by liming but it is uncertain whether this will prove economic in smallholder transmigration projects. In both red-yellow podzolic soils and latosols the fertilizer requirements for phosphorus are likely to be high due to the amount which is fixed in unavailable forms within the soil. There are conflicting data on the soil fixing power in these areas, however; Buurman and Dai (1975) found that in some Lampung profiles there was a considerable residual effect from phosphorus applications.
30. Potassium is likely to be least limiting for agriculture under traditional methods, but, together with nitrogen and phosphorus, will quickly become critical under sustained annual cropping. Potassium obtained from the Tulangbawang area profiles by mild extractants was between 26 and 101 ppm in topsoil horizons. Losses through leaching and crop extraction once cultivation is initiated will quickly reduce these levels.
31. The natural levels of the main plant nutrients under a forest cover will probably support annual crops for the first and perhaps, second seasons. Beyond the second season, however, it can be assumed that these reserves will be largely exhausted. Sustained annual cropping will then depend on heavy fertilizer applications, accompanied by good soil management, the inclusion of legumes in the rotation, and the return of crop residues to the land.

32. In land which is cleared from alang-alang (as will be the case in much of the Tulangbawang and Pematang Panggang areas) heavy fertilizer additions will be required in the first year, as these soils are already exhausted and have few nutrient reserves.

33. Land Use Possibilities. At present red-yellow podzolic soils in many parts of southeast Asia are extensively used for rubber or oil palm, crops such as pepper, and a variety of annual crops; however, rubber is the only consistently satisfactory crop on estates, where good management and the required fertilizer applications are both available and economic. Pepper vines, other than poor-yielding, semiwild vines, are only planted by farmers (such as Chinese smallholders in Malaysia) who have sufficient capital backing to supply the heavy fertilizer investment needed. With this crop soil characteristics (other than good drainage) are less important as nutrient needs are very high and have to be largely added even on relatively fertile soils. Annual crops are almost invariably planted on a shifting cultivation system, except where household trash is available near the homestead. Some crops, such as cassava, are grown intensively by commercial groups, but with high fertilizer additions and usually the intention of using the land for only a limited number of years. In all cases, the sandier ranges of the red-yellow podzolic soils are avoided as far as possible because of their droughtiness, erodibility and lower fertility.

34. Within the context of transmigration projects, it can be said in general that projects based on rubber are likely to have moderate success, while those based on oil palm can only be recommended on specific soil types within the group (and on specific terrain categories) and would be best confined to those soils which are intergrades towards latosols. Projects with a large component of sustained annual cropping are likely to have many problems, however, especially the high fertilizer requirements and the need for good soil management to combat erosion. It remains to be proven whether or not adequate fertilizer can be supplied economically within a transmigrant smallholder project context, and it is unlikely that the migrants will be capable of the necessary land management, at least in the early years of project establishment.

35. Maintaining a traditional system of cultivation and establishing projects based on a shifting cultivation model is theoretically practicable, but in parts of the region where the dry season is less severe (and regrowth is therefore more rapid) a cycle of 15 years is still generally required to avoid land and vegetation degradation. In the environment of southern Sumatra, a 20-year cycle may be needed. Cycles of 9 years have led immediately to alang-alang taking over in the Tulangbawang area. Too few data are available to suggest an optimum cycle in these areas, but it is undoubtedly so large that too few families could be incorporated into such projects on this kind of model to make a significant contribution towards helping transmigration. It is also difficult to see how it can be satisfactorily applied to

areas which are under along-alang at present, or to envisage settlers from Java being able to clear a sufficient area of forest each year to give an adequate crop to support themselves.

36. Upland Area Still Available for Agricultural Development. LPT have estimated (Driessen and Soepraptohardjo, 1974) that red-yellow podzolic soils are distributed in Indonesia as follows:

| | ha million | % of region |
|--------------|-------------|-------------|
| Sumatera | 20.6 | 43.5 |
| Kalimantan | 16.1 | 29.9 |
| Sulawesi | 2.0 | 10.3 |
| Irian Jaya | 9.6 | 23.0 |
| <u>Total</u> | <u>48.3</u> | <u>29.8</u> |

Nusa Tenggara and Maluku are not explicitly mentioned in the above figures but are presumably included in Sulawesi.

37. The red-yellow podzolic soils have developed the reputation in certain quarters as the main hope for agricultural expansion in Indonesia and various hectarages between 40 and 48 million have been quoted by different sources as being available for such development. These figures are presumably based on estimates such as that of LPT.

38. It cannot, however, be assumed that all areas of red-yellow podzolic soils (the figures for which are very approximate) are both available and suitable for further agricultural development. Soils which are too poor for agriculture without costly amelioration are included, as are soils on steep slopes where only limited development confined to tree crops and requiring terraces, can be envisaged. This soil group covers some terrain with at least moderate fertility levels and with slopes such that it does not require expensive investment in soil conservation measures, but such areas have generally been utilized already for settled agriculture and are not available for further development in the context of transmigration programs.

39. An estimate of the land available for consideration in this negative context must allow for these facts and this has been attempted on a broad scale by FAO (Harrop, 1974). An appraisal was made on the available data relating to soils, terrain, land use and other relevant factors, and Indonesia

was classified into development units on a scale of 1:2.5 million. For each unit ratings were given for soil capability for upland and wet rice cropping. Estimates were made of the percentage of the unit which qualified for the rating given. The extent to which the unit was already known to be used for agriculture has been noted, although no percentages were estimated.

40. The FAO study was based on data of greatly varying quality, with soils and land use information being of a rather low level in many areas. The study does, however, represent the closest approach to a realistic assessment of the opportunities available at present. Given below are broad estimates of hectarages which are largely available for agricultural expansion and which have generally moderate potential for development with adequate conservation measures and improvement in nutrient status.

| | Steep land, much of which has potential for rubber but limited potential for annual crops | Less steep land, much of which has potential for annual tree crops | Bottomland, much of which has potential for wet rice | Total |
|---------------|---|--|--|-------------|
| Sumatera | 1.8 | 9.5 | 0.8 | 10.3 |
| Kalimantan | 0.2 | 1.1 | 3.3 | 4.4 |
| Sulawesi | 0.1 | 0.5 | /a | 0.5 |
| Nusa Tenggara | /a | 0.2 | /a | 0.2 |
| Maluku | /a | 0.9 | 0.1 | 1.0 |
| Irian Jaya | 0.5 | 4.8 | 1.8 | 6.6 |
| <u>Total</u> | <u>2.6</u> | <u>17.0</u> | <u>6.0</u> | <u>25.6</u> |

/a Less than 100,000 ha.

It can be taken that most of the uplands considered in the first two columns comprise land with red-yellow podzolic soils. These figures cannot be taken as firm estimates. Much more detailed information is needed regarding land use. The 3.3 million ha quoted as available and suitable for wet rice in Kalimantan, for example, largely comprise bottomlands along major rivers. Even if they are not fully used for agriculture at present, they may well be largely encumbered with ownership claims. The figure of 4.8 million ha in Irian Jaya for general agriculture requires further investigation as it is based on relatively limited data on soils. Offsetting this to some extent, the scale of appraisal must be borne in mind. There may be many small tracts

of moderately reasonable (and available) agricultural land which cannot be considered in a review of the situation at 1:2.5 million scale but which could nevertheless form the nucleus of a transmigration project and which, within the context of planning for the district concerned, might merit consideration for this purpose.

41. It is likely, however, that the total of some 19.6 million ha of land available for agricultural expansion based on dryland crops which has been derived from the FAO appraisal is much closer to the truth than the figures of 40 or more million ha quoted in some other sources.

42. The location of the development units which appear to deserve priority interest in locating further projects based on dryland farming are shown in Figs. 2-9. Figs. 2-5 locate the units where opportunities for general farming, including sustained annual cropping with appropriate fertilizers, are believed to exist. Figs. 6-9 locate additional areas on steeper terrain where opportunities for rubber development can probably be found. In all cases, individual tracts of land shown on these figures may prove to be already under settled cultivation but an attempt has been made to exclude known tracts of cultivated land within the unit.

INDONESIATRANSMIGRATION PROGRAM REVIEWFarming Systems in Five Transmigrant Communities

1. Recent agricultural research shows that the use of fertilizers, pesticides and new cropping systems can produce significant increases in food crop yields in areas dependent on rainfed agriculture (See Annex 3 - Cropping Systems and Management Practices on Red-Yellow Podzolic Soils-CRIA). Based in part on this work, farming systems emphasizing food crop production have become standard for the REPELITA III transmigration program. Recent work by Bank staff suggests, however, that yields on farmers fields are both low and extremely variable and that this may affect the ability and willingness of transmigrants to invest in the required agricultural inputs once free supplies have ceased. As the table on the following page indicates, of the 592 transmigrants from communities dependent on rainfed agriculture only 52 farmers (9%) reported rice yields of more than one ton per family (of gabah or unhulled rice), this is about subsistence for a family of five. Nearly two-thirds (65%) of all farmers reported that they obtained 500 kg of gabah or less, suggesting that most transmigrants in these communities received less than half their subsistence calories from their own rice. By comparison only 3% of migrants in Upang Delta, a tidal reclamation scheme in South Sumatra, obtained less than 500 kg of rice while 84% obtained more than one ton.

Productivity in areas of rainfed agriculture

2. The reasons for low productivity in areas of rainfed agriculture vary. In addition to poor soils which all these communities have in common, villages in the sample each have different experiences - experiences which give some indication of the diversity of problems encountered.

3. Sitiung. Farmers in Sitiung I reported the lowest yields of all migrants in the sample: 221 kg/family or 262 kg/ha. The reasons for this are several. Most important is the fact that improper land clearing has significantly - and permanently - reduced the agricultural potential of the soil. In Sitiung I road construction contractors used bulldozers to uproot trees and level the soil in anticipation of future irrigation. In so doing they removed the topsoil and compacted the subsoil. As a consequence first year yields were extremely low and second year harvests only marginally better. Nearly half of the migrants in the Bank sample (45) got no significant yields in 1977/78 and 96% reported less than 500 kg of rice. In Sitiung II land clearing methods were improved with corresponding increases in yields reported at the end of the first year (526 kg/ha). Agriculture department statistics indicate that the 1978/79 yields were still better in

Table 1: YIELDS REPORTED IN FIVE TRANSMIGRANT COMMUNITIES /a

| | Number of years on site | Rice yield per family per year (kg) | Hectares under cultivation | Yield per hectare /b | % farmers using inputs | % Families Reporting | | | N |
|--------------------|-------------------------|-------------------------------------|----------------------------|----------------------|------------------------|----------------------|-----------------|-------------------|-------|
| | | | | | | No rice yield | 500 kg or under | 1,000 kg or under | |
| <u>Rainfed</u> | | | | | | | | | |
| Sitiung II | 1 | 314 | .60 | 526 | 100.0 | 20 | 88.6 | 100.0 | (35) |
| Sitiung I | 2 | 221 | 1.19 | 262 | 100.0 | 46 | 95.6 | 97.8 | (45) |
| Baturaja I | 1.5 | 623 | 0.93 | 669 | 85.3 | 6 | 72.0 | 81.3 | (32) |
| Rimbojuang II-V | 1.5 | 441 | 1.87 | 235 /c | 98.4 | 18 | 75.0 | 95.6 | (178) |
| Rimbojuang I | 2.5 | 992 | 1.66 | 597 | 71.2 | 4 | 26.0 | 72.2 | (114) |
| Way Abung 9-12 | 4-5 | 504 | 1.05 | 484 | 28.6 | 16 | 68.0 | 95.7 | (70) |
| Way Abung 7-8 | 5-6 | 757 | 1.47 | 514 | 22.2 | 6 | 50.0 | 91.6 | (36) |
| Way Abung 4-6 | 7-8 | 585 | 1.39 | 420 | 8.9 | 7 | 59.0 | 90.9 | (44) |
| Way Abung 1-3 | 9+ | 462 | 1.02 | 452 | 26.2 | 0 | 76.0 | 97.4 | (38) |
| <u>Tidal /d</u> | | | | | | | | | |
| Upang-Purwoharjo | 2 | 2,248 | 1.19 | 1,893 | 0 | 0 | 2.7 | 11.0 | (37) |
| Upang-Tirtakencana | 4-5 | 2,371 | 1.80 | 1,312 | 0 | 0 | 0 | 3.0 | (37) |
| Upang-Tirtamulia | 5-7 | 2,747 | 1.90 | 1,443 | 0 | 0 | 2.4 | 5.0 | (41) |
| Upang-Purwosari | 7-8 | 1,865 | 1.85 | 1,006 | 0 | 0 | 11.1 | 12.0 | (63) |
| Upang-Makarti | 9 | 2,664 | 2.30 | 978 | 0 | 0 | 2.0 | 28.6 | (41) |

/a Farmer reports are typically lower than agricultural department statistics. This is due in part to the fact that agricultural department statistics are extrapolated from measured 5 meter-square plots on harvested fields, fields which fail are not measured and for this reason the statistics overstate aggregate yields. Harvests in the year of most of these surveys were also rather poor.

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/c Field area is oversized in this community. These fields are newly felled by migrants and have perhaps 0.50-0.60 ha of plantable land, thus distorting productivity on a per hectare basis.

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both units suggesting that climate and pests may also have contributed to the very low productivity recorded for 1977/78. In spite of improvements, however, yields from Sitiung compared with yields in the adjacent community of Rimbobujang give clear evidence that improper land clearing has damaged crop potential of the soil.

4. Baturaja. In Baturaja, the new community financed under the first Bank loan for transmigration, yields in Village I averaged 623 kg on 0.93 ha of land after 18 months on site. Among Baturaja farmers, however, 72% reported less than 500 kg of rice and 81% less than one ton. The reliability of farmer reports is suggested by field measurements taken by SCET, the French consulting firm supplying technical assistance to TRANS I. The SCET team measured yields on five meter square plots and they also recorded hectares under cultivation. Their figures show 684 kg/family (gabah) in 1977/78 (the year in which the Bank Survey was taken) and 708 kg/family in 1978/79; figures comparable to the 623 kg reported by the migrants themselves. These relatively low yield levels are attributed first, to the newness of the community - unfamiliarity of farmers with appropriate cropping systems, competing demands for labor, and difficulties in controlling weeds /1 and pests - and second, to erratic input supply. Even after three years, fertilizers and pesticides are frequently unavailable when required even though Baturaja as a Bank-assisted project, has obtained more managerial assistance than most GOI projects of comparable size.

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| Village | Number of harvests | Rice yield per family | Maize yield per family | Cassava yield per family |
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| RB3 | 2 | 286 kg | 60 kg | 5,232 kg |
| RB4 | 1 | 547 kg | 50 kg | 2,309 kg /b |
| RB5 | 1 | 230 kg | 95 kg | 2,978 kg /b |

/a Source: Bank Staff Surveys.

/b Yield data recorded before full cassava harvest had been realized.

/1 Unit I was cleared mainly from alang-alang.

Extension workers attribute the differences between communities to land clearing methods (Unit I was manually cleared), soil differences (Unit III has particularly poor soil) and to the availability of seed and seedlings. Unit I is adjacent to the local Kampung and has had access to seed, Units 2 and 4 are adjacent to 1 which is by now fairly well established, and Units 3 and 5 are beyond 2 and 4 respectively thus experienced greater difficulty in obtaining seed than their sister communities which were established at the same time. Interestingly, according to all extension workers with whom the survey team spoke, lack of seed and seedlings was the main constraint to productivity (given that fertilizers and pesticides were still supplied to farmers by the project.)

6. Way Abung. Way Abung, the existing transmigrant community which was to be rehabilitated under the loan for Transmigration I, illustrates (a) that yields can be improved with fertilizers and other inputs, but (b) that the risks associated with erratic supply and other features of rainfed agriculture may mean that farmers will not avail themselves of their use. As Table 3 indicates productivity on fields using BIMAS (a credit system for obtaining agricultural inputs) is nearly double that on fields which do not use the input package. Of utmost significance, however, is the fact that

Table 3: COMPARISON OF YIELDS BETWEEN BIMAS AND NONBIMAS FIELD THROUGH 1978/79

| Year | Without BIMAS | With BIMAS |
|-------|---------------------|------------|
| 73/74 | 770 kg/ha | 1,580 |
| 74/75 | no data | 2,160 |
| 75/76 | 1,170 kg/ha | 1,470 |
| 76/77 | 1,090 kg/ha | 1,230 |
| 77/78 | 660 kg/ha <u>/a</u> | 1,210 |
| 78/79 | 600 kg/ha | 1,140 |

Source: SCET Progress Report # p. 11

/a The Bank survey for this year indicated aggregate yields of 562 kg/family.

only 5.6% of all residents of Way Abung have availed themselves of credit in the past year and that the rates of repayment have been extremely slow (see Table 4).

Table 4: WAY ABUNG PROJECT: BIMAS REPAYMENT AS OF APRIL 15, 1979

| | Rice | | | | | Other Crops | | | | |
|----------------|-------|-------|-------|-------|-------|-------------|-------|-------|-------|-------|
| | 73/74 | 74/75 | 75/76 | 76/77 | 77/78 | 73/74 | 74/75 | 75/76 | 76/77 | 77/78 |
| Way Abung I | 77.5 | 66.6 | 27.1 | 51.9 | 29.9 | 75.1 | 6.0 | 4.3 | 31.2 | 29.6 |
| Way Abung II.1 | 56.6 | 40.4 | 45.0 | 58.6 | 48.9 | 31.0 | 19.7 | 32.3 | - | 55.7 |
| Way Abung II.2 | - | 40.1 | 29.9 | 11.1 | 7.0 | - | 32.4 | 4.4 | - | - |
| Way Abung | 59.9 | 42.6 | 33.4 | 28.9 | 25.0 | 35.7 | 29.6 | 15.8 | 31.2 | 34.7 |

7. The reason for both low utilization and low repayment rates for BIMAS in Way Abung are two. On one hand, as in Baturaja, timely delivery of inputs cannot be guaranteed and migrants have in the past found that they were forced to pay for fertilizer and pesticides which arrived too late to be of use. In addition, the risks entailed in rainfed agriculture are sufficiently high that the farmers may not wish to borrow because of uncertainty about their yields. Cropping histories taken in Way Abung by Bank staff suggest that even the most progressive farmers have significant crop losses on an average of one year out of four, due largely to erratic climate, pest (particularly rats, mice and wild pigs) and plant diseases.

8. It is difficult to overstate the importance of climatic variation in areas dependent on rainfed agriculture, for in spite of the fact that Way Abung receives about 2,300 mm of rainfall/year, the water balance table on the following page indicates plants have been subject to severe water stress during the growing season in three years of the past six. Even in areas such as Rumbobujang with around 3,000 mm of rainfall annually, the impact erratic climate is significant. Tropical downpours in this area are highly localized and it is not at all uncommon for one village to get enough moisture while another receives no rain for weeks; plants weakened by water shortages are subject to disease and whole villages not uncommonly lose a season's crop. Under these conditions it is not surprising that farmers with low productivity will risk their labor, but not their capital particularly when it must be borrowed and repaid.

8. Upang. The significance of yield levels in rainfed communities is emphasized by comparison with yields in Upang Delta, a swamp reclamation project initiated by the Department of Public Works. In these low lying areas of alluvial soils, the land is bunded and the water table is relatively high; yields are good, and cropping sustained even though no fertilizer is used. Migrants in Upang Delta report an average of more than two tons of rice per family even though rice production per hectare appears to decline slightly over the years (a decline which the migrants themselves attribute mainly to weeds rather than a reduction in soil fertility). The fact that migrants in Upang Delta cultivate more land as productivity declines may be due in part to the presence of surpluses which allow the farmers to invest in land and land clearing. Once again, tidal communities are variable and swamp reclamation is not without associated risks - particularly in areas of deep peat or acid sulphate soils. But the differences in farmers yields in areas of relatively high natural fertility without fertilizer, when compared to overall yields in areas of low natural fertility with fertilizers appearing to have considerable significance for the agricultural strategy for food crop production.

Alternate Farm Models

9. Farming systems based on tree crops may produce higher incomes and reduced risk for migrants dependent on rainfed agriculture. These tree crop farm systems cannot be established for the farmer as the managerial capacity of the Estate Sector is already severely strained and traditional estate planting does not provide the early self-sufficiency which a large scale transmigration program requires. Field visits to Jambi province make it clear, however, that virtually all spontaneous migrants in areas of primary forest and most sponsored migrants who have sufficient land adopt a cropping system in which food crops are planted in the establishment period and intercropped with perennials as soil fertility declines.

10. Under this system of farm management the farmer fells the forest and dibbles in rice among the stumps, taking advantage of residual ash to fertilize fields. In the first or second year he also plants high income annuals or early yielding perennials on the same field - chili, pepper and coffee are the most frequent choices. If planned properly the perennials shade out the rice at about the time field fertility declines. The farmer then opens additional land for annuals and establishes longer maturing perennials among them - particularly rubber and coconuts. When the farmer exhausts the land available for subsistence he has cash income which allows the purchase of rice. In Rimbobujang where migrants have been given five ha of land which is generally adjacent to the house lot, migrants have already begun to adopt this cropping system and there is some indication that both the amount of land and the perceived potential of this diversified farming are promoting rapid land clearing and immigration, two of the desired effects of the transmigration program (see Table 5).

Table 5: COMPARISON OF FARMING STRATEGIES
IN FOUR TRANSMIGRANT COMMUNITIES

| Community | Years on site | Land initially provided | Land now cleared | Trees planted | Spontaneous mig/family |
|---|---------------|-------------------------|------------------|---------------|------------------------|
| <u>Communities with 2.0 ha or Less at Settlement</u> | | | | | |
| Sitiung II | 1 | 1.0 | 0.60 | 34 | 2.21 |
| Sitiung I | 2 | 1.0 | 0.96 | 27 | 0.03 |
| Baturaja I | 1.5 | 1-2 | 0.93 | 78 | 1.22 |
| Way Abung 9-12 | 4-5 | 2.0 | 1.05 | 69 | 0.93 |
| Way Abung 7-8 | 5-6 | 2.0 | 1.47 | 54 | 0.41 |
| Way Abung 4-6 | 7-8 | 2.0 | 1.39 | 46 | 1.26 |
| Way Abung 1-3 | 9+ | 2.0 | 1.02 | 61 | 0.64 |
| <u>Communities with 5.0 ha of Land Available for Settlement</u> | | | | | |
| Rimbobujang 1 | 2.5 | 5.0 | 1.88 | 930 | 2.94 |
| Rimbobujang 2 | 1.5 | 5.0 | 1.97 | 89 | 1.72 |
| Rimbobujang 3 | 1.5 | 5.0 | 1.83 | 578 | 2.75 |
| Rimbobujang 4 | 1.0 | 5.0 | 1.91 | 236 | 0.94 |
| Rimbobujang 5 | 1.0 | 5.0 | 1.77 | 514 | 0.94 |

11. There are a number of advantages to this farm model:
- (a) it provides the early self-sufficiency and the farmer management required by a large-scale transmigration program;
 - (b) it reduces dependence on externally supplied inputs - such as fertilizer - thus reducing risk if inputs are not provided as required or if farmers fail to continue their use when free supplies cease;
 - (c) it provides income diversification and is associated with higher incomes in existing transmigrant communities;
 - (d) it is appropriate to steeper slopes thereby reducing the degree of preplanning required to locate flat land and increasing the number of migrants which can be settled;
 - (e) it is compatible with simple land clearing techniques;

- (f) it re-establishes a tree crop canopy thereby reducing erosion and making it more ecologically sound.

It is important to note that this model is not one of shifting cultivation as all land is maintained in production; nor is it a "tree crop" model in the sense this is generally meant within the Bank (estate-managed, high-input, production oriented.) It is, rather, an intermediate system used by small farmers to establish themselves, reduce risk and improve their incomes. As such it deserves the earliest possible consideration by GOI and the Bank.

Summary and Conclusions

12. Large-scale transmigration will require a variety of farming systems which are adapted to the areas to be settled. Because of critical managerial shortages these farming systems will have to be established by the migrants and provide early self-sufficiency in food. They should be highly diversified in order to avoid risk and aim at maximizing the income farmers can obtain, and they should also be ecologically sound. In different areas different systems may be appropriate. Where land is flat and alluvial deposits have formed, farm systems based food crop production may be preferred, and there is certainly merit in continuing to explore food crop models in otherwise unproductive regions (generally abandoned along-along areas) which are close to existing agricultural services. In the vast majority of settlements, however, where soils are poor, climate is erratic and services remote, farming systems must be developed which minimize dependence on timely inputs and reduce risk. These systems are likely to be based on highly diversified annual crops followed by perennials as soil fertility declines. To support this system will entail changes in agricultural inputs, extension and perhaps national priorities for food crop production.

INDONESIATRANSMIGRATION PROGRAM REVIEWFarming Systems in Five Transmigrant Communities

1. Recent agricultural research shows that the use of fertilizers, pesticides and new cropping systems can produce significant increases in food crop yields in areas dependent on rainfed agriculture (See Annex 3 - Cropping Systems and Management Practices on Red-Yellow Podzolic Soils-CRIA). Based in part on this work, farming systems emphasizing food crop production have become standard for the REPELITA III transmigration program. Recent work by Bank staff suggests, however, that yields on farmers fields are both low and extremely variable and that this may affect the ability and willingness of transmigrants to invest in the required agricultural inputs once free supplies have ceased. As the table on the following page indicates, of the 592 transmigrants from communities dependent on rainfed agriculture only 52 farmers (9%) reported rice yields of more than one ton per family (of gabah or unhulled rice), this is about subsistence for a family of five. Nearly two-thirds (65%) of all farmers reported that they obtained 500 kg of gabah or less, suggesting that most transmigrants in these communities received less than half their subsistence calories from their own rice. By comparison only 3% of migrants in Upang Delta, a tidal reclamation scheme in South Sumatra, obtained less than 500 kg of rice while 84% obtained more than one ton.

Productivity in areas of rainfed agriculture

2. The reasons for low productivity in areas of rainfed agriculture vary. In addition to poor soils which all these communities have in common, villages in the sample each have different experiences - experiences which give some indication of the diversity of problems encountered.

3. Sitiung. Farmers in Sitiung I reported the lowest yields of all migrants in the sample: 221 kg/family or 262 kg/ha. The reasons for this are several. Most important is the fact that improper land clearing has significantly - and permanently - reduced the agricultural potential of the soil. In Sitiung I road construction contractors used bulldozers to uproot trees and level the soil in anticipation of future irrigation. In so doing they removed the topsoil and compacted the subsoil. As a consequence first year yields were extremely low and second year harvests only marginally better. Nearly half of the migrants in the Bank sample (45) got no significant yields in 1977/78 and 96% reported less than 500 kg of rice. In Sitiung II land clearing methods were improved with corresponding increases in yields reported at the end of the first year (526 kg/ha). Agriculture department statistics indicate that the 1978/79 yields were still better in

Table 1: YIELDS REPORTED IN FIVE TRANSMIGRANT COMMUNITIES /a

| | Number of years on site | Rice yield per family per year (kg) | Hectares under cultivation | Yield per hectare /b | % farmers using inputs | % Families Reporting | | | N | |
|--------------------|-------------------------|-------------------------------------|----------------------------|----------------------|------------------------|----------------------|-----------------|-------------------|-------|--|
| | | | | | | No rice yield | 500 kg or under | 1,000 kg or under | | |
| <u>Rainfed</u> | | | | | | | | | | |
| Sitiung II | 1 | 314 | .60 | 526 | 100.0 | 20 | 88.6 | 100.0 | (35) | |
| Sitiung I | 2 | 221 | 1.19 | 262 | 100.0 | 46 | 95.6 | 97.8 | (45) | |
| Baturaja I | 1.5 | 623 | 0.93 | 669 | 85.3 | 6 | 72.0 | 81.3 | (32) | |
| Rimbobujang II-V | 1.5 | 441 | 1.87 | 235 /c | 98.4 | 18 | 75.0 | 95.6 | (178) | |
| Rimbobujang I | 2.5 | 992 | 1.66 | 597 | 71.2 | 4 | 26.0 | 72.2 | (114) | |
| Way Abung 9-12 | 4-5 | 504 | 1.05 | 484 | 28.6 | 16 | 68.0 | 95.7 | (70) | |
| Way Abung 7-8 | 5-6 | 757 | 1.47 | 514 | 22.2 | 6 | 50.0 | 91.6 | (36) | |
| Way Abung 4-6 | 7-8 | 585 | 1.39 | 420 | 8.9 | 7 | 59.0 | 90.9 | (44) | |
| Way Abung 1-3 | 9+ | 462 | 1.02 | 452 | 26.2 | 0 | 76.0 | 97.4 | (38) | |
| <u>Tidal /d</u> | | | | | | | | | | |
| Upang-Purwoharjo | 2 | 2,248 | 1.19 | 1,893 | 0 | 0 | 2.7 | 11.0 | (37) | |
| Upang-Tirtakencana | 4-5 | 2,371 | 1.80 | 1,312 | 0 | 0 | 0 | 3.0 | (37) | |
| Upang-Tirtamulia | 5-7 | 2,747 | 1.90 | 1,443 | 0 | 0 | 2.4 | 5.0 | (41) | |
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/a Source: Bank Staff Surveys.

/b Yield data recorded before full cassava harvest had been realized.

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Extension workers attribute the differences between communities to land clearing methods (Unit I was manually cleared), soil differences (Unit III has particularly poor soil) and to the availability of seed and seedlings. Unit I is adjacent to the local Kampung and has had access to seed, Units 2 and 4 are adjacent to 1 which is by now fairly well established, and Units 3 and 5 are beyond 2 and 4 respectively thus experienced greater difficulty in obtaining seed than their sister communities which were established at the same time. Interestingly, according to all extension workers with whom the survey team spoke, lack of seed and seedlings was the main constraint to productivity (given that fertilizers and pesticides were still supplied to farmers by the project.)

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It is important to note that this model is not one of shifting cultivation as all land is maintained in production; nor is it a "tree crop" model in the sense this is generally meant within the Bank (estate-managed, high-input, production oriented.) It is, rather, an intermediate system used by small farmers to establish themselves, reduce risk and improve their incomes. As such it deserves the earliest possible consideration by GOI and the Bank.

Summary and Conclusions

12. Large-scale transmigration will require a variety of farming systems which are adapted to the areas to be settled. Because of critical managerial shortages these farming systems will have to be established by the migrants and provide early self-sufficiency in food. They should be highly diversified in order to avoid risk and aim at maximizing the income farmers can obtain, and they should also be ecologically sound. In different areas different systems may be appropriate. Where land is flat and alluvial deposits have formed, farm systems based food crop production may be preferred, and there is certainly merit in continuing to explore food crop models in otherwise unproductive regions (generally abandoned along-along areas) which are close to existing agricultural services. In the vast majority of settlements, however, where soils are poor, climate is erratic and services remote, farming systems must be developed which minimize dependence on timely inputs and reduce risk. These systems are likely to be based on highly diversified annual crops followed by perennials as soil fertility declines. To support this system will entail changes in agricultural inputs, extension and perhaps national priorities for food crop production.

PROCEDURES FOR SITE IDENTIFICATION AND
RESOURCE INVENTORIES FOR TRANSMIGRATION

J.P. Malingreau

Introduction

1. The main agencies involved in resource assessment for transmigration planning are:

- the Regional and City Planning Directorate of the Ministry of Public Works (TKTD);
- the Directorate General of Transmigration (DGT) in the Ministry of Manpower and Transmigration;
- the Land Use Directorate in the Directorate General of Agrarian Affairs in the Ministry of Interior;
- the Soil Research Institute acting as a data collection and research agency for the Ministry of Agriculture.

Other Agencies and Institutions (such as PTPT, the Directorate of Estate Crops, Universities, etc.) are also to a limited extent engaged in resource surveys and evaluation activities.

2. The Presidential Decree 26 (1978) has placed the responsibility for physical planning for Transmigration in the TKTD Office of Cipta Karya. But cooperating agencies continue to operate under their own sets of rules and procedures in somewhat an independent fashion and this tends to delay decision making and data coordination. An observation which was repeatedly made during the course of this mission was that the paucity of information on which the physical planning is based is not necessarily a reflection of the lack of data but also of the nonexistence of a systematic procedure for finding and retrieving the information already available in the various agencies. Given the size and the urgency of the present undertakings associated with the Transmigration Program, it appears that the problem of adequate information systems represents a major bottleneck. This report examines the proposals put forward in this field and possible Bank assistance in this matter.

Agencies Involved in Resource Assessment for Transmigration Planning

3. The Directorate of City and Regional Planning (TKTD). TKTD has been given the mandate to prepare the five and twenty year transmigration plans from site screening to detailed village layout. This task will be performed in addition to the regular regional and city planning tasks of the agency and no special section of TKTD will be exclusively in charge of transmigration activities.

4. Procedures for selecting transmigration areas are as follows. Indonesian territory has been divided into Partial Development Regions (WPP) for general planning purposes (each WPP has a potential to absorb 6,000-10,000 families). These have been determined in a desk exercise delineating potential transmigration areas based on a rough estimate of the area of influence covered by a "central location" acting as a "growth pole". Administrative boundaries and prominent geographical features have not been retained as criteria of delineation, but in general the WPP do not overlap provincial boundaries. A list of 63 priority WPPs has been determined and work has proceeded in those areas.

5. In a second stage, the WPPs have been evaluated as to their resources, leading to the identification of potential transmigration areas ("Wilayah Potensial Transmigrasi" or WPT). The next step consists of a structural analysis resulting in the identification of land development units or SKP (Satuan Kawasan Pengembangan). Each SKP is capable of absorbing about 2,000 families. Originally it was hoped that these SKP could be precisely defined on the available maps, however, it turned out that the envisaged level of detail in SKP identification was unrealistic given the lack of information and the time constraints; and consequently SKP are now delineated in a temporary manner and are subject to adjustment as additional information becomes available.

7. At the time of the mission, the structural analysis of 5 WPP had been completed and 17 more were on the drawing board. It was expected that 22 WPP would be finished by the end of November of a total of 63 to be analyzed for Repelita III. (The maps in Annex I of the main report show the location of those WPP presently under examination.) In each WPP, 3-5 SKP (of about 14,000 ha each) are delineated and a priority SKP is designated. Proximity to a center and access are the prime factors in this selection. The SKP maps are then sent to the next subdirectorate for village layout design.

8. Village Design. The third step involves analyzing for detailed planning (village layout). This detailed planning has to be carried out at a 1/5,000 scale and requires a topographical survey. In addition, the following documents are needed: 1/20,000 aerial photographs and a controlled photomosaic, 1/20,000 land use maps and a 1/50,000 soil and land evaluation map. Five consortia grouping 19 firms have been awarded contracts for the detailed mapping of SKP and are expected to deliver their product by mid-November. /1 TKT D is presently under pressure to finish the detail design of 16 SKP for implementation in 1980.

/1 The experience of Trans II has shown that the quality of the detailed mapping is often below acceptable standards (see reports by Messrs. Hill and Cazaux); this has led to delay in the implementation of some Transmigration II sites and also to difficulties for Agraria which cannot always rely on the maps for land staking and cadastral work.

9. The jump between the SKP delineation at 1/100,000 (or even 1/250,000) and the final layout design at 1/5,000 is risky; the SP (settlement units) are delineated on a fairly scanty information base; no room (or time) is left in this procedure either for a detailed land evaluation within the boundaries or for "onsite" adaptation. At the time of the mission, work was progressing on the SP design for the six SKP already analyzed but no village layouts had been completed. The assistance of a foreign consultant was expected to speed this work. In addition, in order to entirely assume the field work previously carried out by PTPT, eleven implementation teams (130 persons) were being recruited and were to be sent to the field after a one-week training.

Observations

10. The planning effort produced by TKTD during this last 1-1/2 years is of a very commendable magnitude and intensity. The amount of dedication which had been put into transmigration planning activities is impressive. However, the TKTD monopoly of physical planning has also produced some unwanted consequences. First, it has placed a very heavy burden on a staff which was already fully occupied by its regular regional and city planning program. Second, it has prevented them from calling upon other qualified agencies for assistance in data collection and interpretation, thereby antagonizing those which have more experience and were willing to be involved. Third, because of the urgency of the daily activities, TKTD has not been able to organize itself to make the best use of its own resources in terms of expertise, foreign consultants and facilities.

11. The mapping requirements for village design also have many implications for the whole program. For example, attempts to apply a uniform farm model simplifies the design work but increases the data requirements. It also underutilizes the available land resources by forcing the planner to ignore alternate possible land use models.

12. A final problem area is that of data collection. The present information unit of TKTD is not formally involved in collection or filing for data for transmigration despite the fact that its capabilities to file and retrieve useful information material are well proven in the field of city and regional planning. At present, each screening, outline planning and layout design team assembles its own information which is left unconsolidated after use and will be difficult to retrieve as further needs arise.

The Directorate General of Transmigration (DGT)

13. Although the DGT is not officially involved in the physical planning for transmigration, it has, over the years, accumulated considerable relevant experience. The DGT approach to site selection was somewhat different than that of TKTD. Site investigations were usually undertaken

after recommendations regarding the location of available and assumedly suitable land was received from provincial authorities. BAPPEDA and Agraria offices acted as channels for the transmission of these proposals. In response, the DGT carried out exploration surveys with the help of universities, research institutes, Agraria, the Ministry of Agriculture and consultants. DGT's criteria for site selection stressed sociopolitical considerations as expressed by local authorities facilitating the integration of the transmigration schemes into regional development programs. Accessibility to Java was another yardstick, as was land suitability, usually established on the basis of studies carried out by the LPT, Agraria or universities.

Observations

14. Although it is clear that the DGT will not be intimately involved in site identification and evaluation anymore, it would be useful if its experienced and trained staff could be utilized in response to the urgency of the task. The DGT has two main assets to offer: first a staff which has experience in resource evaluation and mapping techniques (including airphoto interpretation and cartography) and second, established communication channels with provincial and kabupaten authorities. However, since there are no direct channels of communication between DGT and Cipta Karya at the level of project preparation, the contacts are mainly via the technical team of BAKOPTRANS, creating a situation with little spontaneous exchange of information.

The Directorate General of Agrarian Affairs (Agraria)

15. The Directorate General of Agrarian Affairs (Ministry of Home Affairs) is involved in transmigration program preparation at two different levels, namely, resource mapping and evaluation and cadastral mapping. This report focuses on the first of these activities.

16. Resource mapping and evaluation is carried out by the Land Use Directorate which in addition to its regular land use mapping program conducts detailed surveys for transmigration sites upon consultation with the DGT. Since the reorganization of transmigration activities through Presidential Decree 26/78 its future contribution to the program in areas other than land registration remain uncertain. The agency is confident that its teams can perform and provide valuable inputs into transmigration but their integration into the overall program remains open to question.

Observations

17. The Land Use Directorate of Agraria has suffered, in the eyes of other resources surveyors in Indonesia, from the uneven quality of its land use mapping and from a bias against new and improved survey techniques. However, this should not detract from the fact that it has a strong manpower force in the field ready for work, that logistic support can be provided to them at short notice, that cartographic procedures do exist and are being

used, that communication channels with the field have long been established efficiently and that, as shown in the past, work can progress at a steady pace. It would be a waste of precious expertise and organizational experience to leave this possible input unused.

The Soil Research Center (LPT), Bogor

18. The LPT in Bogor acts as the main surveying agency for the Ministry of Agriculture in the field of transmigration preparation. It has twenty trained teams of ten persons each; each team can survey approximately 20-25,000 ha per year. Each survey takes approximately eight months from preparation to the final report if air photography and photomosaics are available. The total LPT surveying capacity is 500,000 ha per year; in addition LPT is in charge of supervising the survey work done by universities. So far three universities have been judged as reliable: IPB, UGM and UNPAD, but their capacity was not assessed by the mission. The 1978/79 program of LPT in support of transmigration included 358,000 ha of in-house surveys and the supervision of another 212,000 ha. LPT is now urged to concentrate on transmigration surveys and to finish by 1980 all areas considered for transmigration through 1984.

Observations

19. LPT's work is of good quality and its relevance to the transmigration program is widely recognized. But there is little evidence that the resulting reports are used in the present framework of transmigration planning. In fact, it often turns out that the land evaluation work is done after the site selection has been finalized. LPT itself is presently in no position to encourage or control the use of data collected at high cost. The results of the LPT surveys are usually transmitted to the Department of Agriculture which uses them during implementation; but there is little evidence of their being incorporated in the planning process itself.

Information Systems in Support of Transmigration Planning

20. Several Government agencies are presently involved in the preparation and/or implementation of information systems. Bakosurtanal (National Coordinating Agency for Survey and Mapping), Cipta Karya and Agraria are foremost. The importance of an accurate and reliable data base for transmigration purposes warrants a review of the potential inputs, areas of overlap and state of work preparation in the above mentioned agencies. (Because of the present uncertainty about the role of the Land Use Directorate of Agraria in transmigration, the following comments are limited to the first two agencies.)

The Subdirectorate of Information of Cipta Karya

21. This subdirectorate acts as a central coordinating body for data collection and compilation (including maps, airphotos, reports, etc.) for the needs of regional and city planning. It is subdivided into four

sections: Data Organization, Drafting/Reproduction, Manpower Development and Legal Section for City Planning. At this time, the subdirectorate is not involved in data collection for transmigration planning, but some use is made of its map collection and library and of its reproduction facilities. The proposal made by the Regional Planning Section of TKTD to develop a national computerized information system for regional analysis appears to neglect the existing information gathering mechanisms, nor does it provide for the inclusion in the files of the Subdirectorate of Information of data presently gathered for transmigration, thus risking the loss of valuable information.

22. While reproduction and mapping facilities of the Subdirectorate of Information appear limited and in need of upgrading in terms of equipment and staff, their map and document collection is kept up-to-date. Catalogs are available and the retrieval of requested documents is easy. The map collection and the library are constantly updated through an informal network of contacts in other agencies although there is no systematic procedure underlying this effort. No statistics on the use of the existing facilities are available but it appears that requests from outside TKTD and even from outside Public Works are numerous. The function of this subdirectorate as a central repository for the whole Ministry of Public Works merits explicit recognition.

Observations

23. Although the location of the Subdirectorate of Information in the Ministry of Public Works will pose administrative difficulties for its transformation into a national documentary center, its range of activities could be upgraded to serve the entire transmigration effort. What is urgently needed at the present stage is a comprehensive filing system however simple it may be. Additional funds should be allocated to upgrade the cartographic, reproduction and library facilities. A proposal to this effect has been introduced by the GOI to the IGGI in March 1979 (Annex 3.1.)

Bakosurtanal

24. Bakosurtanal is the National Agency in charge of coordinating all surveying and mapping activities. Its program is divided into three broad categories: basic mapping (topographic maps, navigational charts, control network), geographical surveys (regional resources, information system, resources and the environment) and land/sea international boundaries surveys.

25. Topographical Mapping. The preparation of the 1/50,000 topographic maps for Sumatra is progressing but because of manpower and printing constraints it will take approximately another two years to be completed. The air-photography of Kalimantan, Sulawesi and Java which was to be initiated in 1979 under a CIDA loan agreement is experiencing some difficulties related to the terms of the agreement and might suffer from a year to a year-and-a-half delay. The mapping of West Kalimantan (1/500,000) will

nevertheless proceed using less recent photography. No maps more detailed than 1/50,000 will be produced on a systematic basis during Repelita III and no staff is available to carry out detailed surveys such as those requested by TKTD for transmigration planning.

26. Geographical Surveys - Airphoto Interpretation. The staff of the air-photo interpretation and remote sensing section is now fully employed with the analysis of Jambi Province (False Color IR 1/100,00) and of East Kalimantan (Panchromatic 1/20,000) undertaken in the framework of transmigration projects. No additional work of this kind will be taken up in the near future. Although the existing manpower is adequately trained, the number of people who can devote full time to airphoto interpretation is woefully inadequate considering the magnitude of the job to be done. Recruitment appears to be a chronic problem in Bakosurtanal.

27. This section is also engaged in the development of a national map and air-photo index (INDOFOTA) to inventory and file all existing air-photography and maps covering the Indonesian territory and publish these indexes at large. Given the size of the undertaking, it will take at least one year before the system becomes operational and probably more before it becomes inclusive of all air-photos and maps existing in the country.

28. In another similar development, Bakosurtanal has initiated, in cooperation with IPB and some foreign assistance, a study geared at developing a resources information network for land evaluation in regional planning. The COMARC system to be installed soon at Cibinong is expected to serve as the central receiver for all mappable information. The intention of Bakosurtanal is clearly to take the lead in this field and its hope is to enlist the cooperation of all other concerned agencies.

Observations

29. The following observations relate mainly to the actual and potential assistance of Bakosurtanal to the transmigration program. Almost everyone involved in transmigration planning acknowledges the fact that the agency should be in charge of coordinating the mapping of the country and associated activities. However, false expectations have been raised in the past that Bakosurtanal would be able to service transmigration needs in a short time period. This was rather unrealistic considering the discrepancy between the level of detail required for transmigration projects planning and the level which can be realistically adopted for national mapping. Furthermore, the fact that advanced equipment has been made available seems to have created the expectation that advanced technology would solve the problems associated with resource inventories and evaluation. However, because of technology absorption problems coupled with a lack of sufficient manpower, these sophisticated systems will not be fully operational in the near future.

30. An important task which Bakosurtanal is presently undertaking but which may be completed too late for the present transmigration planning

effort, is the organization of the INDOFOTA system. This activity should be encouraged and pursued vigorously.

31. Bakosurtanal's limited surveying and air-photo interpretation capabilities would appear to be more effectively employed in supporting other agencies in their air-photographic work (starting with flight planning and ending with photo interpretation of selected areas). There is also a need for standardizing air-photo acquisition and interpretation procedures and the Bakosurtanal staff should become more instrumental in this task. The recent purchase of the COMARC land use mapping system, which is one of the most powerful land use mapping/analysis tools, will undoubtedly boost the capacity of Bakosurtanal to deliver relevant products to the users, but only in the long run. In a short term perspective, the system will be likely to take personnel away from more urgent tasks.

32. It is unfortunate that Bakosurtanal is judged at this early stage on its capacity to service transmigration, considering that the agency is still young and that transmigration is only one of its sectors of interest. A readjustment of perspectives and priorities may be necessary not only within Bakosurtanal itself, but also among its users.

Recommendations

33. Recommendations have been formulated taking into account the following aspects:

- (a) the urgency of implementing transmigration projects;
- (b) the need for building up a national expertise on transmigration program management; and
- (c) the importance of coordination in an ambitious and complex program.

34. It is recommended that the three following issues associated with the TKTD activities be examined:

- (a) how to speed up the present planning work;
- (b) how to build up TKTD manpower capacity; and
- (c) how to increase the exchange of information and expertise between relevant agencies.

35. At the WPP level, it is recommended that a general assessment of land forms and land cover be made as soon as possible for each of the 63 WPP planned for Repelita III. A team of one expatriate land resources specialist together with two knowledgeable local specialists could in a short period (6 months) working with satellite imagery and other small scale remote sensing products carry out a general assessment. Such an overall

look at the designated areas could speed up and improve the Bank site selection.

36. The SKP delineation process should find a compromise between the generalized approach adopted by TKTD and the more systematic land evaluation procedures developed by LPT. Work at this stage must not be delayed by excessive accuracy but in order to avoid costly mistakes more attention should be paid to the limiting attributes of the land (exclusion mapping) more than to its intrinsic positive characteristics. Diagnostic criteria for exclusion should be carefully examined and defined.

37. The present procedure for village layout design requires a detailed topographical survey which is very time consuming and difficult to obtain with any degree of accuracy. It is most urgent to examine the means to reduce the time spent on preliminary surveys and layout drawings, but respecting at the same time design standards. The problem has not received an adequate answer at this stage, but a move towards greater flexibility would seem indicated. This would include a departure from the unique farm model and acceptance of the principle that a range of models combining homestead gardens, field crops, mixed crops and tree crops must be considered in relation to the nature of the terrain at the sites. This could then lead to a certain relaxation in surveying needs. Agricultural planning could then proceed on the basis of landforms and their associated slope classes; detailed mapping would be restricted to road alignments. Air-photo interpretation would become a more common feature of this approach, the intensity of field checks depending upon the complexity of the terrain and the nature of the land cover.

37. Since the approach is similar to the one adopted in semidetained land evaluation surveys by LPT, the possibility of combining these two components of planning by increasing the scale of the land survey work (from 1/50,000 to 1/25,000) and reducing the scale of the detail agriculture design (from 1/5 000 to 1/25,000) should be examined, as well as the fielding of combined teams.

38. Given the increasing scarcity of suitable land, the concept of multiple land resources use should be advanced; making the choice of possible land utilization types broad enough to accommodate an increasing range of land conditions.

39. Since the approach to planning for transmigration is likely to be a determinant in the success or failure of the whole program, it is suggested to convene a workshop of specialists who would have for task to define a minimum set of planning requirements for transmigration at the WPP, SKP and SP levels. These specialists should in addition define practical ways to obtain the necessary information. Mr. I. Hill's notes on "Planning for Alternative Forms of Development on Transmigration Settlements" could provide an appropriate background document for such a discussion. Further contributions to transmigration planning would come from noncartographers and non-engineers involved in land evaluation and agricultural resources assessment with a view to dovetailing work at all levels of design.

40. The role of the technical team of BAKOPTRANS in the coordination of planning and surveying activities should be enhanced. It is felt that the technical team is the most appropriate place for exerting such influence.
41. The efforts of the Soil Research Institute are worth supporting and possibilities of speeding up manpower development and survey activities of this institution should be further investigated.
42. In view of the long-standing Bank interest in Bakosurtanal, it is suggested that the Bank seek a clarification and, if necessary, a redefinition of the role that Bakosurtanal can and will play in the transmigration program. It is further recommended that the Bank assist Bakosurtanal in launching a training effort compatible with the size of the task it is faced with, with particular regards to transmigration needs.
43. In addition to its present and planned technical support to TKTD, the Bank should consider assistance to a training program at all levels of this agency, with the aim of building up a strong indigenous corps of planners trained in rural/regional planning for transmigration.

Report on Forestry Aspects of the Transmigration ProgramLars-Gunnar Blomkvist /1DGF and the Site Selection ProcessCriteria and National Resource Management

1. The most significant criteria in the selection of sites for transmigration have till recently been population density and land ownership, access and slope (less than 8% for food crops). To the extent that the dilemma of sustained forest production vs. transmigration into forested areas has been considered this has apparently been done with limited involvement of the Directorate General of Forestry. The awareness that valuable national resources are being lost, however, is increasing. To the main criteria mentioned above have been added that primary forest should be avoided as far as possible and preference given to alang-alang areas. A recent Presidential Decree states that forests with volume of more than 50 cu m per ha of commercial species above 35 cm DBH (diameter at breast height) should remain as production forest, /2 and the recent cancellation by the President of six transmigration projects which are located in primary forest may be taken as an example of this growing awareness.

2. Should all areas with primary forest be avoided in the future? It is important to stem a potential over-reaction as the consequences would be impractical and equally lead to waste. In many areas, especially where roads have been built, spontaneous settlers encroach on and destroy the forest, mostly by shifting cultivation. Experience shows that once this process has started, it is practically impossible to stop. In such situations it is desirable that the process be given organized form leading to better utilization of land as well as timber.

/1 This paper is based on research conducted during the course of the transmigration review mission, October 1979. Cost calculations and appendices are available in the original report.

/2 It can be stated with next to 100% certainty that no primary forest in the Indonesian dry lowlands contains less than 50 cu m per ha of commercial species from 35 cm DBH and up (with the exception of some sparsely represented forest types such gelam (*Melaleuca*) on coastal plains and poor soils. Very often this is true even for the logged over stands, at least if the gross volume is considered. "Commercial" is a floating concept which, other factors left aside, will change with time.

DGF's Input of Data

3. In the argumentation for a national sustained yield forest policy DGF must be able to present information on location of forest, stand density, species composition, etc., for the areas in question. Such information is presently scarce, therefore together with other government agencies DGF will have to work out more specific criteria for area selection. Also to be considered is size of the forest areas, proportion of forested land in a given administrative unit or catchment area, location in relation to main transport routes and to forest industry centers and soil properties. The information needed for selection, and further on for project preparation, has to be collected and compiled separately in each case.

4. The data collection would have to be made in two steps. The first step would be an orientation survey with the main purpose of broadly outlining which areas in a given WPP could - following guidelines as mentioned - be alienated from the forest estate and which areas should as far as possible remain as production forest. The result would be presented to BAKOPTRANS and represent DGF's input in the selection process. In view of the usually limited time available the survey would have to be simple and based on existing information (aerial photos, personal experience of field staff). The second step would consist of a regular timber inventory to be made as part of the project preparation once a particular area had been selected. The purpose would be to provide a data base for (a) estimates of land clearing costs, (b) estimates of volumes and value of standing timber in areas to be cleared.

5. According to Bina Program, it would be possible to carry out an orientation survey of a given WPP in six weeks, drawing on aerial photos mostly from BAKOSURTANAL. The Sub-Directorate for data collecting and processing has 40 photointerpreters, some of whom could be assigned this type of job. The same Sub-Directorate is preparing for a nationwide forest inventory including land capability appraisal with assistance from F.A.O. The study of potential transmigration areas should be one of the priorities. Once this inventory gets started there would thus be little need for special orientation surveys for transmigration projects. As to the second step, it is estimated that, given certain support, DGF would be able to make a timber inventory of a particular WPP in three months with two-three teams, depending on area size, plus an additional month for compilation and reporting. At present 7-9 teams can be fielded from Bina Program.

Sources of Information on Forest Cover, Forest Types, Standing Stock and Species Composition.

6. DGF's Bina Program has experience in cooperating with BAKOSURTANAL to get access to aerial photos and satellite pictures, but apparently not with other possible sources of information. In view of the time constraint expanded cooperation with all useful agencies must be encouraged. Other sources of aerial photography are private companies prospecting for oil or minerals. BAKOSURTANAL is preparing a library of all known photography.

7. Most forest areas are under concession agreement. The standard agreement states that the concessionaire should have aerial photos taken of the area and make forest inventories for the annual operation plans. These duties are often neglected. Only very few concessions have aerial photos and the forest inventories made by the concessionaires are designed with Meranti logging in view. Oil prospecting companies have also covered the zones adjacent to the coast line with Side-Looking Radar imagery. As the scale is in about 1 to 1 million no information on the forest stand can be extracted. However, those images provide good information on the Macro topography in areas where the topographic mapping is incomplete.

8. The most serious bottleneck may not be the retrieval of photos and other basic information but interpretation and compiling. As mentioned, Bina Program has certain resources for this. At best, however, photo interpretation can give information about the general topography, location of forest stands and to some extent their relative density. This type of general information should be relatively easily available. For such parameters as standing stock and species composition time consuming data collection in the field is necessary.

DGF's Role in the Disposal of Wood and the Control of Market

General

9. DGF seeks to control the wood utilization through various regulations and taxes. The aim is of course to bring tax revenues to GOI but also to encourage increased domestic processing and reduced export of logs. DGF's resources for policing the adherence to issued laws and regulations are limited. One effect of this is that only timber actually utilized is liable to taxation and not the standing or gross volume. Thus increased utilization is not encouraged.

10. DGF does not actively take part in marketing or promotion of wood or wood based products, nor does any other GOI agency.

Regulations Concerning Felling of Trees in Concessions and Land Clearing Areas

11. Practically all forested land is now covered by timber concessions (HPH agreements) for which the law states that only trees with a DBH of 50 cm or above can be felled. Logs can, according to the laws now in force, be exported only by concession holders, and only if the diameter is above 50 cm. An exception of the latter respect is pulp wood with diameters between 10 and 30 cm, of which minor volumes are being exported.

12. With special reference to clear felling on land for transmigration projects an informal agreement has been reached between the Minister of Agriculture and Bina Marga that all trees with DBH of 35 cm and above should belong to the concessionaire. He can thus remove and use the timber of such trees provided that he pays the regular taxes. The same agreement says that

smaller trees, DBH between 20 and 35 cm, are the property of GOI, primarily for local needs such as house construction. The land clearing or housing contractor who makes use of such timber should equally pay tax to GOI.

13. The Minister of Agriculture has proposed to give priority to the concessionaire when a contract for clearing of an area within the concession is offered. Should the concessionaire turn down the offer it will go to any interested contractor. The latter may then work out an arrangement with the concessionaire for the export of some of the timber. Otherwise, it will have to be discharged on the local market, to the extent that is possible. In the case where the trees are left standing on individual lots to which transmigrants are given land use rights and later ownership no guidelines have as yet been laid down. Most likely the policy will be to allow the title holder to use the wood as he sees fit but charge customary taxes in the case of sale.

Regulations Concerning Production and Marketing of Timber and Timber Products

14. The aim of the regulations is threefold: (a) to avoid an oversupply on the world market, thereby maintaining a stable price level, (b) to encourage domestic processing and (c) to guarantee an adequate supply of wood to domestic industries and consumers at favorable prices.

15. The current national plan calls for a total log production of 32 m cu m of which 18 m may be exported as round wood. The total target for the concessions is set at 28 m cu m which leaves a margin of 4 m to be filled with timber from, for instance, land clearing operations.

16. Each individual concessionaire is given a maximum annual allowable cut (AAC) - depending on the productive area of the concession - and a maximum proportion of the AAC that can be exported in log form - depending on the number of years that the enterprise has been operating and subject to gradual reduction. The AAC is split up per species or species group according to the composition of the standing stock as revealed by forest inventories. Due to higher FOB price, and hence higher profit on Meranti when compared with other species groups the loggers seldom fill the quota of the latter.

17. The taxation policy purportedly aims at reducing this imbalance through a variable export tax per cubic meter according to species. This tax is presently 20% of the so-called check price on logs, 5% on sawn wood and none on plywood. The check price is meant to reflect the current market price but is usually lower and in particular this is the case for sinker species and so called lesser-known species. Production of the latter would thus be encouraged. But the incentive provided by this tax differentiation is not sufficient.

18. DGF has no power to enforce the filling of quota of non-Meranti species. The fact that a logging area is converted into a transmigration site will not change the economics significantly; the loggers should still be expected to show strong preference for Meranti. Furthermore, the difference in profitability is so big that a reduction of taxes on non-Meranti species will have little effect. An increase on the other hand, of taxes on Meranti is probably politically unfeasible at present (two years ago the export taxes on logs were raised from 10 to 20%).

Assessment and Comments

19. As mentioned the concession holder would be given the right to cut and use all trees from 35 cm and up once an area has been declared a transmigration site. He would be given 12 months to remove what he considers valuable. Furthermore, he would be given first priority to the land clearing - and road construction - contract. The latter means that he would be paid for building the roads he normally is paying for himself into an area he is going to log. Even without that component his log cost would be lower than normal as fixed costs are covered by a higher volume per ha.

20. The reason why GOI gives such privileges is probably that the concession holder should be compensated for "loss of land". It could be argued that the concession agreement only applies to the standing trees and not to the land. In the case of an already logged over area the concessionaire is, legally, not allowed to do any additional logging there for the next 35 years (which is the "rotation period" upon which AAC and management plans are based). Since the contract period is not more than 20 years, if such an area is set aside for transmigration the concessionaire does not lose anything. On the other hand, from the point of view of GOI the transfer of ownership of timber of diameters between 35 and 50 cm DBH to the concession holder seems counterproductive as the value of timber in that diameter range could possibly cover the transmigration project costs (a calculated example from Trans II indicates a cautious net value of such timber of about US\$1,350 per ha plus US\$800 in tax revenues. This value is however, highly dependent on marketing capacity).

21. The extent to which the concession holder will make use of his right to log all trees above 35 cm DBH and bring in tax revenues to the government depends on the market situation, the location in relation to transport routes and market and his own marketing skill. At present the concessionaires see little reason for dealing with non-Meranti species and possess insufficient information on the potential market for such species. To increase their export quota would thus be ineffective. DGF is not engaged in market research or promotion and is unable to assist in the disposal of the volumes of mixed species that will be generated from cleared areas. A common belief within DGF even seems to be that an increased outflow of mixed or lesser-known species on the South Sea log market would reduce the demand for and also the price on Meranti logs. This additional log flow would thus be harmful and it would be better to burn the logs.

Land ClearingLand Clearing Methods and Effects of Intensified Logging

22. In the projects presently being implemented or considered each family would be given 3.5 ha (dry land) of which perhaps 1.25 ha would be cleared prior to the family's arrival. The way in which this clearing should be done has been the subject of considerable discussion.

23. Mechanical land clearing with crawler tractors makes destumping and windrowing possible and thereby more complete burning and easier preparation of the land afterwards. On the negative side, it requires considerable capital investment and also causes damage to the soil through compaction and through "plowing down" of the top soil. Manual land clearing with chain saws, on the other hand, requires more labor and related support facilities, makes destumping and windrowing practically unfeasible and may also need longer time. An important advantage is that it leaves the top soil relatively intact. From the point of view of soils management it would thus seem that manual clearing is to be preferred.

24. However, one should also take into account the effects of intensified logging. If the ambition is to utilize and consequently remove every sound log plus a proportion of the defective ones, the consequence will still be considerable tractor traffic. To take an example from Kuamang Kuning in Trans II, an average of 26 trees or say 65 logs would have to be removed from each forested ha (includes presently commercial species only, not the lesser-known ones). Very likely about half the area would be passed over at least once by tractor and skidded logs, with the risk of soil damage as described above.

25. The conclusion seems to be that clear felling and log transport with conventional methods cannot be reconciled with good soil management.

26. Alternative logging methods /1 include:

- using machines with lower ground pressure
- winching the logs to a limited number of trails
- skidding the logs manually to truck or tractor trails (Kuda-kuda system)

However, all these methods have disadvantages and it seems that at present there is no reliable or tried-out alternative to the conventional logging with heavy equipment. It is also likely that this type of logging will prove to be harmful to soil conditions and crop yields.

/1 Alternative logging methods are discussed for example in M. Ross: Land Clearing for the Middle Mahakam Area Development Programme, (T.A.D.).

Who Should Do The Land Clearing?

27. From what is said above, it seems that the transmigrants, with certain organizational and material inputs, should do the land clearing themselves. Not only would this be better for the soil but it would also provide an income to the transmigrants (assuming that they would be allowed to sell the timber at market prices). A third advantage could be that the transmigrants would seek to arrange things in such a way that the time laps between clearing and cultivation would be short enough to prevent invasion of Imperata grass and other weeds.

28. If a certain area has to be cleared before the arrival of the transmigrant so that he has some farm land to begin with, the best solution seems to be to minimize this pre-cleared area.

29. The Minister of Agriculture has proposed to give priority to the concession holder when a contract for land clearing is offered within his area. A good reason for this is that the concession holder is on the spot with his equipment and knows the local conditions. The concessionaire may also be more conversant with the log market and able to make economic use of more of the logs than an ordinary civil works contractor. But to get best value out of the cleared forest GOI should select contractors with documented marketing ability. With regards to methods, equipment and soil management, the two categories are comparable.

Cost of Land Clearing

30. At present contractors charge an amount around US\$260 per ha for clearing of land. To this is added costs for construction of roads, bridges, etc. In return GOI receives a certain amount of royalty on timber. Royalties plus taxes could amount to US\$200-400 per ha. The latter figures, however, refer to total net volume whereas, with the present system, only utilized timber is subject to taxation. Through various forms of malpractice or due to sheer lack of supervising staff within DGF, the amount levied is reduced further so that the land clearing operation eventually causes a cost to GOI. Calculations indicate that the contractor could make a profit of at least US\$270 per ha plus avoided taxes by selling the timber. To this should then be added part of the land clearing cost above as a considerable part of the clearing work consists of removing the big timber.

MarketGeneral Trends

31. Over the last five to six years prices of logs and sawn wood on the export market have been fluctuating sharply but the general trend has been a marked increase. In the case of Meranti logs, the average price increase in US\$ has been in the order of 20%, inflation effects not deducted. The combination with a 50% devaluation has made the Indonesian producer very export oriented. This may in turn have resulted in a certain shortage of

wood on the domestic market. In any case, the prices also have risen sharply there. (The wholesale price index for nonoil export products consumed domestically has risen 120% from June 78 to June 79.)

X 32. In logging, the present world market prices and taxation regulations encourage the production of Meranti logs for export. The sawmills are thus mainly provided with export reject Meranti logs. At the same time the sawmill industry is operating well below capacity, perhaps at 50%. The presently high prices on sawnwood, both domestically and externally, encourage the sawmillers to produce more but they have difficulties in getting enough logs. Would it be possible to feed this industry with logs of mixed species and smaller diameters from land clearing areas? There would, no doubt, be some resistance as the profits would be less. In view of the limited experience among Indonesian sawmillers in general to deal with mixed species, they would find it difficult to sell the products on the export market. A slightly reduced price on the domestic market where the physical needs are undeniable, motivated by a better capacity utilization, would most likely allow increased sales of sawnwood of mixed species and contribute to the country's development. The situation is further complicated by the fact that if Indonesia, by far the biggest supplier of South Sea logs, decides to reduce its log export, the price per cu m of export Meranti logs will again increase and make loggers even more biased towards that species.

The Market for Products from Land Clearing Areas

33. Rattan is of increasing importance and some is used for production and it has been suggested that in land clearing operations the laborers doing the job should be allowed to gather the rattan as an extra incentive (normally a special license from DGF is needed).

The Market for Products from Land Clearing Areas

34. Other so called Minor Forest Products such as latex, resin, oil or medicinal herbs seem to be of small importance. In general transmigrants are not familiar with how to gather or how to use them.

35. Fuelwood for cooking has no market in the areas visited due to abundant supply. Fuelwood for production of lime, bricks and clay tiles can be sold in limited areas where suitable clay or lime is found and where there is a sufficient market for the product. However, sales of this product will not contribute significantly to the disposal of wood.

36. Fuelwood for generating gas or for firing steam engines is a topic now under discussion. Competition from the strongly subsidized /1 petroleum based fuels makes such alternatives unattractive at present. The cost of diesel oil and kerosene in remote areas is about Rp 40 per l. In short the present price relations are such that this form of energy generation is much too costly even if the wood is free.

37. Smallwood for charcoal would be available in large volumes. The cost of charcoal produced in stationary brick kilns on land clearing areas has been estimated at less than US\$30 per ton delivered at sea port in 20 kg plastic bags. The local demand for charcoal is very low, again due to the low cost of petroleum products. No export of charcoal seems to be taking place, and enquiries in Singapore gave the answer that no significant trade in charcoal takes place or passes through there.

38. Wooden shakes for roofing is a specialized product with good prospects. The production is entirely manual using simple hand tools. Prospects are good for transmigrants to develop a simple cottage industry producing wooden shakes and selling to nearby towns.

39. Transmission Poles. The program of rural electrification is proceeding in Java and has recently begun in Sumatra. Only poles made of steel pipes are being used. However, the agency responsible for procurement informs that consultants are working out specifications for preservation treated poles (Cu-Cr-As). The average length of poles used for lateral lines in rural areas is 9 m with 8 m as minimum. Technically, there would be no difficulty in producing such poles from small diameter trees (25-40 cm DBH) of mixed species in areas that are being clear felled. The preparation involves manual labor for debarking and shaping. Transport to roadside can be done manually or with buffalos. (The weight per piece rarely exceeds 900 kg). Trans II would be a very convenient area for this type of production as a high-standard road goes through the area.

40. Small diameter logs for Pulp Production have a limited market only. Perhaps 200,000 cu m are exported annually. No pulp mill using this type of raw material exists within the country.

/1 The T.A.D. project in Samarinda is preparing for field trials with a gas generator and a steam engine. The cost of the machinery for production of electricity from wood via a gas generator and a piston engine is about US\$35,000 for an output of 22 kw. A 20 hp/15 kw steam engine produced in the USA costs about US\$11,000 (including boiler FOB US port, without electric generator. A new 80 hp diesel engine costs about US\$2,000 in for instance Palembang (equally without generator).

41. Logs of lesser-known or mixed species form the main part of the remaining stand after logging. In contrast to the types of products dealt with above such logs could only with considerable support be produced and marketed by transmigrants. The market for and the interest in lesser-known species in Indonesia is still small as has been elaborated above. Several sources claim that large quantities can be sold without difficulties to Singapore, Taiwan and Japan. One condition, apart from export permit, is that sufficiently large volumes can be accumulated, at least 1,000 and preferably 4-6,000 cu m of logs per shipment of similar characteristics with respect to color, hardness, etc. This is no problem for a big company but creates difficulties for a land clearing contractor and of course even more so for individual transmigrants.

42. Sawnwood for transmigrants' housing is often referred to as an important outlet but is insignificant in terms of volume. A standard house requires about 5 cu m of sawnwood or 10 cu m of logs. Per ha this means less than 3 cu m to be taken from the volume of trees with DBH between 20 and 35 cu. The volumes in this diameter range are not recorded in normal forest surveys but should be expected to be at least 20 cu m net per ha.

Conclusions

43. Two types of conclusions emerge from the above.

- (a) Considerable volumes of timber can be sold at profit from land clearing areas, the extent depending not only on location and routes to market but also on the skill of the land clearing contractor. As a consequence GOI should reconsider the concept of giving priority to the concession holder and instead turn to contractors with a documented capacity to market the timber.

One way of doing this would be to impose a royalty on the standing volume of areas to be clean cleared, in which case only contractors who could make use of the timber would be interested. This would generate a capital flow benefiting the public as well as the private sectors. Another way could be to estimate, from case to case, the value of the standing timber assuming good marketing ability, and balance this against the cost of clearing, road construction, etc., plus a reasonable profit. In case of negative balance GOI should pay this, otherwise, profits from the timber sales should be compensation enough.

- (b) Although transmigrants can produce and sell many types of forest products (sale to travelling agents at roadside) the main part of the standing volume will require special arrangements for economic utilization. The "lesser-known" species can be sold only in the form of logs and to buyers who want big volumes.

The Transmigrant and His Forest ResourceGeneral

44. Once the transmigrant has been given land use right, he is to be considered the owner of the trees on the land. In the projects visited, however, the transmigrants were not informed about the location of their land apart from parcels already cleared or block planted.

45. In theory this forested portion would contain all trees with DBH below 35 cm plus a number of bigger trees of species that the concessionaire has not found useful. In reality the situation will vary according to the circumstances. The Rimbobujang area can be taken as one extreme where the concessionaire has not had the time to take out all that he might use. The other extreme is illustrated in Baturaja where the forest stand was poor from the beginning and where the land clearing contractor is cutting whatever has a commercial value before the land is divided into individual lots. A similar situation would be reached in areas close to markets and operated by concession holders and land clearing contractors with good marketing abilities.

Areas With Poor Remaining Forest Stand (example Baturaja)

46. As practically no trees of commercial value remain the additional income that transmigrants can generate by selling wood or wood products is negligible. The only obtainable commodity is fuelwood which normally commands such a low price that production hardly is worthwhile.

47. From the transmigrant's point of view, the land clearing is only an "investment" that consumes his labor and other resources. At the same time it can be argued that the removal of the remaining small trees does not require special equipment, nor much of special skill. In the worst case, the land could have been criss-crossed by heavy equipment causing damage to the soil. Of interest in that situation is to what extent small trees and invading bushes can contribute to a restoration of the porosity of the top soil. If that is the case, the transmigrant should of course be encouraged to leave the most damaged spots for some time.

Areas Where Trees of Lesser-known Species Have Been Left

48. In this case the work load will be considerable as trees with DBH of 1 m or more may occur. To illustrate the situation, a theoretical example has been worked out. The conclusion is that the forest can provide a substantial extra income (at least Rp 210,000 and possibly 275,000). The delivery of marketable products would require about 85 mandays (income per man-day about Rp. 2,800) assuming that chainsaws are available.

49. Another and more crucial assumption is that an agent/buyer is at hand to take care of logs of lesser-known species. If the assumptions are reasonably correct one can further conclude that it will be quite possible for the transmigrant to do the clearing of 2.25 ha and that he could even clear more, if the area clean cleared before his arrival would be reduced. Again, however, the chainsaw is an important facility without which the total labor consumption would be about double.

Areas Where Also Considerable Volumes of Commercial Timber Have Been Left (example Rimbobujang)

50. Due to more standing stock the total income could reach Rp 650,000 with a labor input of 190 mandays. Due to higher proportion of valuable timber, the income per day would be as much as 40% higher than in the alternative above (Rp 4,000 per manday).

51. It is difficult to say in which proportions the three alternatives dealt with here will occur in the future. As the timber market develops and loggers and sawmillers get organized it is reasonable to assume that the situation in which lesser known species are left will prevail with a trend ^X towards the more exploited situation described for ⁺Baturaja.

Assistance to Transmigrants for Felling and Processing of Timber

52. The first step must be to inform the transmigrant about the location of his land so that he can cut the trees or protect them till a suitable time. The second step would be to give the transmigrant objective information about the value of the timber and training in felling, maintenance of tools, etc.

53. All the operations in question can be done with simple hand tools but the use of chainsaws will almost double the overall productivity. Depending on stand density one saw will be needed for every 10-15 families. To use contractors who may charge Rp 10-12,000 per day for chainsaw with operator is a possibility. Such contractors already exist to some extent and they would probably be able to find or train additional operators if there were a demand. The transmigrants would then pay in kind, knowing the value of the product. The alternative would be collectively owned saws under the village associations. With the limited experience in such arrangements among the transmigrants, this would be more complicated.

54. For the conversion of logs or flitches to boards, chainsaws are sometimes used. This should not be encouraged, however, as the method is hazardous and also wasteful. Manual sawing (thin blade mounted in a frame) or milling in simple mobile sawmills is to be preferred.

55. Sawing into boards for the local market adds considerable value. Smallmills are reported from several transmigrant villages but arrangements concerning ownership or distribution of profits are not known. As one unit would be sufficient for one village and as the unit is relatively stationary and thus easy to supervise, cooperative management might be a feasible solution in this case.

Marketing of Lesser Known Species

56. The peculiarities of this species group have been dealt with previously. Big volumes would have to be accumulated for export. This could only be done by specialized agents, perhaps logging companies. These agents would have to develop a system for cooperation with the transmigrants.

57. The transmigrant must be informed that in order to make his logs valuable, he must accumulate at least a truck load (8 to 10 cu m in the case of a San Tai Wong). When he feels ready to cut this volume, he would have to take two steps: (a) contact a chainsaw contractor to fix a date; and (b) inform a contact man, for instance the village chief, about the date. The contact would forward the information to the agent and get a go-signal if the agent's transport resources permit. To accumulate bigger volumes but also to assist each other in the manual work and to make best use of truck trails neighbors should be encouraged to cooperate in felling, skidding and lay-out of trails.

58. When the logs that can be skidded manually have been brought to truck trail, the agent should again be informed. If he cannot pick-up the logs immediately, they would have to be sprayed with insecticide and S-hooks would have to be clamped into the ends to prevent cracking. This can be done by the transmigrants if the agent provides the equipment through the village chief. The agent would need a special storage place near to loading point with facilities for sprinkling the logs with water to prevent decay, while sufficient volumes are being accumulated.

59. To get this new type of activity started, credits to agents would probably be necessary. To justify such credits a proper market survey would have to be done and if possible contracts with buyers signed or at least negotiated preliminarily. These preliminary activities should be undertaken under supervision from DGF as it would contribute to a better understanding within that agency of markets and marketing questions.

60. In their report "Land Clearing and Waste Wood Use Proposals for NES III, Rimbobujang", M.S. Ross and Sarsito (T.A.D.) estimate the investment in logging machinery for skidding, trucking and barging of 320,000 cu m per year from the project site to Jambi at about US\$7 million. This amount includes costs for crawler tractors, skidders and loaders. By using the more versatile and much cheaper San Tai Wong, the amount could be reduced considerably. Finally, the size of investment will of course depend on the volume found marketable.

Conclusion

61. As can be seen in Rimbobujang, the transmigrants can, with their own resources and through spontaneously developing marketing channels, produce and sell boards and fitches of Meranti species. In this particular case, the

nearness to a strong local market as well as the export market provides very attractive economic incentives (the fitches are resawn for export with a FOB price in the order of US\$225 per cu m of which about 25% goes back to the transmigrant).

62. In the case of lesser-known species and in areas with less access to markets, there is no guarantee that a parallel development will take place. To assure a full utilization of the timber and additional income to the transmigrants a system for collecting and marketing has to be built-up, possibly by means of credits to agents.

Potential Wood Flow from Transmigration Areas

63. The DGF claims that the flow of timber from land clearing areas will be big enough to cause disturbances on the South Sea log market. DGF's concern is explained by the fact that it does not have the power to instruct loggers to reduce their annual cut. In fact the AAC is given once and for all in the HPH agreement.

64. The concessionaires who are affected by transmigration projects can be asked to relocate their operations to areas that are going to be cleared while maintaining their total logging volume. However, such arrangements will change the species composition of the cut towards a lower proportion of Meranti and consequently towards a lower profit.

65. Simple estimates indicate that Trans II and III alone will create a log flow in the order of 7 to 8% of the present national logging target. DGF's concern that the log market will be upset may not be fully justified, however, as only some 25% of this volume will consist of Meranti. The remaining part will be a species mixture, some of which can be consumed locally and some exported to specialized buyers. This export market, it is felt, is rather independent of the Meranti market and consequently an increased supply of mixed species should not affect the prices on Meranti. If, on the other hand, the Meranti logging volume is to be maintained at today's level, the handling of the additional volumes from land clearing areas will require new investments in logging equipment, storing and loading facilities, etc. Full utilization of the mixed species will further require installation of new sawmills closer to the log source and more adapted to the local market. Private companies seem to be interested in doing this but need time. It is also essential to prepare the marketing routes, domestic as well as foreign.

Conclusion and Recommendations

66. Within the Government administration, the Ministry of Environment and DGF are the agencies who represent the interests of forest protection. Obviously DGF alone could argue from a standpoint of forestry economics and sustained timber production, but so far it seems to have been playing only a minor role. To be better prepared, DGF needs better information on the National Forest Resource - a national forest survey is under preparation -

and a set of criteria as to what forest areas could be alienated from the forest estate. Until DGF has formed at least a preliminary policy on these matters and has surveyed ways of disposing of the timber from cleared areas no large program of transmigration into forested areas should be embarked upon./1

67. Projects located in forested areas and already initiated or decided upon must of course be pursued. DGF should be encouraged to contribute with orientation surveys and data for the detailed planning. In so doing it should also strengthen its channels to BAKOPTRANS.

68. The reason given for locating projects in forested areas and not on open areas is often that in the latter there are ownership claims. With the present system project preparation and land clearing in forested areas could cause additional costs that might exceed the cost of compensating claimants.

69. At present DGF has no means of contributing to a full utilization of the timber resource. Taxes are levied only on utilized timber. DGF should be approached with a proposal for assistance by competent marketing specialists in a survey of the market for lesser known species. The purpose of the survey would be to identify potential buyers, to assess the market value and to determine the interrelationship between the markets for Meranti and lesser-known species. With the results at hand DGF could establish a reasonable level of royalty and export taxes on the standing gross volume of timber in land clearing areas. No bid for clearing below this level should be considered. This type of royalty would not only generate added income to GOI but also serve as an incentive to better timber utilization. PTPT should cooperate in this matter by only considering land clearing contractors with a documented ability in marketing. If such contractors cannot be found within the country, foreign firms should be invited to participate in order to "break the ice" and open channels to the markets for lesser known or less profitable species.

70. Two policy decisions concerning ownership of wood should be made by the Government. The Ministry of Agriculture has agreed informally that when a forested area has been designated for transmigration the concessionaire should be given the ownership of all trees down to 35 cm DBH compared to 50 cm under the normal concession agreement. It is understandable that the Government wants to maintain confidence among investors. However, by an arrangement where the concession holder is given 12 months notice, and preferably more, to log the area in the normal way or go back to what remains above 50 cm DBH, the concession holder would lose practically nothing. The value of the timber less than 50 cm DBH should be credited to the project as this value

/1 This conclusion is underlined by the fact that the export value of timber and timber products has been rising steadily since large scale forest exploitation started in Indonesia.

would not have accrued had the project not been initiated. At the same time the Government would retain a bigger volume on which to levy the above mentioned royalty (minimum bid).

71. The second desirable decision regards the distribution of timber and the benefits derived, between contractors and transmigrants. (As all timber is assumed to be subject to taxation, the Government's share remains constant.) It has been shown that cutting and selling of timber can give a very substantial extra income to transmigrants in forested areas. If this is found desirable - it can be said to be unfair vis-a-vis transmigrants settling in unforested areas - certain measures should be taken as a consequence. Such measures include (a) the early demarcation of individual lots to allow the transmigrant to protect this property; (b) building up of commercial ventures which can buy and market the transmigrants' timber products; (c) instructing the transmigrant on the value of such products, in tool maintenance, etc.; and (d) assistance in installing cooperatively owned small circular sawmills. Without proper demarcation, the other measures might encourage encroachment into forest reserves or neighbouring concessions.

72. In order to minimize soil disturbance as much of the logging and land clearing as possible should be done manually and can probably be done best and cheapest by the transmigrants themselves.

73. In view of the market prospects and the standing stock in the project areas presently considered (Trans II & III) there appears to be no reason for GOI to pay for mechanical clearing, rather it should get paid by the contractor for the timber sold (minimum payment equal to the royalty and taxes mentioned above). If DGF or GOI should show reluctance to the market survey for lesser-known species proposed above or to the concept that land clearing in timber forest should bring a net income, the Bank should stay away from transmigration projects in forested areas until questions concerning costs, timber value, etc., have been further clarified.

74. To make sure that timber produced by the transmigrants finds its way to the market, thus generating incomes to the transmigrants as well as to GOI, special ventures for handling and marketing of especially lesser known species would have to be set up. If needed such ventures should be provided with credits (for equipment, storage facilities, etc.) to guarantee an early start-up. Such ventures would contribute to a smooth adaptation to the considerably increased flow of timber of lesser-known species. The spontaneous production of timber by transmigrants that can at present be observed in some areas deals only with well-known species or about 30% of the total volume.

Report on Forestry Aspects of the Transmigration ProgramLars-Gunnar Blomkvist /1DGF and the Site Selection ProcessCriteria and National Resource Management

1. The most significant criteria in the selection of sites for transmigration have till recently been population density and land ownership, access and slope (less than 8% for food crops). To the extent that the dilemma of sustained forest production vs. transmigration into forested areas has been considered this has apparently been done with limited involvement of the Directorate General of Forestry. The awareness that valuable national resources are being lost, however, is increasing. To the main criteria mentioned above have been added that primary forest should be avoided as far as possible and preference given to alang-alang areas. A recent Presidential Decree states that forests with volume of more than 50 cu m per ha of commercial species above 35 cm DBH (diameter at breast height) should remain as production forest, /2 and the recent cancellation by the President of six transmigration projects which are located in primary forest may be taken as an example of this growing awareness.

2. Should all areas with primary forest be avoided in the future? It is important to stem a potential over-reaction as the consequences would be impractical and equally lead to waste. In many areas, especially where roads have been built, spontaneous settlers encroach on and destroy the forest, mostly by shifting cultivation. Experience shows that once this process has started, it is practically impossible to stop. In such situations it is desirable that the process be given organized form leading to better utilization of land as well as timber.

/1 This paper is based on research conducted during the course of the transmigration review mission, October 1979. Cost calculations and appendices are available in the original report.

/2 It can be stated with next to 100% certainty that no primary forest in the Indonesian dry lowlands contains less than 50 cu m per ha of commercial species from 35 cm DBH and up (with the exception of some sparsely represented forest types such gelam (*Melaleuca*) on coastal plains and poor soils. Very often this is true even for the logged over stands, at least if the gross volume is considered. "Commercial" is a floating concept which, other factors left aside, will change with time.

DGF's Input of Data

3. In the argumentation for a national sustained yield forest policy DGF must be able to present information on location of forest, stand density, species composition, etc., for the areas in question. Such information is presently scarce, therefore together with other government agencies DGF will have to work out more specific criteria for area selection. Also to be considered is size of the forest areas, proportion of forested land in a given administrative unit or catchment area, location in relation to main transport routes and to forest industry centers and soil properties. The information needed for selection, and further on for project preparation, has to be collected and compiled separately in each case.

4. The data collection would have to be made in two steps. The first step would be an orientation survey with the main purpose of broadly outlining which areas in a given WPP could - following guidelines as mentioned - be alienated from the forest estate and which areas should as far as possible remain as production forest. The result would be presented to BAKOPTRANS and represent DGF's input in the selection process. In view of the usually limited time available the survey would have to be simple and based on existing information (aerial photos, personal experience of field staff). The second step would consist of a regular timber inventory to be made as part of the project preparation once a particular area had been selected. The purpose would be to provide a data base for (a) estimates of land clearing costs, (b) estimates of volumes and value of standing timber in areas to be cleared.

5. According to Bina Program, it would be possible to carry out an orientation survey of a given WPP in six weeks, drawing on aerial photos mostly from BAKOSURTANAL. The Sub-Directorate for data collecting and processing has 40 photointerpreters, some of whom could be assigned this type of job. The same Sub-Directorate is preparing for a nationwide forest inventory including land capability appraisal with assistance from F.A.O. The study of potential transmigration areas should be one of the priorities. Once this inventory gets started there would thus be little need for special orientation surveys for transmigration projects. As to the second step, it is estimated that, given certain support, DGF would be able to make a timber inventory of a particular WPP in three months with two-three teams, depending on area size, plus an additional month for compilation and reporting. At present 7-9 teams can be fielded from Bina Program.

Sources of Information on Forest Cover, Forest Types, Standing Stock and Species Composition.

6. DGF's Bina Program has experience in cooperating with BAKOSURTANAL to get access to aerial photos and satellite pictures, but apparently not with other possible sources of information. In view of the time constraint expanded cooperation with all useful agencies must be encouraged. Other sources of aerial photography are private companies prospecting for oil or minerals. BAKOSURTANAL is preparing a library of all known photography.

7. Most forest areas are under concession agreement. The standard agreement states that the concessionaire should have aerial photos taken of the area and make forest inventories for the annual operation plans. These duties are often neglected. Only very few concessions have aerial photos and the forest inventories made by the concessionaires are designed with Meranti logging in view. Oil prospecting companies have also covered the zones adjacent to the coast line with Side-Looking Radar imagery. As the scale is in about 1 to 1 million no information on the forest stand can be extracted. However, those images provide good information on the Macro topography in areas where the topographic mapping is incomplete.

8. The most serious bottleneck may not be the retrieval of photos and other basic information but interpretation and compiling. As mentioned, Bina Program has certain resources for this. At best, however, photo interpretation can give information about the general topography, location of forest stands and to some extent their relative density. This type of general information should be relatively easily available. For such parameters as standing stock and species composition time consuming data collection in the field is necessary.

DGF's Role in the Disposal of Wood and the Control of Market

General

9. DGF seeks to control the wood utilization through various regulations and taxes. The aim is of course to bring tax revenues to GOI but also to encourage increased domestic processing and reduced export of logs. DGF's resources for policing the adherence to issued laws and regulations are limited. One effect of this is that only timber actually utilized is liable to taxation and not the standing or gross volume. Thus increased utilization is not encouraged.

10. DGF does not actively take part in marketing or promotion of wood or wood based products, nor does any other GOI agency.

Regulations Concerning Felling of Trees in Concessions and Land Clearing Areas

11. Practically all forested land is now covered by timber concessions (HPH agreements) for which the law states that only trees with a DBH of 50 cm or above can be felled. Logs can, according to the laws now in force, be exported only by concession holders, and only if the diameter is above 50 cm. An exception of the latter respect is pulp wood with diameters between 10 and 30 cm, of which minor volumes are being exported.

12. With special reference to clear felling on land for transmigration projects an informal agreement has been reached between the Minister of Agriculture and Bina Marga that all trees with DBH of 35 cm and above should belong to the concessionaire. He can thus remove and use the timber of such trees provided that he pays the regular taxes. The same agreement says that

smaller trees, DBH between 20 and 35 cm, are the property of GOI, primarily for local needs such as house construction. The land clearing or housing contractor who makes use of such timber should equally pay tax to GOI.

13. The Minister of Agriculture has proposed to give priority to the concessionaire when a contract for clearing of an area within the concession is offered. Should the concessionaire turn down the offer it will go to any interested contractor. The latter may then work out an arrangement with the concessionaire for the export of some of the timber. Otherwise, it will have to be discharged on the local market, to the extent that is possible. In the case where the trees are left standing on individual lots to which transmigrants are given land use rights and later ownership no guidelines have as yet been laid down. Most likely the policy will be to allow the title holder to use the wood as he sees fit but charge customary taxes in the case of sale.

Regulations Concerning Production and Marketing of Timber and Timber Products

14. The aim of the regulations is threefold: (a) to avoid an oversupply on the world market, thereby maintaining a stable price level, (b) to encourage domestic processing and (c) to guarantee an adequate supply of wood to domestic industries and consumers at favorable prices.

15. The current national plan calls for a total log production of 32 m cu m of which 18 m may be exported as round wood. The total target for the concessions is set at 28 m cu m which leaves a margin of 4 m to be filled with timber from, for instance, land clearing operations.

16. Each individual concessionaire is given a maximum annual allowable cut (AAC) - depending on the productive area of the concession - and a maximum proportion of the AAC that can be exported in log form - depending on the number of years that the enterprise has been operating and subject to gradual reduction. The AAC is split up per species or species group according to the composition of the standing stock as revealed by forest inventories. Due to higher FOB price, and hence higher profit on Meranti when compared with other species groups the loggers seldom fill the quota of the latter.

17. The taxation policy purportedly aims at reducing this imbalance through a variable export tax per cubic meter according to species. This tax is presently 20% of the so-called check price on logs, 5% on sawn wood and none on plywood. The check price is meant to reflect the current market price but is usually lower and in particular this is the case for sinker species and so called lesser-known species. Production of the latter would thus be encouraged. But the incentive provided by this tax differentiation is not sufficient.

18. DGF has no power to enforce the filling of quota of non-Meranti species. The fact that a logging area is converted into a transmigration site will not change the economics significantly; the loggers should still be expected to show strong preference for Meranti. Furthermore, the difference in profitability is so big that a reduction of taxes on non-Meranti species will have little effect. An increase on the other hand, of taxes on Meranti is probably politically unfeasible at present (two years ago the export taxes on logs were raised from 10 to 20%).

Assessment and Comments

19. As mentioned the concession holder would be given the right to cut and use all trees from 35 cm and up once an area has been declared a transmigration site. He would be given 12 months to remove what he considers valuable. Furthermore, he would be given first priority to the land clearing - and road construction - contract. The latter means that he would be paid for building the roads he normally is paying for himself into an area he is going to log. Even without that component his log cost would be lower than normal as fixed costs are covered by a higher volume per ha.

20. The reason why GOI gives such privileges is probably that the concession holder should be compensated for "loss of land". It could be argued that the concession agreement only applies to the standing trees and not to the land. In the case of an already logged over area the concessionaire is, legally, not allowed to do any additional logging there for the next 35 years (which is the "rotation period" upon which AAC and management plans are based). Since the contract period is not more than 20 years, if such an area is set aside for transmigration the concessionaire does not lose anything. On the other hand, from the point of view of GOI the transfer of ownership of timber of diameters between 35 and 50 cm DBH to the concession holder seems counterproductive as the value of timber in that diameter range could possibly cover the transmigration project costs (a calculated example from Trans II indicates a cautious net value of such timber of about US\$1,350 per ha plus US\$800 in tax revenues. This value is however, highly dependent on marketing capacity).

21. The extent to which the concession holder will make use of his right to log all trees above 35 cm DBH and bring in tax revenues to the government depends on the market situation, the location in relation to transport routes and market and his own marketing skill. At present the concessionaires see little reason for dealing with non-Meranti species and possess insufficient information on the potential market for such species. To increase their export quota would thus be ineffective. DGF is not engaged in market research or promotion and is unable to assist in the disposal of the volumes of mixed species that will be generated from cleared areas. A common belief within DGF even seems to be that an increased outflow of mixed or lesser-known species on the South Sea log market would reduce the demand for and also the price on Meranti logs. This additional log flow would thus be harmful and it would be better to burn the logs.

Land ClearingLand Clearing Methods and Effects of Intensified Logging

22. In the projects presently being implemented or considered each family would be given 3.5 ha (dry land) of which perhaps 1.25 ha would be cleared prior to the family's arrival. The way in which this clearing should be done has been the subject of considerable discussion.

23. Mechanical land clearing with crawler tractors makes destumping and windrowing possible and thereby more complete burning and easier preparation of the land afterwards. On the negative side, it requires considerable capital investment and also causes damage to the soil through compaction and through "plowing down" of the top soil. Manual land clearing with chain saws, on the other hand, requires more labor and related support facilities, makes destumping and windrowing practically unfeasible and may also need longer time. An important advantage is that it leaves the top soil relatively intact. From the point of view of soils management it would thus seem that manual clearing is to be preferred.

24. However, one should also take into account the effects of intensified logging. If the ambition is to utilize and consequently remove every sound log plus a proportion of the defective ones, the consequence will still be considerable tractor traffic. To take an example from Kuamang Kuning in Trans II, an average of 26 trees or say 65 logs would have to be removed from each forested ha (includes presently commercial species only, not the lesser-known ones). Very likely about half the area would be passed over at least once by tractor and skidded logs, with the risk of soil damage as described above.

25. The conclusion seems to be that clear felling and log transport with conventional methods cannot be reconciled with good soil management.

26. Alternative logging methods /1 include:

- using machines with lower ground pressure
- winching the logs to a limited number of trails
- skidding the logs manually to truck or tractor trails (Kuda-kuda system)

However, all these methods have disadvantages and it seems that at present there is no reliable or tried-out alternative to the conventional logging with heavy equipment. It is also likely that this type of logging will prove to be harmful to soil conditions and crop yields.

/1 Alternative logging methods are discussed for example in M. Ross: Land Clearing for the Middle Mahakam Area Development Programme, (T.A.D.).

Who Should Do The Land Clearing?

27. From what is said above, it seems that the transmigrants, with certain organizational and material inputs, should do the land clearing themselves. Not only would this be better for the soil but it would also provide an income to the transmigrants (assuming that they would be allowed to sell the timber at market prices). A third advantage could be that the transmigrants would seek to arrange things in such a way that the time laps between clearing and cultivation would be short enough to prevent invasion of Imperata grass and other weeds.

28. If a certain area has to be cleared before the arrival of the transmigrant so that he has some farm land to begin with, the best solution seems to be to minimize this pre-cleared area.

29. The Minister of Agriculture has proposed to give priority to the concession holder when a contract for land clearing is offered within his area. A good reason for this is that the concession holder is on the spot with his equipment and knows the local conditions. The concessionaire may also be more conversant with the log market and able to make economic use of more of the logs than an ordinary civil works contractor. But to get best value out of the cleared forest GOI should select contractors with documented marketing ability. With regards to methods, equipment and soil management, the two categories are comparable.

Cost of Land Clearing

30. At present contractors charge an amount around US\$260 per ha for clearing of land. To this is added costs for construction of roads, bridges, etc. In return GOI receives a certain amount of royalty on timber. Royalties plus taxes could amount to US\$200-400 per ha. The latter figures, however, refer to total net volume whereas, with the present system, only utilized timber is subject to taxation. Through various forms of malpractice or due to sheer lack of supervising staff within DGF, the amount levied is reduced further so that the land clearing operation eventually causes a cost to GOI. Calculations indicate that the contractor could make a profit of at least US\$270 per ha plus avoided taxes by selling the timber. To this should then be added part of the land clearing cost above as a considerable part of the clearing work consists of removing the big timber.

MarketGeneral Trends

31. Over the last five to six years prices of logs and sawn wood on the export market have been fluctuating sharply but the general trend has been a marked increase. In the case of Meranti logs, the average price increase in US\$ has been in the order of 20%, inflation effects not deducted. The combination with a 50% devaluation has made the Indonesian producer very export oriented. This may in turn have resulted in a certain shortage of

wood on the domestic market. In any case, the prices also have risen sharply there. (The wholesale price index for nonoil export products consumed domestically has risen 120% from June 78 to June 79.)

X 32. In logging, the present world market prices and taxation regulations encourage the production of Meranti logs for export. The sawmills are thus mainly provided with export reject Meranti logs. At the same time the sawmill industry is operating well below capacity, perhaps at 50%. The presently high prices on sawnwood, both domestically and externally, encourage the sawmillers to produce more but they have difficulties in getting enough logs. Would it be possible to feed this industry with logs of mixed species and smaller diameters from land clearing areas? There would, no doubt, be some resistance as the profits would be less. In view of the limited experience among Indonesian sawmillers in general to deal with mixed species, they would find it difficult to sell the products on the export market. A slightly reduced price on the domestic market where the physical needs are undeniable, motivated by a better capacity utilization, would most likely allow increased sales of sawnwood of mixed species and contribute to the country's development. The situation is further complicated by the fact that if Indonesia, by far the biggest supplier of South Sea logs, decides to reduce its log export, the price per cu m of export Meranti logs will again increase and make loggers even more biased towards that species.

The Market for Products from Land Clearing Areas

33. Rattan is of increasing importance and some is used for production and it has been suggested that in land clearing operations the laborers doing the job should be allowed to gather the rattan as an extra incentive (normally a special license from DGF is needed).

The Market for Products from Land Clearing Areas

34. Other so called Minor Forest Products such as latex, resin, oil or medicinal herbs seem to be of small importance. In general transmigrants are not familiar with how to gather or how to use them.

35. Fuelwood for cooking has no market in the areas visited due to abundant supply. Fuelwood for production of lime, bricks and clay tiles can be sold in limited areas where suitable clay or lime is found and where there is a sufficient market for the product. However, sales of this product will not contribute significantly to the disposal of wood.

36. Fuelwood for generating gas or for firing steam engines is a topic now under discussion. Competition from the strongly subsidized ^{/1} petroleum based fuels makes such alternatives unattractive at present. The cost of diesel oil and kerosene in remote areas is about Rp 40 per l. In short the present price relations are such that this form of energy generation is much too costly even if the wood is free.

37. Smallwood for charcoal would be available in large volumes. The cost of charcoal produced in stationary brick kilns on land clearing areas has been estimated at less than US\$30 per ton delivered at sea port in 20 kg plastic bags. The local demand for charcoal is very low, again due to the low cost of petroleum products. No export of charcoal seems to be taking place, and enquiries in Singapore gave the answer that no significant trade in charcoal takes place or passes through there.

38. Wooden shakes for roofing is a specialized product with good prospects. The production is entirely manual using simple hand tools. Prospects are good for transmigrants to develop a simple cottage industry producing wooden shakes and selling to nearby towns.

39. Transmission Poles. The program of rural electrification is proceeding in Java and has recently begun in Sumatra. Only poles made of steel pipes are being used. However, the agency responsible for procurement informs that consultants are working out specifications for preservation treated poles (Cu-Cr-As). The average length of poles used for lateral lines in rural areas is 9 m with 8 m as minimum. Technically, there would be no difficulty in producing such poles from small diameter trees (25-40 cm DBH) of mixed species in areas that are being clear felled. The preparation involves manual labor for debarking and shaping. Transport to roadside can be done manually or with buffalos. (The weight per piece rarely exceeds 900 kg). Trans II would be a very convenient area for this type of production as a high-standard road goes through the area.

40. Small diameter logs for Pulp Production have a limited market only. Perhaps 200,000 cu m are exported annually. No pulp mill using this type of raw material exists within the country.

^{/1} The T.A.D. project in Samarinda is preparing for field trials with a gas generator and a steam engine. The cost of the machinery for production of electricity from wood via a gas generator and a piston engine is about US\$35,000 for an output of 22 kw. A 20 hp/15 kw steam engine produced in the USA costs about US\$11,000 (including boiler FOB US port, without electric generator. A new 80 hp diesel engine costs about US\$2,000 in for instance Palembang (equally without generator).

41. Logs of lesser-known or mixed species form the main part of the remaining stand after logging. In contrast to the types of products dealt with above such logs could only with considerable support be produced and marketed by transmigrants. The market for and the interest in lesser-known species in Indonesia is still small as has been elaborated above. Several sources claim that large quantities can be sold without difficulties to Singapore, Taiwan and Japan. One condition, apart from export permit, is that sufficiently large volumes can be accumulated, at least 1,000 and preferably 4-6,000 cu m of logs per shipment of similar characteristics with respect to color, hardness, etc. This is no problem for a big company but creates difficulties for a land clearing contractor and of course even more so for individual transmigrants.

42. Sawwood for transmigrants' housing is often referred to as an important outlet but is insignificant in terms of volume. A standard house requires about 5 cu m of sawwood or 10 cu m of logs. Per ha this means less than 3 cu m to be taken from the volume of trees with DBH between 20 and 35 cu. The volumes in this diameter range are not recorded in normal forest surveys but should be expected to be at least 20 cu m net per ha.

Conclusions

43. Two types of conclusions emerge from the above.

- (a) Considerable volumes of timber can be sold at profit from land clearing areas, the extent depending not only on location and routes to market but also on the skill of the land clearing contractor. As a consequence GOI should reconsider the concept of giving priority to the concession holder and instead turn to contractors with a documented capacity to market the timber.

One way of doing this would be to impose a royalty on the standing volume of areas to be clean cleared, in which case only contractors who could make use of the timber would be interested. This would generate a capital flow benefiting the public as well as the private sectors. Another way could be to estimate, from case to case, the value of the standing timber assuming good marketing ability, and balance this against the cost of clearing, road construction, etc., plus a reasonable profit. In case of negative balance GOI should pay this, otherwise, profits from the timber sales should be compensation enough.

- (b) Although transmigrants can produce and sell many types of forest products (sale to travelling agents at roadside) the main part of the standing volume will require special arrangements for economic utilization. The "lesser-known" species can be sold only in the form of logs and to buyers who want big volumes.

The Transmigrant and His Forest ResourceGeneral

44. Once the transmigrant has been given land use right, he is to be considered the owner of the trees on the land. In the projects visited, however, the transmigrants were not informed about the location of their land apart from parcels already cleared or block planted.

45. In theory this forested portion would contain all trees with DBH below 35 cm plus a number of bigger trees of species that the concessionaire has not found useful. In reality the situation will vary according to the circumstances. The Rimbobujang area can be taken as one extreme where the concessionaire has not had the time to take out all that he might use. The other extreme is illustrated in Baturaja where the forest stand was poor from the beginning and where the land clearing contractor is cutting whatever has a commercial value before the land is divided into individual lots. A similar situation would be reached in areas close to markets and operated by concession holders and land clearing contractors with good marketing abilities.

Areas With Poor Remaining Forest Stand (example Baturaja)

46. As practically no trees of commercial value remain the additional income that transmigrants can generate by selling wood or wood products is negligible. The only obtainable commodity is fuelwood which normally commands such a low price that production hardly is worthwhile.

47. From the transmigrant's point of view, the land clearing is only an "investment" that consumes his labor and other resources. At the same time it can be argued that the removal of the remaining small trees does not require special equipment, nor much of special skill. In the worst case, the land could have been criss-crossed by heavy equipment causing damage to the soil. Of interest in that situation is to what extent small trees and invading bushes can contribute to a restoration of the porosity of the top soil. If that is the case, the transmigrant should of course be encouraged to leave the most damaged spots for some time.

Areas Where Trees of Lesser-known Species Have Been Left

48. In this case the work load will be considerable as trees with DBH of 1 m or more may occur. To illustrate the situation, a theoretical example has been worked out. The conclusion is that the forest can provide a substantial extra income (at least Rp 210,000 and possibly 275,000). The delivery of marketable products would require about 85 mandays (income per man-day about Rp. 2,800) assuming that chainsaws are available.

49. Another and more crucial assumption is that an agent/buyer is at hand to take care of logs of lesser-known species. If the assumptions are reasonably correct one can further conclude that it will be quite possible for the transmigrant to do the clearing of 2.25 ha and that he could even clear more, if the area clean cleared before his arrival would be reduced. Again, however, the chainsaw is an important facility without which the total labor consumption would be about double.

Areas Where Also Considerable Volumes of Commercial Timber Have Been Left (example Rimbobujang)

50. Due to more standing stock the total income could reach Rp 650,000 with a labor input of 190 mandays. Due to higher proportion of valuable timber, the income per day would be as much as 40% higher than in the alternative above (Rp 4,000 per manday).

51. It is difficult to say in which proportions the three alternatives dealt with here will occur in the future. As the timber market develops and loggers and sawmillers get organized it is reasonable to assume that the situation in which lesser known species are left will prevail with a trend towards the more exploited situation described for Bat~~ur~~aja.

Assistance to Transmigrants for Felling and Processing of Timber

52. The first step must be to inform the transmigrant about the location of his land so that he can cut the trees or protect them till a suitable time. The second step would be to give the transmigrant objective information about the value of the timber and training in felling, maintenance of tools, etc.

53. All the operations in question can be done with simple hand tools but the use of chainsaws will almost double the overall productivity. Depending on stand density one saw will be needed for every 10-15 families. To use contractors who may charge Rp 10-12,000 per day for chainsaw with operator is a possibility. Such contractors already exist to some extent and they would probably be able to find or train additional operators if there were a demand. The transmigrants would then pay in kind, knowing the value of the product. The alternative would be collectively owned saws under the village associations. With the limited experience in such arrangements among the transmigrants, this would be more complicated.

54. For the conversion of logs or flitches to boards, chainsaws are sometimes used. This should not be encouraged, however, as the method is hazardous and also wasteful. Manual sawing (thin blade mounted in a frame) or milling in simple mobile sawmills is to be preferred.

55. Sawing into boards for the local market adds considerable value. Smallmills are reported from several transmigrant villages but arrangements concerning ownership or distribution of profits are not known. As one unit would be sufficient for one village and as the unit is relatively stationary and thus easy to supervise, cooperative management might be a feasible solution in this case.

Marketing of Lesser Known Species

56. The peculiarities of this species group have been dealt with previously. Big volumes would have to be accumulated for export. This could only be done by specialized agents, perhaps logging companies. These agents would have to develop a system for cooperation with the transmigrants.

57. The transmigrant must be informed that in order to make his logs valuable, he must accumulate at least a truck load (8 to 10 cu m in the case of a San Tai Wong). When he feels ready to cut this volume, he would have to take two steps: (a) contact a chainsaw contractor to fix a date; and (b) inform a contact man, for instance the village chief, about the date. The contact would forward the information to the agent and get a go-signal if the agent's transport resources permit. To accumulate bigger volumes but also to assist each other in the manual work and to make best use of truck trails neighbors should be encouraged to cooperate in felling, skidding and lay-out of trails.

58. When the logs that can be skidded manually have been brought to truck trail, the agent should again be informed. If he cannot pick-up the logs immediately, they would have to be sprayed with insecticide and S-hooks would have to be clamped into the ends to prevent cracking. This can be done by the transmigrants if the agent provides the equipment through the village chief. The agent would need a special storage place near to loading point with facilities for sprinkling the logs with water to prevent decay, while sufficient volumes are being accumulated.

59. To get this new type of activity started, credits to agents would probably be necessary. To justify such credits a proper market survey would have to be done and if possible contracts with buyers signed or at least negotiated preliminarily. These preliminary activities should be undertaken under supervision from DGF as it would contribute to a better understanding within that agency of markets and marketing questions.

60. In their report "Land Clearing and Waste Wood Use Proposals for NES III, Rimbobujang", M.S. Ross and Sarsito (T.A.D.) estimate the investment in logging machinery for skidding, trucking and barging of 320,000 cu m per year from the project site to Jambi at about US\$7 million. This amount includes costs for crawler tractors, skidders and loaders. By using the more versatile and much cheaper San Tai Wong, the amount could be reduced considerably. Finally, the size of investment will of course depend on the volume found marketable.

Conclusion

61. As can be seen in Rimbobujang, the transmigrants can, with their own resources and through spontaneously developing marketing channels, produce and sell boards and fitches of Meranti species. In this particular case, the

nearness to a strong local market as well as the export market provides very attractive economic incentives (the fitches are resawn for export with a FOB price in the order of US\$225 per cu m of which about 25% goes back to the transmigrant).

62. In the case of lesser-known species and in areas with less access to markets, there is no guarantee that a parallel development will take place. To assure a full utilization of the timber and additional income to the transmigrants a system for collecting and marketing has to be built-up, possibly by means of credits to agents.

Potential Wood Flow from Transmigration Areas

63. The DGF claims that the flow of timber from land clearing areas will be big enough to cause disturbances on the South Sea log market. DGF's concern is explained by the fact that it does not have the power to instruct loggers to reduce their annual cut. In fact the AAC is given once and for all in the HPH agreement.

64. The concessionaires who are affected by transmigration projects can be asked to relocate their operations to areas that are going to be cleared while maintaining their total logging volume. However, such arrangements will change the species composition of the cut towards a lower proportion of Meranti and consequently towards a lower profit.

65. Simple estimates indicate that Trans II and III alone will create a log flow in the order of 7 to 8% of the present national logging target. DGF's concern that the log market will be upset may not be fully justified, however, as only some 25% of this volume will consist of Meranti. The remaining part will be a species mixture, some of which can be consumed locally and some exported to specialized buyers. This export market, it is felt, is rather independent of the Meranti market and consequently an increased supply of mixed species should not affect the prices on Meranti. If, on the other hand, the Meranti logging volume is to be maintained at today's level, the handling of the additional volumes from land clearing areas will require new investments in logging equipment, storing and loading facilities, etc. Full utilization of the mixed species will further require installation of new sawmills closer to the log source and more adapted to the local market. Private companies seem to be interested in doing this but need time. It is also essential to prepare the marketing routes, domestic as well as foreign.

Conclusion and Recommendations

66. Within the Government administration, the Ministry of Environment and DGF are the agencies who represent the interests of forest protection. Obviously DGF alone could argue from a standpoint of forestry economics and sustained timber production, but so far it seems to have been playing only a minor role. To be better prepared, DGF needs better information on the National Forest Resource - a national forest survey is under preparation -

and a set of criteria as to what forest areas could be alienated from the forest estate. Until DGF has formed at least a preliminary policy on these matters and has surveyed ways of disposing of the timber from cleared areas no large program of transmigration into forested areas should be embarked upon./1

67. Projects located in forested areas and already initiated or decided upon must of course be pursued. DGF should be encouraged to contribute with orientation surveys and data for the detailed planning. In so doing it should also strengthen its channels to BAKOPTRANS.

68. The reason given for locating projects in forested areas and not on open areas is often that in the latter there are ownership claims. With the present system project preparation and land clearing in forested areas could cause additional costs that might exceed the cost of compensating claimants.

69. At present DGF has no means of contributing to a full utilization of the timber resource. Taxes are levied only on utilized timber. DGF should be approached with a proposal for assistance by competent marketing specialists in a survey of the market for lesser known species. The purpose of the survey would be to identify potential buyers, to assess the market value and to determine the interrelationship between the markets for Meranti and lesser-known species. With the results at hand DGF could establish a reasonable level of royalty and export taxes on the standing gross volume of timber in land clearing areas. No bid for clearing below this level should be considered. This type of royalty would not only generate added income to GOI but also serve as an incentive to better timber utilization. PTPT should cooperate in this matter by only considering land clearing contractors with a documented ability in marketing. If such contractors cannot be found within the country, foreign firms should be invited to participate in order to "break the ice" and open channels to the markets for lesser known or less profitable species.

70. Two policy decisions concerning ownership of wood should be made by the Government. The Ministry of Agriculture has agreed informally that when a forested area has been designated for transmigration the concessionaire should be given the ownership of all trees down to 35 cm DBH compared to 50 cm under the normal concession agreement. It is understandable that the Government wants to maintain confidence among investors. However, by an arrangement where the concession holder is given 12 months notice, and preferably more, to log the area in the normal way or go back to what remains above 50 cm DBH, the concession holder would lose practically nothing. The value of the timber less than 50 cm DBH should be credited to the project as this value

/1 This conclusion is underlined by the fact that the export value of timber and timber products has been rising steadily since large scale forest exploitation started in Indonesia.

would not have accrued had the project not been initiated. At the same time the Government would retain a bigger volume on which to levy the above mentioned royalty (minimum bid).

71. The second desirable decision regards the distribution of timber and the benefits derived, between contractors and transmigrants. (As all timber is assumed to be subject to taxation, the Government's share remains constant.) It has been shown that cutting and selling of timber can give a very substantial extra income to transmigrants in forested areas. If this is found desirable - it can be said to be unfair vis-a-vis transmigrants settling in unforested areas - certain measures should be taken as a consequence. Such measures include (a) the early demarcation of individual lots to allow the transmigrant to protect this property; (b) building up of commercial ventures which can buy and market the transmigrants' timber products; (c) instructing the transmigrant on the value of such products, in tool maintenance, etc.; and (d) assistance in installing cooperatively owned small circular sawmills. Without proper demarcation, the other measures might encourage encroachment into forest reserves or neighboring concessions.

72. In order to minimize soil disturbance as much of the logging and land clearing as possible should be done manually and can probably be done best and cheapest by the transmigrants themselves.

73. In view of the market prospects and the standing stock in the project areas presently considered (Trans II & III) there appears to be no reason for GOI to pay for mechanical clearing, rather it should get paid by the contractor for the timber sold (minimum payment equal to the royalty and taxes mentioned above). If DGF or GOI should show reluctance to the market survey for lesser-known species proposed above or to the concept that land clearing in timber forest should bring a net income, the Bank should stay away from transmigration projects in forested areas until questions concerning costs, timber value, etc., have been further clarified.

74. To make sure that timber produced by the transmigrants finds its way to the market, thus generating incomes to the transmigrants as well as to GOI, special ventures for handling and marketing of especially lesser known species would have to be set up. If needed such ventures should be provided with credits (for equipment, storage facilities, etc.) to guarantee an early start-up. Such ventures would contribute to a smooth adaptation to the considerably increased flow of timber of lesser-known species. The spontaneous production of timber by transmigrants that can at present be observed in some areas deals only with well-known species or about 30% of the total volume.

The Organization and Functions of the Directorate for
Urban and Regional Planning (TKTD)
(Andrew A. MacMillan, FAO Cooperative Program)

General Functions, Organization, Staff and Budget

1. TKTD is a Directorate within the Directorate General of Housing, Building, Planning and Urban Development (Cipta Karya), itself part of the Ministry of Public Works. As its name implies, TKTD has responsibility for urban and regional planning and its organizational structure reflects these purposes - with subdirectorates responsible for:

- regional planning at the national level;
- regional planning (within regions);
- detailed design; and
- technical support for planning (e.g., mapping).

2. As a result of Decree 26 of 1978, TKTD has also assumed responsibility for physical planning for the transmigration program, a role which had been temporarily filled by PTPT but one previously handled by DGT. No structural changes have been made to cater for this additional responsibility but staff of each of the subdirectorates have been mobilized for transmigration-related work under the leadership of the Subdirectorate for National Regional Planning. No senior staff work full-time on transmigration. High priority, however, is given to transmigration planning and a major proportion of staff time is currently spent on it, probably to the detriment of TKTD's other functions.

3. TKTD staff totals 397 of whom 157 are university trained (123 technical, 34 nontechnical). Most senior staff are stationed in Jakarta but the Directorate is aiming to build up its provincial organization and to involve these in transmigration planning: eleven of the 22 provincial offices so far established are considered to be operating competently but until now have not been involved in transmigration-related activities, beyond assembling locally available data as a planning input. All subdirectors report difficulties in filling vacancies with well-qualified senior technical staff. Consequently much work is contracted to consulting companies.

4. TKTD's 1979/80 budget is approximately Rp 5.6 billion, of which Rp 3.5 billion (62.5%) is for transmigration planning. The largest item (Rp 1,344 billion) is for 1:5,000 mapping and planning. The 1980/81 draft budget request calls for resources totalling Rp 13.75 billion, but this is likely to increase substantially once the expected work load has been reviewed in detail.

Transmigration Planning

Standard Procedures

5. TKTD aims to approach physical planning for transmigration at three levels:

- Long-term regional planning, involving the definition of regions (WPPs) in which there appears (according to existing data) to be a potential for transmigration.
- Outline planning, designed to identify within selected WPPs those areas capable of absorbing transmigrants: each unit with an estimated capacity for 2,000 transmigrant families is designated as an SKP and an outline plan (scale 1:20,000) is prepared, generally on the basis of data already available within the Ministry of Public Works (e.g., existing aerial photography, regional development studies, irrigation and road network long-term plans), but also taking into account available information on land use (from Agraria) and forest reserves. It is TKTD's aim to make checks to confirm the feasibility of the outline plan.
- Detailed mapping and design for upland transmigration sites is to be carried out in 208 SKPs for the Repelita III program. Standard procedures call for preparation of:
 - 1:20,000 aerial photography and controlled photomosaic;
 - 1:5,000 topographic and slope maps, derived from field surveys;
 - 1:20,000 land use map (based on 1:20,000 photography); and
 - 1:50,000 soil map based on land evaluation survey.

On the basis of these maps and using standard criteria on village layout, holding size, cropping pattern, social infrastructure, etc., detailed designs are to be prepared for the settlement and road network. Contract documents are prepared on the basis of quantities derived from these detailed designs.

6. General responsibility for each level of planning is assigned to different subdirectorates within TKTD: the Subdirectorate for National Regional Planning defines WPPs, while the Subdirectorate for Regional Planning

is responsible for outline planning and the definition of SKPs: detailed design is carried out by the Subdirectorate for Detailed Planning. Basic data, training support and cartographic services are supplied to all sub-directorates by the Subdirectorate for Technical Services. Most TKTD staff occupy a substantial part of their time on transmigration-related work, although most mapping and design work is subcontracted to consulting firms.

Actual Procedures

7. In practice, because of the urgency associated with meeting transmigration targets, TKTD has had to improvise over the past year in its approaches both to WPP definition and to outline and detailed planning, and has been unable to adopt the standards which it has set itself.

8. WPP Selection. When TKTD was assigned responsibility for physical planning for transmigration it identified broad areas with an apparent capacity to absorb substantial numbers of transmigrants. Criteria for ranking these WPPs were derived from estimates of the available cultivable area, population density (less than 50 per sq km) and present and future accessibility: in this assessment flatness of topography was used as a proxy for land capability. Boundaries of WPPs were related principally to accessibility and to distance from designated growth poles, and did not take specific account of administrative boundaries or geographical features. In preparing a list of 63 priority WPPs for consideration of BAKOPTRANS in March 1979, TKTD had no access to the alternative DGT proposals for priority transmigration sites for Repelita III selected according to different criteria and reflecting the proposals of provincial authorities. Indeed the concept of WPPs and the criteria for their definition were not acceptable to BAKOPTRANS members other than those representing the Ministry of Public Works.

9. DGT submitted a revised proposal to TKTD in August for priority sites for the settlement of 500,000 families under Repelita III, which was subsequently assessed against TKTD's WPP selection criteria, leading to a third proposal presented for BAKOPTRANS consideration. This in turn proved unacceptable to all parties and a further compromise list was prepared by TKTD for BAKOPTRANS in October. This list includes both TKTD and DGT proposals and gives less prominence to the WPP concept and more to the identification of specific sites.

10. Although no final decision had been taken by October 1979 on the total Five-Year Plan or on the respective roles of national and foreign finance in implementing it, this has not yet unduly delayed more detailed planning activities. Few changes have been introduced into the selection of WPPs for inclusion in the 1979/80 and 1980/81 planning program.

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13. Except in the case of possible sites for Transmigration III, there has been no field checking of SKP outline plans. Inaccuracies which might have been avoided by flying over identified SKPs have led to 3 of the 7 outline plans being returned to their designers on the grounds that they are unsuitable as a basis for detailed planning.

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- areas much larger than those eventually selected for settlement have been subjected to detailed mapping and SKP boundaries have been shifted;

- topographical mapping standards have frequently been poor; and
- settlement designs based on poor maps cannot realistically be used for project implementation.

15. TKTD is using expatriate assistance supplied by the World Bank to improve mapping standards.

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Staff Requirements and Costs

17. TKTD estimates that it will need to mobilize 322 technical staff for work in teams responsible for supervising planning activities in 35 WPPs in 1980/81. Latest internal estimates suggest that they can mobilize 132 existing staff (including 65 from provincial planning units) for this task. Total technical manpower needs (including those to be met by consulting firms) for 1980/81 are estimated as follows:

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| - Field surveyors | 2,688 |
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| - Soil scientists/land classifiers | 13 |
| - Land use specialists | 13 |
| - Road engineers | 121 |
| - Physical planners | 96 |
| - Regional planners | 13 |

18. It does not appear that these estimates include staff required for land capability surveys (estimated by the Soils Research Institute to require about 11 persons per 40,000 ha per year).

19. The lapsed time between outline planning initiation and completion of tender documents is sensitive to the number of persons mobilized and particularly the time required to have aerial photography carried out and base maps prepared. Using current TKTD procedures and specific approved methods it is unlikely to be less than 18 months.

20. Costs of each operation are difficult to define with precision but appear to be approximately as follows for land under forest:

- Preparation of 1:20,000 semicontrolled photomaps:
 - Rp 1,800 per ha (equivalent to approximately Rp 4,000-5,000 per ha eventually settled).
- Preparation of 1:5,000 topographical maps:
 - Rp 4,000 - 5,000 per ha (equivalent to approximately Rp 6,000 - 7,000 per ha settled).
- Preparation of land evaluation maps (by Soil Research Institute, Bogor):
 - Rp 3,000 - 4,000 per ha (Rp 6,000 per ha settled).
- Preparation of village designs:
 - Rp 3,000 per ha settled.

21. Total survey and planning costs (excluding land use mapping and land titling) would thus amount to about Rp 20,000 (US\$32) per ha or Rp 70,000 (US\$112) per family settled. In the case of Transmigration II these costs have been exceeded because of overruns.

Assessment

22. TKTD staff have responded heroically to the challenge set by the Government Repelita III targets and, in spite of their complete lack of experience in rural resettlement planning, have devised a planning methodology which, in general, is appropriate to the definition of priority areas for transmigration and for the physical planning of specific projects. The current problems faced by TKTD in recruiting qualified staff, and the poor standards of work prepared by consultants suggest, however, that, if the present organizational arrangements and standards are maintained, it will not be possible to meet Repelita III targets.

23. A review of the main factors influencing the capacity for physical planning for transmigration is presented below.

Organizational Arrangements

24. Capacities for physical planning will be influenced by the extent to which:

- the internal organization of TKTD facilitates full-time concentration of staff on transmigration planning;

- TKTD is able to mobilize competent consulting firms to assume part of the work load; and
- linkages between TKTD and other agencies result in productive collaboration, reduced duplication of effort and speedy communication.

25. TKTD Internal Organization. Transmigration was added to TKTD's functions after its internal organization had been established. Current arrangements (involving the part-time use of large number of staff from various subdirectorates) have been appropriate as a means of mobilizing existing staff but now require institutionalization to prevent transmigration planning detracting from the capacity of TKTD to fulfill its other functions (regional and town planning), and to ensure full-time concentrated attention is given to transmigration planning.

26. It is suggested that staff working principally on transmigration planning be regrouped into a single subdirectorate, to be established, at least initially, in TKTD. This would have the added advantage of permitting a smoother flow of materials through the various phases of planning than is currently possible, and would increase the capacity of TKTD to absorb technical assistance to substitute for local staff shortages. It would also simplify budgetary processes.

27. Should this approach not be feasible, consideration should be given to their measures, such as the establishment of transmigration sections in each concerned subdirectorate, to which staff would be assigned full-time to work on transmigration. This alternative, however, would fail to ensure the full-time senior staff direction which is believed necessary.

28. TKTD is actively considering assigning multidisciplinary physical planning teams to work in each province where there is a transmigration potential. If adequate numbers of staff can be recruited and if TKTD at the center can provide sufficient technical guidance and logistic support, this approach can be expected to increase physical planning capacity significantly.

29. Subcontracting and Technical Assistance. While TKTD has sought to subcontract most mapping and design work to consulting firms, the capacity of local companies to deliver work of satisfactory standards in the time allotted has been proven very limited. As a result TKTD has had to provide unusually heavy supervision to ensure standards and frequently to use its own staff to redo work which contractors have failed to complete. Lack of experienced staff in TKTD has also limited the success of this course and it is possible that the "plan as you proceed" approach to project implementation pioneered by PTPT may have to be applied on TKTD-designed sites in 1980/81.

30. Complicated procedures have made it difficult for TKTD to engage foreign consultants.

31. An assessment must be made as to the extent to which the personnel necessary for planning can be supplied from local sources or must be recruited abroad.^{/1} Subsequently it will be necessary to decide on the balance between TKTD staff, local consultants and foreign consultants. If TKTD limits its role to supervising consultants it would require about 35 technical staff (1 per 12 contracts per year) and a strengthened contracting section. On the other hand there is probably a case for some direct involvement in mapping and planning as a means of developing new methodologies.

32. If external consultant assistance is found essential it will be necessary to decide where this should be concentrated. Options are:

Purposes

- | | |
|-----------------------------|---|
| - In TKTD: | - staff training; - development of methodology; - supervision of consultants; - mapping and planning |
| - In training institutions: | - increasing supply of trained surveyors and physical planners |
| - In consulting sector: | - mapping and planning |

33. Because of the pressure imposed by ongoing planning commitments and because of the lack of a discrete unit for transmigration planning, TKTD's current capacity to use external consultants in a training and advisory capacity is limited. Small groups (maximum 4 persons each) could possibly be absorbed to provide technical assistance for preliminary screening of sites ^{/2} and to assist in reviewing maps and designs prepared by consultants, as well as in staff training. If provincial planning teams are set up, this could increase the institution's capacity to absorb additional technical assistance.

34. Before recommendations can be made for increasing training capacities for physical planning and surveying it would be necessary to assess demand and the capacities of existing institutions.

35. Given the current regulations for the prequalification of consulting firms there is a danger that the least qualified might be selected for mapping and design work. Selection procedures may have to be revised to take full advantage of local consulting capacities, but it is expected that, at least for the next few years, reputable foreign consulting firms will have to be invited to participate.

^{/1} See "Staff Requirements" below (para. 48).

^{/2} UK Government assistance is under consideration for this.

36. Interagency Coordination. Difficulties of arriving at an operational interpretation of Decree 26/1978 have led to the following problems:

- lack of definition of responsibilities for integrating physical plans within the context of feasibility studies;
- assignment of total responsibility for mapping and physical planning to TKTD without establishing a means of mobilizing existing capacities and staff in DGT, Agraria and universities for this work;
- lack of involvement of provincial and local authorities in selection of priority zones for transmigration and consequently the need to develop a very large planning capacity in Jakarta; and
- duplication of activities between agencies (e.g., TKTD, Agraria, LTP each are responsible for preparing base maps for survey work within their field of responsibility).

37. The current arrangements for interagency collaboration on planning are also characterized by a lack of free and regular dialogue at the technical level on a wide range of issues affecting the design of transmigration projects - a problem exacerbated by a growing resentment within the "rural" agencies at the assertive role assumed by the Ministry of Public Works. The result is that either issues are insufficiently discussed or are elevated to the level of the Inter-Agency Coordinating Council (BAKOPTRANS).

38. While BAKOPTRANS provides the formal means of achieving interagency coordination, there appears to be a need to expand arrangements for collaboration at the technical and operational level. The "Technical Team" has proven effective (though slow) as a means of promoting interagency consensus on the selection of priority settlement areas and consideration might usefully be given to establishing a larger number of "technical teams" to work on specific subjects, under leadership of Junior Ministry staff. Some such teams could be temporary, set up with the specific purpose of examining and formulating recommendations for treatment of restricted subjects (e.g., survey methods, village layouts, farm models, etc.).

39. There is definitely a need to establish mechanisms for more direct and regular contact between agencies on such matters as:

- information gathering, storage and transfer (e.g., to define roles of various agencies in commissioning and interpreting aerial photography: to ensure uniformity of base maps used in topographical, soil, land use and forest surveys, etc.);
- settlement design criteria; and

- degree of physical planning necessary for alternative intensities of agricultural development.

40. The prospects of securing improved coordination between agencies involved in planning and surveys are remote until a Government decision is taken on which agency should be responsible for coordinating planning, an issue on which Decree 26/1978 is far from clear. There would appear to be advantages in assigning this to the Junior Ministry for Transmigration which could delegate it to DGT in its secretariat role. Whichever institution is assigned this responsibility, however, must establish its credibility by detaching itself from its narrower role in project implementation, and must be given the staff capability to carry out the work.

41. There is an equally urgent need to identify mechanisms for mobilizing qualified physical planning staff attached to agencies other than TKTD to supplement their stretched resources. Sources include DGT and Agraria, in addition to PTPT which is already committed to assigning planning staff to TKTD.

Mapping and Design Methods

42. Opportunities appear to exist for increasing TKTD's planning capacity by introducing changes into the methodology being followed for mapping and settlement design. Currently TKTD seeks to apply a uniform methodology, assuming the need to plan for a more or less uniform type of settlement and system of agriculture. While the application of a single set of standards to planning simplifies the task it may lead in some cases to unnecessarily detailed surveys with commensurately high costs and, more seriously, to an underutilization of the land resources to be developed. Furthermore, insistence by TKTD on a single model has tended to alienate agencies supporting alternative - and possibly equally good - models.

43. TKTD standard mapping and planning methods are determined by the Government's aim to prepare site development plans which identify with precision each settler's house lot and farm holding, with the holding divided into separate blocks according to slope category. The policy that each farm should have at least 2.0 ha of food crops on lands of less than 8% slope, lying within 2.5 km of nucleated villages, has made it necessary to carry out highly detailed topographical surveys for all land in each SKP. Because the definition of probable SKP boundaries is based on a limited desk review of only part of the data available, detailed surveys are carried out over much larger areas than are eventually identified as being suitable for development under the standard agricultural model.

44. Highly detailed planning has also been justified (at least in the case of Transmigration II) on the grounds that high caliber on-site management is difficult to attain and that detailed specifications are required for preparation of tender documents, particularly for mechanical land clearing.

The Organization and Functions of the Directorate for
Urban and Regional Planning (TKTD)
(Andrew A. MacMillan, FAO Cooperative Program)

General Functions, Organization, Staff and Budget

1. TKTD is a Directorate within the Directorate General of Housing, Building, Planning and Urban Development (Cipta Karya), itself part of the Ministry of Public Works. As its name implies, TKTD has responsibility for urban and regional planning and its organizational structure reflects these purposes - with subdirectorates responsible for:

- regional planning at the national level;
- regional planning (within regions);
- detailed design; and
- technical support for planning (e.g., mapping).

2. As a result of Decree 26 of 1978, TKTD has also assumed responsibility for physical planning for the transmigration program, a role which had been temporarily filled by PTPT but one previously handled by DGT. No structural changes have been made to cater for this additional responsibility but staff of each of the subdirectorates have been mobilized for transmigration-related work under the leadership of the Subdirectorate for National Regional Planning. No senior staff work full-time on transmigration. High priority, however, is given to transmigration planning and a major proportion of staff time is currently spent on it, probably to the detriment of TKTD's other functions.

3. TKTD staff totals 397 of whom 157 are university trained (123 technical, 34 nontechnical). Most senior staff are stationed in Jakarta but the Directorate is aiming to build up its provincial organization and to involve these in transmigration planning: eleven of the 22 provincial offices so far established are considered to be operating competently but until now have not been involved in transmigration-related activities, beyond assembling locally available data as a planning input. All subdirectors report difficulties in filling vacancies with well-qualified senior technical staff. Consequently much work is contracted to consulting companies.

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7. In practice, because of the urgency associated with meeting transmigration targets, TKTD has had to improvise over the past year in its approaches both to WPP definition and to outline and detailed planning, and has been unable to adopt the standards which it has set itself.

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26. It is suggested that staff working principally on transmigration planning be regrouped into a single subdirectorate, to be established, at least initially, in TKTD. This would have the added advantage of permitting a smoother flow of materials through the various phases of planning than is currently possible, and would increase the capacity of TKTD to absorb technical assistance to substitute for local staff shortages. It would also simplify budgetary processes.

27. Should this approach not be feasible, consideration should be given to their measures, such as the establishment of transmigration sections in each concerned subdirectorate, to which staff would be assigned full-time to work on transmigration. This alternative, however, would fail to ensure the full-time senior staff direction which is believed necessary.

28. TKTD is actively considering assigning multidisciplinary physical planning teams to work in each province where there is a transmigration potential. If adequate numbers of staff can be recruited and if TKTD at the center can provide sufficient technical guidance and logistic support, this approach can be expected to increase physical planning capacity significantly.

29. Subcontracting and Technical Assistance. While TKTD has sought to subcontract most mapping and design work to consulting firms, the capacity of local companies to deliver work of satisfactory standards in the time allotted has been proven very limited. As a result TKTD has had to provide unusually heavy supervision to ensure standards and frequently to use its own staff to redo work which contractors have failed to complete. Lack of experienced staff in TKTD has also limited the success of this course and it is possible that the "plan as you proceed" approach to project implementation pioneered by PTPT may have to be applied on TKTD-designed sites in 1980/81.

30. Complicated procedures have made it difficult for TKTD to engage foreign consultants.

31. An assessment must be made as to the extent to which the personnel necessary for planning can be supplied from local sources or must be recruited abroad.^{/1} Subsequently it will be necessary to decide on the balance between TKTD staff, local consultants and foreign consultants. If TKTD limits its role to supervising consultants it would require about 35 technical staff (1 per 12 contracts per year) and a strengthened contracting section. On the other hand there is probably a case for some direct involvement in mapping and planning as a means of developing new methodologies.

32. If external consultant assistance is found essential it will be necessary to decide where this should be concentrated. Options are:

Purposes

- | | |
|-----------------------------|---|
| - In TKTD: | - staff training; - development of methodology; - supervision of consultants; - mapping and planning |
| - In training institutions: | - increasing supply of trained surveyors and physical planners |
| - In consulting sector: | - mapping and planning |

33. Because of the pressure imposed by ongoing planning commitments and because of the lack of a discrete unit for transmigration planning, TKTD's current capacity to use external consultants in a training and advisory capacity is limited. Small groups (maximum 4 persons each) could possibly be absorbed to provide technical assistance for preliminary screening of sites ^{/2} and to assist in reviewing maps and designs prepared by consultants, as well as in staff training. If provincial planning teams are set up, this could increase the institution's capacity to absorb additional technical assistance.

34. Before recommendations can be made for increasing training capacities for physical planning and surveying it would be necessary to assess demand and the capacities of existing institutions.

35. Given the current regulations for the prequalification of consulting firms there is a danger that the least qualified might be selected for mapping and design work. Selection procedures may have to be revised to take full advantage of local consulting capacities, but it is expected that, at least for the next few years, reputable foreign consulting firms will have to be invited to participate.

^{/1} See "Staff Requirements" below (para. 48).

^{/2} UK Government assistance is under consideration for this.

36. Interagency Coordination. Difficulties of arriving at an operational interpretation of Decree 26/1978 have led to the following problems:

- lack of definition of responsibilities for integrating physical plans within the context of feasibility studies;
- assignment of total responsibility for mapping and physical planning to TKTD without establishing a means of mobilizing existing capacities and staff in DGT, Agraria and universities for this work;
- lack of involvement of provincial and local authorities in selection of priority zones for transmigration and consequently the need to develop a very large planning capacity in Jakarta; and
- duplication of activities between agencies (e.g., TKTD, Agraria, LTP each are responsible for preparing base maps for survey work within their field of responsibility).

37. The current arrangements for interagency collaboration on planning are also characterized by a lack of free and regular dialogue at the technical level on a wide range of issues affecting the design of transmigration projects - a problem exacerbated by a growing resentment within the "rural" agencies at the assertive role assumed by the Ministry of Public Works. The result is that either issues are insufficiently discussed or are elevated to the level of the Inter-Agency Coordinating Council (BAKOPTRANS).

38. While BAKOPTRANS provides the formal means of achieving interagency coordination, there appears to be a need to expand arrangements for collaboration at the technical and operational level. The "Technical Team" has proven effective (though slow) as a means of promoting interagency consensus on the selection of priority settlement areas and consideration might usefully be given to establishing a larger number of "technical teams" to work on specific subjects, under leadership of Junior Ministry staff. Some such teams could be temporary, set up with the specific purpose of examining and formulating recommendations for treatment of restricted subjects (e.g., survey methods, village layouts, farm models, etc.).

39. There is definitely a need to establish mechanisms for more direct and regular contact between agencies on such matters as:

- information gathering, storage and transfer (e.g., to define roles of various agencies in commissioning and interpreting aerial photography: to ensure uniformity of base maps used in topographical, soil, land use and forest surveys, etc.);
- settlement design criteria; and

- degree of physical planning necessary for alternative intensities of agricultural development.

40. The prospects of securing improved coordination between agencies involved in planning and surveys are remote until a Government decision is taken on which agency should be responsible for coordinating planning, an issue on which Decree 26/1978 is far from clear. There would appear to be advantages in assigning this to the Junior Ministry for Transmigration which could delegate it to DGT in its secretariat role. Whichever institution is assigned this responsibility, however, must establish its credibility by detaching itself from its narrower role in project implementation, and must be given the staff capability to carry out the work.

41. There is an equally urgent need to identify mechanisms for mobilizing qualified physical planning staff attached to agencies other than TKTD to supplement their stretched resources. Sources include DGT and Agraria, in addition to PTPT which is already committed to assigning planning staff to TKTD.

Mapping and Design Methods

42. Opportunities appear to exist for increasing TKTD's planning capacity by introducing changes into the methodology being followed for mapping and settlement design. Currently TKTD seeks to apply a uniform methodology, assuming the need to plan for a more or less uniform type of settlement and system of agriculture. While the application of a single set of standards to planning simplifies the task it may lead in some cases to unnecessarily detailed surveys with commensurately high costs and, more seriously, to an underutilization of the land resources to be developed. Furthermore, insistence by TKTD on a single model has tended to alienate agencies supporting alternative - and possibly equally good - models.

43. TKTD standard mapping and planning methods are determined by the Government's aim to prepare site development plans which identify with precision each settler's house lot and farm holding, with the holding divided into separate blocks according to slope category. The policy that each farm should have at least 2.0 ha of food crops on lands of less than 8% slope, lying within 2.5 km of nucleated villages, has made it necessary to carry out highly detailed topographical surveys for all land in each SKP. Because the definition of probable SKP boundaries is based on a limited desk review of only part of the data available, detailed surveys are carried out over much larger areas than are eventually identified as being suitable for development under the standard agricultural model.

44. Highly detailed planning has also been justified (at least in the case of Transmigration II) on the grounds that high caliber on-site management is difficult to attain and that detailed specifications are required for preparation of tender documents, particularly for mechanical land clearing.