STAFF SUMMARY REPORT

WORKSHOP ON TECHNOLOGY FOR INCREASING RURAL PRODUCTIVITY IN INDONESIA

Jakarta, Indonesia
June 5-8, 1979

Sponsored by

Committee for the Formulation and Evaluation of National Research and Technology Program for Basic Human Needs
Ministry for Research and Technology
Republic of Indonesia

and

Board on Science and Technology for International Development
Commission on International Relations
National Academy of Sciences-National Research Council
United States of America

NATIONAL ACADEMY OF SCIENCES
Washington, D.C.

This report is a summary of the Workshop on Technology for Increasing Rural Productivity in Indonesia. The activity was jointly sponsored by the Indonesian Ministry for Research and Technology and the U.S. National Academy of Sciences.

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1 OBJECTIVES AND BACKGROUND

Introduction

The Workshop on Technology for Increasing Rural Productivity is the first joint activity between the U.S. National Academy of Sciences (NAS) and the Ministry of Research and Technology under a science and technology loan agreement between the U.S. Agency for International Development (AID) and the Government of Indonesia.

The loan agreement provides for joint workshops, study groups, and seminars on policy aspects of applying science and technology to Indonesian economic and social development. Increasing rural productivity is a national development priority in the Third Indonesian National Development Plan (Repelita III). In consultations among officials of the Ministry of Research and Technology and USAID and staff members of the Board on Science and Technology for International Development (BOSTID), increasing rural productivity was identifed as an appropriate topic for the initial workshop consultations (termed "brainstorming" by the Minister) in the context of USAID's program concerns for assisting the rural poor.

In determining priorities for research and technology in Repelita III, the Minister of Research and Technology established consultative

committees ("Pepunas") broadly representative of the R&D community. The first of these committees, concerned with basic human needs, was given the responsibility for the workshop, and its chairman, Professor Sayogyo, was also the chairman of the Indonesian workshop panel. The format adopted during the meeting of the committee, which was determined in advance discussions, is outlined below.

Focus

Discussion centered on ways of achieving two complementary objectives:

1. Raising agricultural productivity to the level at which a small percentage of families will provide enough food and other agricultural produce for themselves and for a large number of non-farming families at a higher level of per capita consumption than now prevails

2. Generating enough employment in support of higher agricultural productivity and in other pursuits to absorb the families not directly engaged in agricultural production.

Key Brainstorming Questions

Questions emphasized included the following:

1. What kind of agricultural development will best promote the dramatic increases in productivity implied in objective #1?

2. What technology is necessary and available to achieve this kind of productivity?

3. What incentives, including group incentives, institutions, and opportunities must be made available to induce rural people to adopt new technologies?

4. What employment must be generated in other activities to take up the slack created by increased productivity in the farm sector and to (partly) pay for the surplus farm output? How can this employment be generated?

Major Discussion Points

In a preliminary effort to answer the key questions, the following aspects were discussed:

Food Production

1. Biological resources: Breeding, agronomy, and husbandry of selected grains, tubers, vegetables, fruits, animals and fish for food and for recycling of agricultural wastes for energy.

2. Land resources: Fertility of irrigated and upland farmlands, shifting cultivation.

3. Environmental and water resources, especially for irrigation.

4. Food acceptance: Food processing technology, waste, and by-products.

5. Postharvest technology.

Health

1. Environmental health: Potable water and relevant technologies; fishpond culture and public health.

2. Human nutrition: Integration of food production campaigns and nutritional improvements for calorie-deficient households; monitoring and evaluation.

Human Settlement

1. Integrated rural settlement development: Typology, technology, and management of human settlement.

2. Amenities and sociocultural resources.

Education

1. Educational technology, non-formal education, alternative systems of education.

Case Studies and Field Visits

To add concreteness to the committee's study, the southern part of Sumatra was used as a case study. Surveys over the past five years have

yielded data on South Sumatra that indicate that the main agricultural problems include the change from shifting cultivation to sedentary farming for food and perennial tree gardening for export crops and the increased attention to upland resources in farming.

Analysis of these cases covering the topics specified above was based on concepts of integrated rural settlement development and on the results of field demonstrations of technology diffusion packages. These represented a serious attempt to find ways to integrate research and technology with the country's larger rural development efforts.

A field visit to three sites near Palembang (Sembawa, Palembang Rice Estate, and Delta Upang) was organized for selected participants.

2. AGENDA AND PARTICIPANTS

The workshop was formally opened by Dr. B. J. Habibie, Minister of State for Research and Technology, on the morning of June 5 at a plenary session in the conference room of Pertamina Tower in Jakarta. During the first day, background presentations were made by selected Indonesian participants. The second day, field visits were made to three sites near Palembang in Southern Sumatra. On the third day, the participants divided into four working groups to consider the following topics: (A) Agricultural Technology and Farm Employment, (B) Food and Nutrition including Food Technology, (C) Industry and Non-farm Employment and Energy, and (D) Human Settlements and Environmental Health in a Rural Development Context.

The fourth day of the workshop was spent in plenary sessions for discussion of the reports of the working groups, consideration of overlapping issues, and brief concluding ceremonies.

The detailed workshop agenda follows.

Monday, June 4

Evening	Reception hosted by Dr. B. J. Habibie

Tuesday, June 5

Registration

Welcoming Remarks	Dr. Sayogyo Chairman, Indonesia Panel.
Keynote Address	Dr. B. J. Habibie
Remarks	Dr. Harrison Brown

Break

Plenary Session

Preliminary Discussion on Workshop Programs: Focus, Questions, and Expected Results.

Lunch Break

Continuation of Plenary Session

Presentation: A Profile of Rural Conditions in Indonesia. Dr. Sediono Tjondronegoro

Discussion/Open Forum

Break

Case Study Presentation, South Sumatra: Dr. Go Ban Hong.

Discussion/Open Forum

Reception hosted by Mr. Paul F. Gardner, Deputy Chief of Mission. U.S. Embassy

Wednesday, June 6

Field Visits in South Sumatra

Group I : Delta Upang

Group II : Palembang Rice Estate

Group III: Sembawa

Courtesy Call to The Governor of South Sumatra, Palembang.

Thursday, June 7

A.M.	Discussion by Small Groups
	Group A: Agricultural Technology and Farm Employment. Chairperson: Dr. Go Ban Hong
	Group B: Nutrition and Food Technology. Chairperson: Dr. Hillem Haposan Sitompul
	Group C: Industry and Non-farm Employment and Energy. Chairperson: Dr. Julie Sulianti Sarosa
P.M.	Small group chairpersons, rapporteurs, and NAS counterparts prepare reports.

Friday, June 8

A.M.	Closing Plenary Session
	Presentation of Findings of Small Group Sessions
	Discussion/Open Forum
	Break
	Luncheon
P.M.	Final Report to the Minister of State for Research and Technology
	Closing Remarks: Dr. B. J. Habibie

Eight panelists and two BOSTID staff members attended the workshop on behalf of the NAS.

Participant List

NAS Panel

Harrison Brown (Chairman), Director
Resource Systems Institute
The East-West Center, Honolulu, Hawaii

Carl Djerassi, Professor
Department of Chemistry
Stanford University, Stanford, Calfiornia
President
ZOECON Corporation, Palo Alto, California

Harris Gitlin, Professor
Extention and Agricultural Engineering
University of Hawaii, Honolulu, Hawaii

Stephen A. Goulden, Vice President
CETUS Corporation, Berkeley, California

William Hughes, Director
Engineering Energy Laboratory
Oklahoma State University, Stillwater, Oklahoma

E. R. Pariser, Senior Research Scientist
Department of Nutrition and Food Science
Massachusetts Institute of Technology, Cambridge, Massachusetts

Hugh Popenoe, Director
International Programs in Agriculture
University of Florida, Gainesville, Florida

A. S. Whitney, Professor
University of Hawaii Experiment Station, Kula Maui, Hawaii

NAS Staff

Rose A. Bannigan, Assistant to the Director
Board on Science and Technology for International Development
Commission on International Relations

Michael G. C. McDonald Dow, Deputy Director
Board on Science and Technology for International Development
Commission on International Relations

Indonesian Panel

Sayogyo (Chairman), Professor
Rural Sociology
Bogor Agricultural University, Bogor;
Chairman
Committee for the Formulation and Evaluation of National Research and Technology Programs for Basic Human Needs

Julie Sulianti Sarosa, Professor
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Kartomo Wirosuhardjo, Director
Demographic Institute, Faculty of Economics
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Go Ban Hong, Professor
Soil Sciences
Bogor Agricultural University, Bogor

Soemardi Sastrakusumah, Professor
Bogor Agricultural University, Bogor;
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Ministry of Agriculture, Jakarta

Setiati Sastrapradja, Senior Researcher and Director
National Biological Institute of Sciences, Bogor

Hillen Haposan Sitompul, Lecturer
Biochemistry
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Directorate of Technology Development
Agency for the Development and Application of Technology, Jakarta

Otto Soemarwoto, Professor and Director
Institute of Ecology
Padjadjaran University, Bandung

Herman Johannes, Professor of Physics and previous Rector Gadjah Mada University, Jogyakarta

Daedjo Somaatmadja, Director
Chemical Research Unit
Ministry of Industry, Bogor

Benito Kodiyat, Chairman
Board of Directors, Center for Research, Science and Technology
Office of the Minister of State for Research and Technology, Jakarta;
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Sediono Tjondronegoro, Senior Lecturer
Department of Rural Sociology
Bogor Agricultural University, Bogor

Sartono Kartodirdjo, Professor of History and Director
Institute for Rural and Regional Studies
Gadjah Mada University, Jogyakarta

Government Officials

Bambang Sumitroadi, Head
Research and Development Center
Ministry of Public Works, Jakarta

Binsar Pangaribuan, Head
Sub-Division for Technology
Division of Systems Development, Research and Development Agency
Ministry of Transport and Communications, Jakarta

Risman Maris, Head
Sub-Directorate for General Regional Planning
Ministry of Public Works, Jakarta

Wahyudi Sugianto, Senior Official
Planning Bureau
Ministry of Agriculture, Jakarta

Wardani, Senior Official
Directorate General for Food Agriculture
Ministry of Agriculture, Jakarta

Suryadi, Senior Official
Ministry of Mining and Energy, Jakarta

Maraudin Pandjaitan, Head
Sub-Directorate for Regulation and Monitoring
Directorate General for Energy
Ministry of Mining and Energy, Jakarta

Subargio
Directorate for Regional Development
Ministry of the Interior, Jakarta

Agoesman Koesoemowidjojo, Director
Directorate for Village Economies
Ministry of the Interior, Jakarta

Rachmat Wiradisurya, Assistant Minister
Office of the Minister of State for the Control of Development
and the Environment, Jakarta;
Formerly, Director-General
Housing and Regional Development
Ministry of Public Works, Jakarta

P. Donathus, Senior Staff Member
Indonesian Institute of Sciences, Bogor

Secretariat Staff

S. B. Joedono, (Workshop Planner and Organizer), Assistant Minister
Ministry of Research and Technology, Jakarta

Wilfred Tampubolan,
Ministry of Research and Technology, Jakarta

Yustina Marsih
Ministry of Research and Technology, Jakarta

3 WORKING GROUPS REPORTS

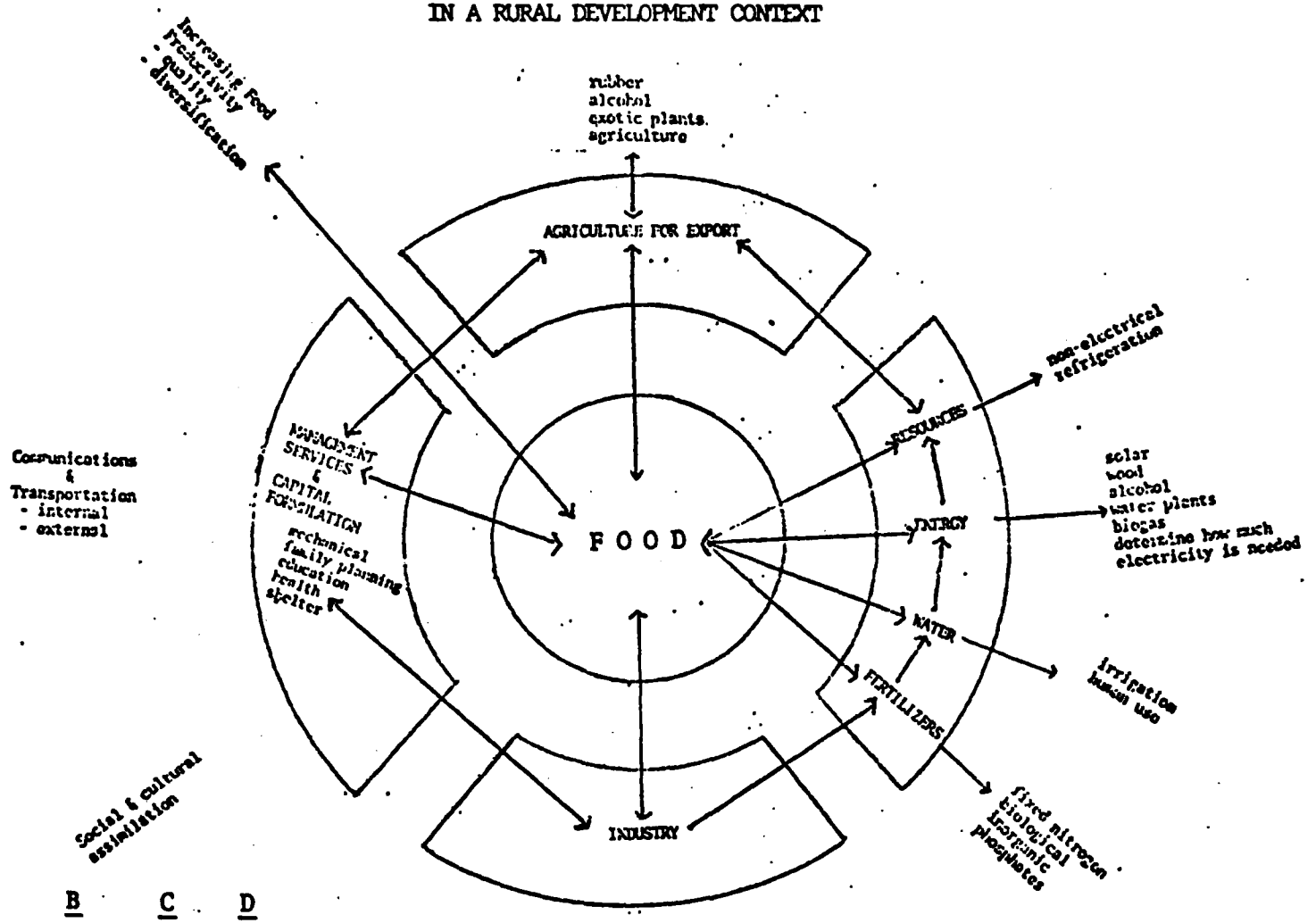
After one day of plenary discussion on background presentations and field site visits, the workshop participants divided into four working groups. The working groups each discussed technologies and R&D needs as they would fit into a model human settlement.

Each group had a chairperson and a rapporteur. The meetings were informal and the discussion candid and vigorous.

The chairpersons, rapporteurs, and especially the secretarial staff worked long after the group sessions were finished, completing summary reports for presentation in plenary session the following day. It was determined that Group D should report first, since their group, which focused more sharply on the human element, had designed a matrix into which the findings of the other groups could be incorporated.

The matrix designed by Group D, as modified in plenary discussions, is shown on the next page.

MAIN ELEMENTS OF A HUMAN SETTLEMENT
IN A RURAL DEVELOPMENT CONTEXT



R&D NEEDS

Group	A	B	C	D
1				
2				
3				
etc.				

APPLICABLE TECHNOLOGIES

Group	A	B	C	D
1				
2				
3				
etc.				

Group A

Agricultural Technology and Farm Employment

Chairperson:	Dr. G. Ban Hong
NAS Panelists:	Prof. Harris Gitlin
	Dr. A. S. Whitney
	Dr. Hugh Popenoe

The Group on Agricultural Technology and Farm Employment was charged with suggesting efficient models for settlements on different types of lands, such as red-yellow podzolic soils, flood plains, and tidal swamp areas, and also with indicating research and development needs.

The group began with the basic assumption that an area of 10,000 ha would support 10,000 families, not all of whom would be involved in agriculture.

At a low level of technology using animal draft power, 1,600 families using 5,600 ha could provide food on red-yellow podzolic soils for the community. Of this area, 2,400 ha would be used for actual food production and 3,200 ha would be used for pasture for the 1,600 draft animals.

With mechanized draft power, the number of families involved in food production could be decreased, as could the acreage for supporting draft animals.

Another 500 ha would be needed to support village infrastructure, including housing, services, storage, and industry.

The options for using the remaining 4,400 ha to support the production of energy and raw materials for the employment of the remaining 8,400 families will depend on physiographic conditions, as summarized in the table on the following page.

Applications

	Available Technology	Red-Yellow Podzolic Soils	Flood Plain	Tidal Swamp	R&D Needs
Biological, Plant	Multiple Cropping pattern Plantation crops (coconut, rubber, oil palm) Energy crops	Corn, rice peanut, cassava Fruit tree Tree legumes	Rice Soybean Sago	Rice, Maize Coconut, fruits, cloves	Breeding upland rice Breeding rice bean Pest control
Biological, Animal	Pasture Fish Prawn Poultry	Stylosanithus, Centrosema, Brachiaria pasture for ruminants Chickens, ducks	Prawns Chickens Ducks	Ducks	Animal Health Aquaculture technique Breeding fish and prawn
Mechanical	Locally produced machinery Labour augmenting technology - draft - machine Advanced technology Postharvest technology	Land development: heavy machinery Farming: -labor -animal -machinery	Land development: Heavy machinery Farming: -labor -animal -machinery	Land development: heavy machinery Farming: -labor -animal -machinery	Economical machinery Postharvest technology of cassava and other agriculture products
Chemical	Fertilizer Pesticide Herbicide	400 kg/ha (100 N + 50P_2O_5+ 50 K_2O)	400 kg/ha (100 N + 50P_2O_5+ 50 K_2O)		Fertilizer Pesticide and herbicide
Institutional infrastructure					Develop coordinating institution

Group B

Nutrition and Food Policy

Chairperson	Dr. Hillen Haposan Sitompul
Rapporteur:	Mr. E. Ray Pariser
NAS Panelist:	Dr. M.G.C. McDonald Dow

To improve food production, nonagricultural employment, per capita income, health and general living conditions, and the volume of "exported" food from an existing or projected settlement, members of Group B offered the recommendations discussed below:

1. Rice, the country's most important staple food and cultivated crop, can, with existing technologies, be harvested, processed, and distributed with significantly lower losses. The necessary technologies should be selected and introduced where appropriate, with farmers trained and the methods disseminated. It is estimated that about 2 million tons of rice can be saved annually.

2. The harvest, processing, drying, storage, and distribution of starchy foods such as cassava and other tuber crops, and sago and palm juice products can be greatly improved. Most important, many such foods can be utilized as substrates for the microbial production of proteins. Modern technologies exist to achieve these ends.

3. The processing of legumes by indigenous food techniques, especially by fermentation, can be improved and streamlined by available technologies. Production of soybeans and other legumes can be increased (500,000 tons are imported annually to cover the present food and animal feed requirements of the country).

4. Ethyl alcohol can be easily produced by fermentation and distillation by using starch-based products or unutilized industrial by-products such as molasses. The alcohol can be utilized in simple modern technologies to process edible fish not usually employed for human consumption, to preserve this most important source of animal protein, and to reduce the large postharvest losses. It can also be used to provide a stable material that can be added as an ingredient in existing fish-based foods or as a supplement to protein-deficient diets. The fish oils that accrue from this defatting and dehydration process can be used in the margarine industry that is already operating in the country.

5. The large unutilized potential for the production of dry ice is a resource that must be used for the expansion of a greatly underdeveloped fishery market.

Fish, which exist in abundance in Indonesian waters, can be distributed to a much wider population than is now possible if they are appropriately cooled. The dry ice, available from the fertilizer plants, can also be used for a wide variety of important food technologies mainly to preserve valuable perishable crops.

6. Agricultural wastes can be used in a variety of ways; for instance, for the growing of mushrooms.

7. Technologies exist to produce cheap food products like noodles, chips, and crackers from root and tuber crops and should be utilized more extensively.

8. Technologies are available for cottage and large-scale industries to produce ferrocement structures such as rainwater cisterns, sewage pipes, latrines, and fishing boats, as essential components of a technology-based rural development model.

Group C

Industry and Energy

Chairperson:	Dr. Sayogyo
Rapporteur:	Dr. William Hughes
NAS Panelists	Dr. Stephen A. Goulden

The Industry and Energy Group was charged with studying conditions for increasing rural productivity and increasing non-farm employment in rural villages. To achieve higher productivity, several elements appear necessary. First, people must be motivated to increase productivity through adequate incentives. Second, training in the skills necessary for using the new technologies must be provided. Third, use of new technologies, including new fuel technologies, will require the development and application of methods to generate those fuels in the villages. Fourth, continuous management of these technologies is a requirement for their successful use, and the village communities must develop that management capability. Finally, simple and intermediate implements and farm machines must somehow be made available to the farmers to increase their productivity.

On the basis of these assumptions, Group C submits the following recommendations:

1. Efforts should be made to establish better marketing conditions for farmers so that they have incentives to increase production that will give them surplus income. This, in turn, would increase opportunities for non-farm employment in rural villages.

2. Planning should begin for extension technical training programs designed to aid villagers in using new technology such as energy devices (for instance biogas generators, pyrolizers, alcohol fermenters and stills) and techniques for better use of land (including crop diversification and rotation and fast-growing plants to produce firewood).

3. Two or three pilot projects should be undertaken to provide the bases for energy source development in rural areas, for example:

- A total biogas system, probably using ferrocement construction, starting with a digester using human and animal wastes, agricultural wastes, and nonagricultural plant materials to produce biogas and fertilizer. The effluent from the digester should be used to feed an algae pond, with the algae being used for poultry and/or fish food to produce protein.
- An alcohol production system using cassava, sago palm, sugar palm, and other appropriate biomass carbohydrate sources indigenous to Indonesia. In planning, due consideration should be given to preventing alcoholism among the villagers.
- A pyrolysing system suitable for using inputs such as weeds, grass, rice hulls, and other agricultural wastes,

the output being gas, oils, and charcoal that can be used as a substitute for increasingly scarce firewood and for other fuel needs.

It is strongly suggested that these test pilot projects should be organized so that the inevitable initial operating difficulties can be worked out without creating initial scepticism in villagers. It is also strongly suggested that each of these projects be made the specific primary task of a small group of people who are charged with the responsibility for its success.

4. A pilot project should be undertaken to develop ways of producing clean water through the use of solar heaters, catch basin systems, and communal or house storage systems, etc., to minimize the need to use scarce fuels to sterilize water.

5. Ways should be explored to make village and tree-planting subsidy funds more effective by placing more management responsibility on villagers for energy farming as well as food farming. Energy farming is becoming increasingly important because of the firewood problem.

6. Economic incentives should be provided for local manufacturers to produce simple farm implements and machines, and low-interest credit should be made available to enterprising cooperatives and farmers to purchase such implements.

7. Joint efforts should be encouraged among biologists, engineers, and economists for employment-generation modeling based on the new technologies, management requirements, and social considerations.

Group D

Human Settlements and Environmental Health in Rural Development Context

Chairperson:	Dr. Julie Sulianti Sarosa
Rapporteurs:	Dr. Sartono Kartodirdjo
	Mrs. Rose Bannigan
Members:	Dr. Kartomo Wirosuhardjo
	Dr. Hasan Purbo
	Dr. Sediono Tjondronegoro
	Dr. Bambang Sumitroadi
	Dr. Subargio
	Dr. Agoesman Koesoemowidjojo
NAS Panelists:	Dr. Harrison Brown
	Dr. Carl Djerassi

The main objective is for each human settlement to become self-sufficient. This is not to suggest that each unit would produce everything it needs but rather that it would exist through a combination of producing its own food and buying machinery and other imports with self-generated income. The settlement should, however, be able to maintain its own equipment.

The main elements of human settlements and their interrelationships are depicted in the model designed by Group D (page 15).

The group proposes that two major settlement experiments be undertaken:

1. A new typical transmigration settlement, located outside Java, large enough and with sufficient population to permit management and services.

2. A settlement experiment located in Java, perhaps in a river basin area, where land use is an issue and the area is already densely populated. The experiment would incorporate small-scale industry and aim at increasing both agricultural and industrial production on the limited available land.

The responsibility for developing this effort should rest with Pepunas (Group on Basic Human Needs), and it should involve representatives of relevant agencies. It should explore possible sites and analyze them in terms of selecting the best site for the experiment.

The criteria for selection of the experimental sites include:

- Transferability of experience;
- Accessibility for monitoring by researchers;
- Ethnic considerations;
- A minimum time investment for establishing the settlement, and high visibility for public relations;
- A minimum rupiah investment with maximum rupiah return; and
- A high chance of success.

In the experiments, a systems approach should be applied to promote integration of all aspects of rural development. The experiment should

prove useful to the Indonesian Government for future policy formulation with respect to rural development.

A limitation should be set on the time needed to reach conclusions about the settlement. Once an area is selected, the committee would determine:

- Food crops that can best be grown on that specific site;
- The best crops for export purposes, i.e., sago palm for alcohol, exotic plant products;
- The optimum ratio of food and export crops;
- The energy sources available;
- The sources of water for agriculture and human use; and
- The availability of fertilizer for local sources, i.e., small phosphate deposits, biological processes, and nitrogen fixation.

Given the physical and ecological framework, the committee should examine the number of people each settlement can support. In addition, they should determine the services required to meet the basic needs of the people of the community with respect to health, family planning, education (both formal and non-formal), and management.

In Java, the critical problem would involve determination of suitable small-scale industries and appropriate technologies to ensure maximum utilization of both human and natural resources.

The size of the study population should be determined on the basis of ability to reach economic self-sufficiency. In setting up the model experiment, various aspects of management and social participation should also be taken into account. Management of the community should be organized with local participation rather than leaning too heavily on the national government bureaucracy. (An exception, of course, would be the system of communications and transportation.)

4 PERSPECTIVES

Indonesian-NAS Cooperation

The Workshop on Technology for Increasing Rural Productivity in Indonesia continues the close cooperation between the Indonesian scientific community and the U.S. National Academy of Sciences. In 1968, the NAS and the Indonesian Institute of Sciences (LIPI) cooperated in a joint workshop on food, with the objective of producing practical recommendations on food and nutrition problems in Indonesia to aid in the formulation of national policy and programs for the first five-year development plan (1969-1973). Many of the recommendations were incorporated into the first development plan and were also used in the second plan (1974-1979).

A 1971 workshop on industrial and technological research examined research, development, and engineering capabilities in Indonesia. The objectives were to suggest ways to improve the selection of R&D priorities in support of national industrial development plans, to strengthen R&D management, and to build a more effective national R&D infrastructure.

National resources planning and management was the focus of a 1974 workshop. Recommendations on land and soil, water, forest, ocean, and mineral resources were submitted to the National Development Planning

Board (BAPPENAS) for consideration in preparation of the second development plan.

Ten years after the first workshop on food, LIPI again asked BOSTID to participate in a national workshop on food and nutrition. This meeting, held in July 1978, proposed policy recommendations for inclusion in Indonesia's third five-year plan and reviewed the state of food production and nutrition in Indonesia; the review led to recommendations on new goals and programs.

Planning and Organization

The negotiation of a five-year science and technology loan from the U.S. Agency for International Development (AID) to the Government of Indonesia has provided a framework for more regular and sustained cooperation between BOSTID and Indonesia's scientific and technological institutions.

The Minister of State for Research asked BOSTID to cooperate in conducting a set of joint activities aimed at strengthening the capacity of these institutions to help meet the economic and social needs of Indonesia's people.

Initial discussion took place after the 1978 workshop on food and nutrition between Dr. Joedono, William Littlewood, and BOSTID staff. In addition, BOSTID staff met with Dr. Baiquni and Dr. Trisura Suhardi to discuss future collaboration.

In January 1979, Dr. Dow of the BOSTID staff visited Jakarta and met with Dr. Joedono and Mr. Littlewood regarding the next activity. The workshop date was selected and the major issues to be considered were discussed.

During the remaining few months before the workshop, background materials were exchanged between the Ministry for Research and Technology and the NAS; and further organizational matters were resolved through correspondence and cables. A briefing session for NAS participants was held in Jakarta.

The support and cooperation of the Indonesian workshop organizers and hosts were excellent, and the administrative and logistical aspects of the meeting were well-organized, especially the difficult arrangements for the site visits. Participants were particularly indebted to Dr. B. T. Habibie who provided two Indonesian-built KASA 212 planes for the round-trip flight to Palembang. The support provided by the workshop secretariat deserves special note. They worked well into the evening to prepare documents for the next day's sessions.

The Indonesians provided lunch each day for the workshop, an event that not only was pleasant but also permitted a helpful informal exchange among the participants. Two other pleasant occasions for social interaction were a reception hosted by Dr. B. J. Habibie on the evening of June 4 and one hosted by Paul Gardner, U.S. Chargé, on the evening of June 5.

Press Coverage

Members of the local press attended the opening ceremony as well as other plenary sessions. In addition, Dr. Brown held a press conference with ICA officials at the U.S. Embassy on Monday June 11, following the conclusions of the workshop.

A copy of the newspaper article on the opening of the workshop is attached as Appendix 7.

Staff Support and Follow-Up

M.G.C. McDonald Dow and Rose Bannigan of the BOSTID staff coordinated NAS participation in the workshop.

Dr. Dow arrived in Jakarta on May 30, and on May 31 and June 1 and 2 discussed the workshop arrangements with local AID and Indonesian officials.

Mrs. Bannigan and the eight NAS participants arrived in Jakarta on June 2,3, and 4. The group met with USAID officials on the morning of June 4 for a briefing. Minister Habibie hosted a luncheon on that day for USAID Mission Director Thomas Niblock and Harrison Brown, chairman of the NAS panel. Also attending were Dr. Dow, Mr. Littlewood, Dr. Joedono, Dr. Harsono Paspanegoro, and Dr. Burhan Napitupulu.

During the afternoon of June 4, a meeting was held at Pertimina Towers to discuss the energy portion of the science and technology loan agreement.

In his closing remarks, Minister Habibie asked a small committee of Indonesian panelists headed by Professor Sayogyo to meet with Dr. Brown and members of the NAS panel and staff and Mr. Littlewood to discuss the next steps. Therefore, following the conclusion of the workshop, a meeting was held on the morning of June 8 to plan a course of action.

After considerable discussion, it was agreed that the Indonesians should further elaborate on the criteria provided by Group D for selection of the site or sites. A BOSTID staff member would visit Indonesia in the fall of 1979 to discuss detailed developments of the project and assist in arrangements for the next joint workshop meeting at the selected site(s), tentatively planned for early 1980.

Appendixes

RI-USA Brainstorming Session on Improving Rural Productivity (The Indonesia Times)

Indonesian Report of Meetings

Role of Locally produced Small Farm Machinery in Increasing the Agricultural Productivity in Indonesia

The Basic Approach of the Transmigration Programs

Land and Water Resources Development in Southeast Sumatra

A Profile of Rural Conditions in Indonesia

Conclusions of the 1978 Energy Workshop on Energy Supply for Rural Areas

RI - USA Brain-storming Session on Improving Rural Productivity

By Our Reporter

Some forty Indonesian and American scientists started yesterday a 5 - day brain-storming session to try to design a model of a village using appropriate technology has a high agricultural productivity. The Americans are from the US' National Academy of Science while their Indonesian counterparts are from government institutions and departments and universities.

Minister of Research and Technology Prof. B.J. Habibie opened the session in a brief ceremony here yesterday.

The minister, in his opening speech, the session was not expected to produce solutions, but ideas on how, when and where to start to increase the villagers' productivities, "We want more detailed scenaries of rural economics," he said.

The projected village will have a small percentage of families involved in agricultural activities who will provide enough food and other agricultural crops for themselves and a large percentage of families at higher levels of per capita consumption than now prevail. The largest part of the families will work in sectors not directly involved in agricultural production.

Pilot projects of this kind of village might be established in South Sumatra or South Sulawesi. Selected attendances to the session are scheduled to visit three sites near Palembang, South Sumatra, today.

If the projected formula comes into reality, it will bring a singificant change in the handling of Indonesia's transmigration programme which has so far been agricultural oriented. The existing transmigration policy regulates that every family transmigrated from one place to another, particularly from the impoverished areas of Java to other islands of Indonesia, is provided with a 2 hectare agricultural plot. Therefore, the transmigrants are trained in agricultural skills before they are resettled in a transmigration project. With this system, a transmigration project of 10,000 hectares is inhabited by 5,000 families, all of whom engage in agricultural activities, even in a monocultural sector.

As an example, Prof. Habibie said that the 10,000 hectares area would be inhabited by 10,000 families, of which only 1,000 would be involved in agriculture. The other 9,000 families, he said would work in other sectors which would support higher agricultural productivity.

(psm)

The Indonesia Times, June 6, 1979.

REPORT OF MEETING*

INTRODUCTION

Throughout Indonesia, in government and in private circles, in central ministries and in universities, thought is being given to the nature and form of rural development which is taking place in the country. The development of rural places -- i.e., those areas outside of the large metropolitan centers -- is stated policy, but a central strategy for implementing that policy has yet to be developed. As the specific goals of rural development vary, so also do the forms which development takes and the strategies which are used to achieve it.

The seminar reported on here was organized for the purpose of bringing together scholars, policymakers, and those involved in action programs in the field of rural development to share their knowledge and to discuss and summarize alternative strategies and policies related to rural development. Selo Soemardjan, Chairman of the SEADAG Indonesia Panel, set the stage by suggesting that the tasks of the seminar were to identify the elements of rural development, to develop points for policy consideration, and to suggest ways of measuring the relevance and effectiveness of specific rural development programs in Indonesia.

Four recurrent themes were apparent in the seminar's deliberations and the papers which were presented. Although formulated differently by various participants, these themes centered on the following essential elements of rural development: coherent strategy, program flexibility, political will, and popular involvement.[1] The problem of equity also figured largely in seminar discussions. Several of the papers presented clearly showed that equity considerations are not unique to Indonesia. Indeed, it was observed that one of the most persistent themes in current international discussions of rural development concerns the issue of equity and a closely related strategy,

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* This report was prepared by Eugene C. Erickson and Sartono Kartodirdjo, with the assistance of Soetatwo Hadiwigeno, J. Nasikun, and Timothy Mahoney.

1. The ideas summarized in the discussion which follows are consistent with the Basic Guidelines of State Policy *(GBHN - Garis-Garis Besar Haluan Negara)* developed by the People's Representative Council *(MPR - Majelis Permusyarakatan Rakyat)*.

participation.[2] Equity, it was recognized, is not a narrow concept; it includes various kinds of access -- access to jobs, to a stable source of income, to knowledge, and to an ability to have some control over the affairs of daily life. Much more needs to be known about the way in which wealth is distributed in rural areas, and about the chances people have for gainful employment. For example, Sulistyo's paper indicated that, at a very minimum, the farmer's use of modern seeds and cultivation practices, when accompanied by irrigation, changes the nature of farm work dramatically: more labor is needed in nearly all phases of farm operation. On the other hand, there may be an increase in the actual number, or at least the proportion, of landless persons in rural areas. If widely true, the implications for development policy in terms of deciding when project money should be spent, where services should be located, and so forth, are significant.

A second theme in the seminar discussion focused on what might be called political and social considerations. Polarization or rural dualism, as it is called, may be increasing. This phenomenon is expressed in many forms: the number of large farmers versus the number of small ones; the relationship of those employed to those under- or unemployed; the number of individuals who own or have access to employment on land versus those who are landless. Polarization is a political concern in the sense that while rural areas in earlier times had patterns of patron-client relations which were well known to everyone, and in later times a multitude of political parties which provided structure to rural society, these institutions have disappeared or are disappearing; as a result, the bonds of the village system are changing. Polarization is also a social concern in the sense that many dimensions of rural life are changing under modern conditions.

A third consideration dealt with by the seminar, although obviously interwoven with those mentioned above, was more strictly economic in nature. The issue of adequate employment was regarded paramount. Sulistyo pointed out the benefits of employment in rural areas in terms of slum prevention, provision of additional income, reduction of income inequalities, and easing of social tensions that could disrupt the development process. His paper discussed the effects on employment of major rural development policies such as *INPRESS*,[3] *BIMAS*,[4] and *SUBSIDI*

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2. A review of international themes on rural development is contained in the paper by Sartono Kartodirdjo and the Staff of the Institute of Rural and Regional Studies, "The Development Process: Perspectives, Implications, and Dimensions in the Context of Rural Development Strategies," presented at this seminar.

3. *Instruksi Presiden* - Program of Presidential Instructions.

4. *Bimbingan Massal* - Mass Guidance.

kepada DESA.[5] Despite these programs, it was alleged that income distribution has worsened. Pricing policies and adoption of new technologies ought to be more precisely linked to labor needs.

A fourth theme that arose involved a concern for the integration of rural development programs; however, there was no clear agreement on this issue. Indeed, some panelists noted that if Indonesia were able to integrate successfully its various public and private programs, it would be one of the first societies to have done so. But the issue is probably relative; minimally, coordination of scarce national resources is necessary.

APPROACHES AND ELEMENTS OF RURAL DEVELOPMENT

A number of different approaches to rural development were examined in the course of the seminar. Several of these are identified and described in the discussion which follows. Within what are here termed "general approaches" there are specific "elements" of development which merit consideration. It must be stressed at the outset that these approaches or elements are not considered to be mutually exclusive. That is, no development program is likely to succeed by using a single approach or subset of elements. Rather, a successful program would embody a variety of considerations.

General Approaches

None of the participants argued, either in papers or in discussion, that a single sector approach to development — be it economic, agriculture, health, welfare, education, or any other sector — is feasible. An integrated or at least a multi-policy development program was assumed to be necessary. Such an approach takes into account the interconnectedness of development efforts and, as programs are implemented, the continual improvement of linkages between all agencies having development objectives. It was generally assumed that development policy must be systemic in nature — i.e., must recognize the interconnectedness of actions and policies. The significance of systemic linkages is illustrated by studies which show that as purchasing power of farmers increases, demand for farm goods also increases — linkages abound.

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5. A direct subsidy to the village government.

Institution-Building Approaches

One of the approaches most often mentioned was that of institution-building (although the term itself came up for criticism). As discussed here it refers to the organization of problem solving institutions at the local level. Dawam Rahardjo suggested that organizations such as cooperatives[6] which arise out of the interests and needs of people are most likely to work. The mobilization of peasants as an essential feature of the development process and of institution-building was noted in various ways. Of particular concern is the method and process of mobilization, especially of those peasants not presently involved in development-related organizations. This kind of institutional development is particularly difficult to accomplish. A related problem involves the stimulation and particularly the creation of rural leadership. Koentjaraningrat suggested that information is needed on why many leaders behave in an authoritarian manner while others do not. The complexity of the problem was underscored by a long discussion of the methods and virtues of transferring loyalties from traditional to modernizing systems (see research suggestions). A third element in institution-building concerns the role of existing organizations in promoting development. Cooperatives, community development centers,[7] and community health and welfare centers[8] can perform a very significant function in terms of organizing their respective memberships for development, provided they do not operate in a patronizing way. That difficulties persist in this regard is indicated by studies which report that people have a feeling of uneasiness, born of a long tradition of respect for authority, when dealing with government.

The Role of Government

Obviously, the dynamics of the role of government in the development process is a crucial consideration. Few governments today do not recognize that they are "of the people" and therefore have obligations to create an environment in which people can find peace, security, and prosperity. But this also means there is a need to promote organized participation at the grassroots level. In this context, Saleh Widodo's

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6. *K.U.D.* (*Koperasi Unit Desa* - Village Cooperative Unit).

7. *LSD* (*Lembaga Social Desa* - Village Social Committee).

8. *PUSKESMAS* (*Pusat Kesehatan Masyarakat* - Community Health Center) and *PKK* (*Pendidikan Kesejahteraan Keluarga* - Family Welfare Education).

paper on decentralization of administration reaffirmed the principle that rural development is group action which requires the involvement of people in decisions which affect their lives. The seminar discussion stressed the need to give a greater role to local officials and local leaders. Specifically, the role of the *bupati*, *camat*, and *lurah*[9] in the planning process should be strengthened. However, as Rahardjo suggested, rural development should be based on the people's support, and leadership should include a solid element of popular participation. In contrast to those who think the burden of development rests with government, there are many who feel that people, through self-support, should have the freedom to use those programs and resources made available to them which fit their needs and interests.

Decentralization does not mean that the central or provincial governments should abrogate their responsibilities. It is even more important that central planning take place and that central coordination be assured. It is the decentralization of administration which is most needed. Some panelists envisaged an initial government impetus for programs with an eventual pull-back to permit local, fairly autonomous operation. Coordination of departmental activities, therefore, was seen as one of the most hopeful signs at present. There is an indication that the impetus to improve coordination is coming from the ministries themselves.

Another element of government organization is that of greater participation of local people in the programs that affect their lives. The difficulty of achieving true participation was stressed continually. Building local organizations that combine the ability to accomplish their own objectives, as well as to fulfill the goals of the society (e.g., mutual security), is not easy. Finally, it was stressed that the private sector also has a significant role to play in this process. Some very innovative programs of local initiative and self-help have been introduced by the private sector. Soetrisno's paper provided a good illustration of one program[10] which began with a concern for community health care and, through popular participation, ultimately helped to improve other aspects of community life.

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9. The *bupati*, *camat*, and *lurah* are the top officials in the three smallest units of government: *kabupaten*, *kecamatan*, and *kelurahan*, respectively.

10. *Dana Sehat* - community health care scheme.

Integration of Rural and Economic Development

One of the major accompaniments of Indonesian independence has been the integration of the national economic sector with that of rural society. This has involved substantial social change in terms of the establishment of better developed, more integrated, and more viable rural centers[11] -- thereby reducing the economic dualism which existed in colonial times. This development must continue. The establishment of various rural centers is intended to create structures which enable the peasantry to obtain a multitude of benefits.[12] Development of a wide range of occupational skills through better, more comprehensive, yet more responsive education is one aspect of this process. Another is the creation of more local industries and services, especially small industries and services which can be organized and managed by local people; these will provide a range of employment opportunities and will use the skills that are available. Mochtar Buchori stressed the need for the development of community based education. Studies indicate that where there are schools there is also a higher level of living. Still, in a larger sense, the vital problem of education is the dissemination of information in language which is understandable to villagers. The question remains what should be the content of the curriculum and how should it be developed? Care in answering this question is important. Some excellent curricula in outlying islands train people for jobs that are available only in Jakarta. This is hardly an acceptable policy for rural development.

COMPONENTS OF THE DEVELOPMENT STRATEGY

It was stressed that a single strategy cannot be applied to all regions and villages in Indonesia. Castles and Alfian have documented the regional variations in terms of relative vulnerability to price structure, willingness to risk, attention by government, and role of local leadership. However, throughout the country the principle of integration of program objectives with the needs and self-determination

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11. In addition to *LSDs* there are *PUSPENMAS* (*Pusat Penerangan Masyarakat* - Center for Community Information) and *UDKP* (*Unit Dearah Kerja Penbangunan* - Operational Unit for Development).

12. For example, the *kelompok-kelompok kerja* (village work groups) maintained by the *LSDs*.

of the people is essential. The seminar recognized that agricultural production is one of the major specific goals of rural development. However, it was also recognized that agricultural production cannot be considered except in the more general context of rural development. (The systemic nature of development is stressed again.) Herman Soewardi's paper stressed that only through a more general integration of rural development goals (which include agricultural production) can the very significant question of income distribution be addressed.

The need for more precise information (data) on the various facets of rural development was emphasized, as was the crucial importance of evaluating various development activities. In nearly every sector, basic data is needed to enable scientists and decision makers alike to make recommendations that are significantly beneficial. Also, better linkages are needed between pilot projects and the national system. Some panelists suggested that efforts should be made to duplicate some development programs while dropping others.

POLICY CONSIDERATIONS

Throughout the seminar discussion and in the papers presented various policy issues arose.[13] These are summarized briefly here:

(1) There is an urgent need for a comprehensive national policy on rural development. The issues relating to problems of coordination and decentralization of decision making should be solved, but they depend on an explicit acceptance of a comprehensive national policy.

(2) There must be an explicit recognition that a multi-disciplinary, multi-departmental and coordinated approach to rural development is necessary. However, such an approach must take into account the complexity of the problem and the many aspects of rural development. None of the problems are likely to be solved by single sector approaches. Coordination is illustrated in the implementation of employment-generating activities. These activities must be synchronized in terms of their timing and use of the right technology for particular places and resources.

(3) There should be a policy that rural development efforts at any level -- national, regional, local, or sectoral -- should include

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13. The original version of this section of the report was completed by Soetatwo Hadiwigeno.

the participation of people in both the planning and the implementation phases of the program.

(4) A policy encouraging local initiative should be adopted. Programs must be flexible enough to accommodate local problems and variations, explicit needs of villagers, and many other local typological characteristics. However, the role of the central government should not be abrogated. General guidelines are still essential; specific implementation should take place locally. An illustration of the need for flexibility is implicit in the word "participation" itself. There are many different forms of participation. It is involved when people use a hospital, when they are active members of an organization such as a cooperative, and when they contribute time and energy to a project such as mutual aid.[14] Different forms of participation and of local organization should be encouraged. Organizations should be suited to local situations and to the activities, interests, and skills of local groups. A corollary policy concerns the creation of a climate for local decision making. This involves some degree of decentralization of decision making and the encouragement of nongovernmental units such as the local health insurance and cooperative schemes. Yet, even here, coordination is important.

(5) There should be a policy that supports and recognizes the significance of evaluating rural development programs. Patterns of success or failure (or relative success) need to be identified. These evaluations need to be comprehensive enough so that they include various linkage effects of the programs.

(6) The present policy of making the *kecamatan* (a local unit of government with a territory of about fifty square kilometers) the central governmental unit for the implementation of development programs was discussed and in general was favorably received. However, it was suggested that continual and careful evaluation of this policy should be made.

(7) A policy of central government coordination should be established. (It was believed that this is now in process.) However, the specific goals, targets, and division of labor among the various agencies should be clearly delineated. The specific role of formal and informal leaders, especially vis-a-vis the development agent (who will presumably be located at the *kecamatan*), should be carefully documented.

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14. Known throughout Indonesia as *gotong royong*.

NEEDED INFORMATION

In terms of its original objectives, the seminar developed a clear statement of some of the elements of rural development. It also suggested some areas for policy consideration. The discussion did not, however, analyze current policies and programs, part of the reason being that much more data is needed before a thorough analysis is possible. Data collection is fundamental to any model of decision making since decisions are frequently based upon what men "know;" this in turn, depends upon the information to which they have been exposed. When people's interests are involved it is especially important to determine their roles and reactions, as well as the real or potential results of projects. The information which panelists considered necessary for effective decision making is classified below into several broad categories to facilitate presentation. Topics for potential research are presented in the form of questions.

Integration of Development Activities

It was suggested that more needs to be known about the obstacles to coordination of development programs. Do these obstacles differ at the central, provincial, regional, and local levels of government? How does sectoral management compare with regional management? Are there psychological problems which prevent or hamper coordination of programs?

What are the linkages between education programs and rural development? Especially needed is a far more accurate inventory of ongoing programs both in rural development in general and the educational sector in particular.

There were also questions concerning which management strategies best promote integration. A research inventory of strategies now being used by each ministry would be useful. Who manages what? What is the process of decision making with respect to the expenditure of development funds? What role do the *camat* and other officials play in this process? An inventory of information on the ranges of successful development, the contribution of development efforts to improvements in the market, methods of participation, the access of cooperatives to capital, and the effect of the presence or absence of organizations would be insightful.

Access to Development Decision Making

The access people have to programs depends on both the relative flexibility of the program design and factors of choice on the part of people. What is the role of nongovernmental personnel and programs in rural development? What is the nature of the regional system within

which comprehensive, integrated rural development must take place? What are the differences in people's accessibility to technical information when ministries are located in government centers such as *kecamatans* and *kabupatens* (the next larger unit of local government)? What are the networks like and how do they fit the social and governmental networks? What kind of system seems to stimulate flexible local development?

Who are the target groups for development programs in Indonesia? How are they to be identified once they are selected? What is the nature of the inequities which presumably exist? What causes people to reach out and take what programs have to offer? Why do some programs fails to attract the attention of the target groups for which they are intended?

Do seasonal migrants move back and forth to villages and what is the effect of various programs and policies on such migration? What are the experiences of transmigrants? Do they have a stimulating effect on development in the region to which they migrate?

What kind of mechanism could be used to determine social needs in a given area? How are these needs related to regional and community variations in Indonesia? Are there some typologies of villages which might help explain the variation?

What factors increase the motivation of people to modernize?

More community surveys are needed: Who uses government programs and why? What is needed in an area? How are people involved? How is the role of the development agent, whether located in a regional market town or a village, made more attractive to dedicated and competent people?

Data is needed on the role of off-farm employment in manufacturing, commerce, and services in rural areas. This would include villages, market towns, small cities, and the kinds of employment opportunities that are both traditional and modern. What are the facts and trends, and what are the constraints that should be broken to increase off-farm employment? Where is the flexibility? For example, what effect would access to credit for working capital have on the promotion of investment clusters?

Methods of Organization

One of the most difficult apsects of rural development involves the formation of organizations, particularly among those sectors of rural society that are unorganized, which enable rural people to partcipate in development. How can such organizations best be formed and what is their role in the developmental process? What are the elements of cost, time, and energy that are expended in organizing? What kinds of skills (training) are needed? How can the specific knowledge which

people have and the additional technical information which might be provided to them be assessed? Methods need to be developed to evaluate participation, both historically and at present. What forms does participation take?

How should an educational program which is specifically meaningful to a village be set up? Data is needed on the range and content of education programs — i.e., an inventory of education needs.

Managers of Programs

There are many sincere and dedicated people who are presently government officials, managers of private development programs, and the like. Case studies are needed which detail the observations and experiences of these people. What are the questions and problems faced by managers, and by their boards of directors, supervisors, and other responsible personnel? What are the questions and problems they face in their programs? An inventory of the concerns and frustrations such people currently feel would be helpful and insightful to anyone involved in development.

Leadership

Numerous illustrations were cited of leadership problems; often these were problems beyond the control of the individuals involved. Some panelists felt that local leaders were responsible for so many programs that they did not have the time to provide the necessary "leadership." (One participant called this phenomenon "role proliferation.") To what extent is it true? More broadly, why do development objectives occur in less than their full potential? Why do some leaders (and others in responsible positions) not cooperate? Why do they act in an authoritative manner? What are the reasons for their different styles? Studies are needed of the development behavior of both leaders and followers. Does their social behavior signify the presence of an attitude of reliance on, respect toward, or a reluctance to participate in government? What is the nature of leaders' response to power? What kinds of leadership are available at the local level? What kinds of typologies of leadership would be useful? What are the relationships between leadership and success in achieving developmental goals? Would comparative analysis of different places and different community settings reveal different styles of leadership? (Studies already indicate the answer is "yes." The ranges of types need to be documented.) Can traditional leadership be used to modernize rural areas?

Development Units

The emphasis being placed on central planning in large regions is consistent with much current development theory. But, what are the smallest system units which should be the focus of development goals: the village, the *kecamatan*, the *kabupaten*? What are the structural characteristics of these different units? Is it possible, as Arthur Mosher has suggested, to develop typologies of "development potential" for different units? Is it also possible to fashion development programs to fit those different structural settings?

ROLE OF LOCALLY PRODUCED SMALL FARM MACHINERY IN INCREASING THE AGRICULTURAL PRODUCTIVITY IN INDONESIA

By

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BACKGROUND INFORMATION :

It is well known that in Indonesia more than 80% of population lives in rural area and are dependant on agriculture as main source of income. Average holding of farm size is said to be much less than 1/2 ha in densely populated inner islands and within 2 ha in outer islands. At present the agricultural labour productivity of Indonesian farmer is very low (although yields of food crops particularly rice are quite good), Considering the fact that it takes about 200 man-days (from land-preparation to harvesting) for one ha of sawah compared to 100 man-days in other South East Asian rice growing countries like Philippines, India, etc.

One of the major obvious reason for this low labour productivity is inadequate power and no proper tools being available, to farmers in Indonesia. Therefore in order to increase the agricultural labour productivity of an Indonesian farmer, he will need adequate power and proper implements. In view of the fact that there is a shortage of cattle power and is said to be decreasing at the rate of 2 to 3% per year, the choice of introducing additional power falls on mainly mechanisation of agriculture.

Howeever, in the most densely populated inner islands of Java, Bali and Madura, the Government of Indonesia has the additional responsibility to see that with mechanisation, the unemployment of land-less labourers shall not increase and should not aggravate the income distribution in rural areas in favour of bigger farmers.

But it has been brought to the notice of Government policy makers that in certain pockets of Java and at certain agricultural peak seasons, there is a shortage of labour and due to that various agricultural operations are being delayed and therefore not able to raise an additional crop. For example in Kerawang there is said to be about 10,000 ha idle land which can be brought under cultivation only with the help of machines due to shortage of agricultural labour in that area. Similarly Jatiluhur authority is anxious to bring the turn around time between the crops to less than 2 weeks (at present farmers are taking more than 4 weeks) and introduce an additional dryland crop (palawija) inabout 250,000 ha under its (area to be irrigated) ayacut. In outer islands lack of adequate power has been identified as one of the major constraints in bringing more land under cultivation.

A CASE FOR LOCALLY PRODUCED SMALL FARM MACHINERY

Having seen that there is a justified need and sufficient potential for agricultural mechanisation here, now the question arises as to what kind of technology is the most appropriate for Indonesia

Already several brands of tractors, power tillers, and other sophisticated agricultural machinery mainly from Japan are being imported by various dealers in the country. The spare parts and service facilities, the downtime on these machines is quite high. Besides (particularly after 15 November 1978), the price of these machines has gone high and therefore in most cases appear to be uneconomical compared to the present cost of cultivation.

Further it will take considerably long time to learn the skills of such highly sophisticated technology both for maintenance and manufacturing within the country.

Therefore the considered advice to developing countries particularly for agriculture and rural development is to opt for what is called "Appropriate Technology".

In consideration of this important aspect, IRRI in addition to its main task of generating high yielding varieties of rice technology, has developed small farm machinery suitable for rice farmers in South East Asian countries. Here it may be mentioned that in developing these machinery, the single most important factor taken was its utter simplicity and low cost to manufacture and maintain by small workshops and mechanics. Therefore these machines do not look so attractive when compared with well painted, smart looking imported machines. But the designs of these machines are released to local small manufactures, only after testing throughly over long periods of time in actual working conditions at Los Banos Agricultural Enggineering Department, IRRI

In order to assist and promote the use of these simple farm machines, IRRI with USAID funding has started industrial extension centres for small farm machinery in four countries, Pakistan, Thailand, Philippines and recently in Indonesia.

Here in Indonesia, at present an Agricultural Enggineering Consultant is assisting Subdirektorat Mekanisasi under

the Directorate of Bina Produksi. Already six local manufacturers have been assisted in manufacturing the above designed machines. The main problem, however facing this nascent industry is creating the market for their products. In order to encourage this local industry, Government of Indonesia is being advised to give following support.

NEEDED GOVERNMENT POLICY SUPPORT

We recommended the following measures be considered by the Government of Indonesia:

a. To encourage a doption of locally produced small farm machinery and thus create the base for decentralized industry and employment opportunities in Indonesia.

b. To help and give incentives to local manufacturers of small farm machinery such as providing credit at lower interest rates and charging lower duty and taxes on necessary imported raw materials.

c. To encourage Government departments to purchase locally made equipment whenever and wherever possible, such as at government run research farms, government technical high schools, government extension agencies, etc.

d. To ask financial institutions to give liberal credits to KUD/BUUDs and enterprising farmers and individuals for purchasing locally manufactured equipment to enable them to hire out to the needy farmers.

e. To strengthen extension departments concerned with small scale from mechanization at national and provincial levels with additional funds.

THE BASIC APPROACH

OF THE TRANSMIGRATION PROGRAMS

May, 1978

DIRECTORATE GENERAL OF HIGHWAYS
MINISTRY OF PUBLIC WORKS

A. STAGES OF TRANSMIGRANTS LIVELIHOOD

1. Every family of transmigrants would follow stages of livelihood, as shown on figure 1, e.g. :

   a. Starting when no "real access" was available, the livelihood was still in subsistence stage (I). During that stage, they are in an isolated condition.

      Note :
      1). Real access means that commerce and transport facilities could reach them.
      2) During the selection of the locations the accessibility has been taken into consideration, although only potentially.
      The achievement of the real access needs time, say three years
      The sooner the better.

   b. At the achievement of the "real access," the surplus products start to be absorbed by the markets, giving them extra income (II).

      This extra income, could be primarily used for consumptive purposes, without creating the development influences resulting from the act of producing.
      At the time when part of their income is used for investments, then the starting of the real development takes place (III).

2. Starting from the subsistence stage (I) to the beginning of the development stage (III), is called the transition period. The opportunity and capability to overcome this transition period, would indicate how fast the transmigrants livelihood could develop.

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FIGURE 1 : Schematic Figure Of Changes At The Stages Of Transmigration Livelihood

FIGURE 2 : Transmigration Settlement Long Range Plan (20 Years)

FIGURE 3 : Transmigration Program Pelita III Province : Jambi

FIGURE 4 : Standard Scheduling

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B. THE AMOUNT OF GOVERNMENT SUBSIDIES

1. The number of transmigrants to be moved is quite big, e.g. 500.000 KK*) during Pelita III (minimum).

2. Government financing capacity is limited, so that government subsidy to each KK is quite small. 'sbi per ha.

3. Even though, these subsidies should meet the "minimum demand", to guarantee the transmigrants that after this subsidy period, they would be able to develop their acts of producing.

4. According to the principal thinking mentioned in A, the amount of "minimum demand", is equal to the amount necessary to overcome the transition period.

5. In reality, meeting the "minimum demand" would have to be parallel with efforts like :

   a) The selection of locations and settlements planning, that really support the development of the optimum "Regional Development Structure".

   b) The selection of technology in land preparations to reduce the costs to a minimum.

   c) The supply of technological input to the farmers' activity, to speed the achievement of the market scale of economics.

   d) To know and apply as much as possible the natural limiting factor in the implementation programs in general, to minimize the inefficiency and failures factors, for keeping down the amount of Government subsidies to be supplied.

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*) KK means families.

C. STANDARD NEEDS OF TRANSMIGRANTS

Average Standards and Non Average Standards

1. The needs to overcome the "transition period" are called **average standard (SR) needs.** These average standard needs are applicable to all the transmigrants and the same for each KK (family).

2. Additionally, there are other needs for the development stage, like irrigation, cattle or tractors, estates crops. When these needs are to be included in the Government Subsidies, then they are categorized as being non average standard (STR). This standard is not to be applied for all transmigrants, but selective only.

3. The criteria of being selective depends on certain considerations, like irrigations, that cannot be implemented without high construction costs, or export drive considerations for estates, that needs high investment costs and quite long preparations, etc.

Criteria And Land Supplies

4. During the isolated condition (A.I.a.), there is no other choice for the transmigrants, but planting food crops (not only rice).
This demand will give additional limitations to the land capacity criteria, specifically related to the slope of land

5. The above mentioned limitations, primarily related with the need of land conservation, are still considered to be within the natural limit

of the technical and financial capacities. For that reason the land slopes would be limited to 8% only.

6. The subsistence stage is equivalent to income amount of 240 kg rice per capita per year. Considering that 1 KK consist of 5 people, then the need of 1 KK equals the equivalent of 1200 kg rice per year.

7. For the relatively unfertile soil, such an income can be achieved by land area of about 1,2 Ha dry soil.

8. The transmigrants livelihood with a little beyond the subsistence level, is an income equivalent to 320 kg rice per capita per year or about 1600 kg rice per KK per year.
This is 30% beyond subsistence.

9. For the same type of soil, such an income was gained with a land area of more than 1.6 Ha, or rounded 2 Ha.

10. The transmigrants life subsidies would only be for the first year, and this could be even less than one year, say 8 months. For this reason, efforts should be made to enable the transmigrants to achieve the production to meet their living needs, although minimum subsistence, directly at the first year.

11. In relation to the above mentioned, the land to be supplied should be in a well prepared condition, i.e. ready for planting.
The timing should also be planned, say at the beginning of the rainy season, and all the transmigrants should be well prepared for planting

12. Even with the possible available plans for rubber plantations in future years for each transmigrant, a certain forest area would be necessary to be supplied for each unit of settlement, to meet the minimum need of local climatic maintenance and the supply of energy (Wood burned). That kind of need could be combined with estates business activities.

13. Assuming that one labourer could "tap" (rubber) about 0,5 -1,0 ha and the need for wood energy could be meet by the supply of a forest area of 0,4 ha per KK, then the total need would not exceed 1.5 ha with the understanding that they still cultivate 2 ha land for yearly plantings.

14. Moreover, when starting, there should be multiple cropping. This kind of intensive cultivation would be highly recommended, considering the limited area of total land, while population always increase.

Note :
The changing of planting pattern toward estates would increase farmers income, but it could also influence the increase of alarmed food supply sector.

Input Supply

15. A farm worker can work on 0.7 ha of land (1 shoulder = bahu) without the help of cattle. When considering that one KK equals 1.5 worker an average, then the cultivating capacity per KK equals 1.05 ha.

That means, that the capacity of one KK is not enough to meet the subsistence living, without additional input supply.

16. For that reason, additional input should be given in the form of seed, fertilizer and pesticide/insecticide. This input naturally could be grouped within the **average standard** of needs, refer table 1.

Land Clearing and Cover Crops

17. 2 ha land should be cleared at once, because if this could not be done, the uncleared part of forest would be a **source of plant pest.**

18. In the early years, the 1 Ha land not to be cultivated by the transmigrants, will be covered by cover crops, for maintenance or betterment of soil fertility.

19. If possible, cattle grass should be selected as cover crops. Furthermore, cattle can then being introduced, and later on when the transmigrants need cattle, there will be avaiable cattle food (grass).

20. The surplus product which can be reached by cultivating land of 1 Ha, would be expected later on to form a kind of capital to buy cattle. Buying cattle means investment activity and this makes the farmers able to cultivate close to 2 Ha. meaning that they will increase into the development stage.

D. LOCATION SELECTION

Population Carrying Capacity

1. Primary investigations on land potentials is needed for regions outside Java/Madura/Bali, for carrying additional population The identification of land potentials is based on criteria :

   a) Land capability with conditions above the minimum limits.

   b) Slopes not more than 8%

2. Considering that each KK need gross land of 2.5 Ha, one could have an idea of the carrying capacity as shown on table 2.

   Note :

   1) A forest area of 1.5 Ha, outside the net 2 Ha, will be placed on the rest of land, having slopes more than 8%
      If this is not available then it would be taken from that potentials.

   2) Carrying capacity has been calculated for 20 years period, with be assumption that 60% of population are farmers.

3. The results of calculations show that 6 Provinces like North Sumatera, West Sumatera, Lampung, South Kalimantan, North Sulawesi and Central Sulawesi, have negative figures, meaning that even for carrying the local population, those Provinces will have shortage of land.

The Relation With Regional Development

4. After knowing the potentials, important for the transmigration is the

speedy reach of real "access". Therefore the first step to be carried out is the identification of the level of accessibility of the potential land.

5. "The level of accessibility", is defined by the intensity of the distribution services (commerce and transportation). The transmigration settlement in big groups will invite distribution services with high intensities.

6. With the same intensity, the access effectiveness or the reach of market price, would be defined according its position in the existing regional development structure.

7. According No. 5 and No. 6, the location selection has to consider :

   a) The grouping of potential land

   b) The existing regional development structure and the future one

   Note :

   1) The existence of the regional development structure is related to the existence of the units of development regions (SWP) in Indonesia.

   2) One will have about more than 70 units (SWP) spread over all Indonesia which do not have equal strength. This forms a precondition of an unbalanced growth amongst regions.

   3) These SWP will be used as the variable in the planning towards the realization of balance amongst regions.

   4) This objective would define the direction of the future regional development structure.

8. An example of the treatment of the regional development structure would be seen for Aceh Province, and the followup screening process. Refer to figure 2 and table 3.

The Relation With The Implementation Program

9. The implementation of the transmigration program would involve a big number of heavy equipment. It is indicated that in 1979/1980 (the 1st year of Pelita III), about more than US. $. 400 million for heavy equipment would be needed.

10. For this reason, the location selection should be so arranged as to minimize the "mobilization costs". Therefore the successive locations to be created year by year, should be decided based on optimizations for the "least cost" of the equipment mobilization.

As example, see Jambi Province, figure 3.

***

E. IMPLEMENTATION PROGRAM

1. The implementation of the transmigration programs, would consider the "Standard scheduling", with the proper time and sequence for the sake of the success of the transmigrants activity to meet their needs, in the first year. This would give indications, like :

   a) Physical work of land clearing should only be carried out during the dry season (6 months per year); i.e. : April until September.

   b) Road construction to reach the land to be opened, should be carried out one year earlier.

   c) The seeding, needed by the transmigrants at year n, should be done at least at the rainy season of year n−1.

   Note :

   1) For the seeding purposes, land should be cleared, ready for planting, before the rainy season of year n−1.

   2) For the seeds of 80.000 KK in first year 1979/1980, seeding land of 16.000 Ha is necessary, which should be ready in September 1978. See figure 4.

2. Beside the physical work of the land clearing, the seeding problems is a part of the activity which is very critical in nature.
   For this seeding, prior September 1978, selected farmers should be moved, amounting about 510 people. The cost of seeding is estimated to be Rp. 144.000 per KK receiving seeds.

***

Table 1 : Necessary Inputs of the Average Standard Needs

Alternative	Surplus* (Rp)		Subsidy		
	Without Subsidy	With Subsidy	Seed	Fertil.	Pestic.
Without Fertilizer	– 40.932	17.400	x	–	x
With Fertilizer A	388.368	489.400	x	x	x
With Fertilizer B	267.118	350.350	x	x	x

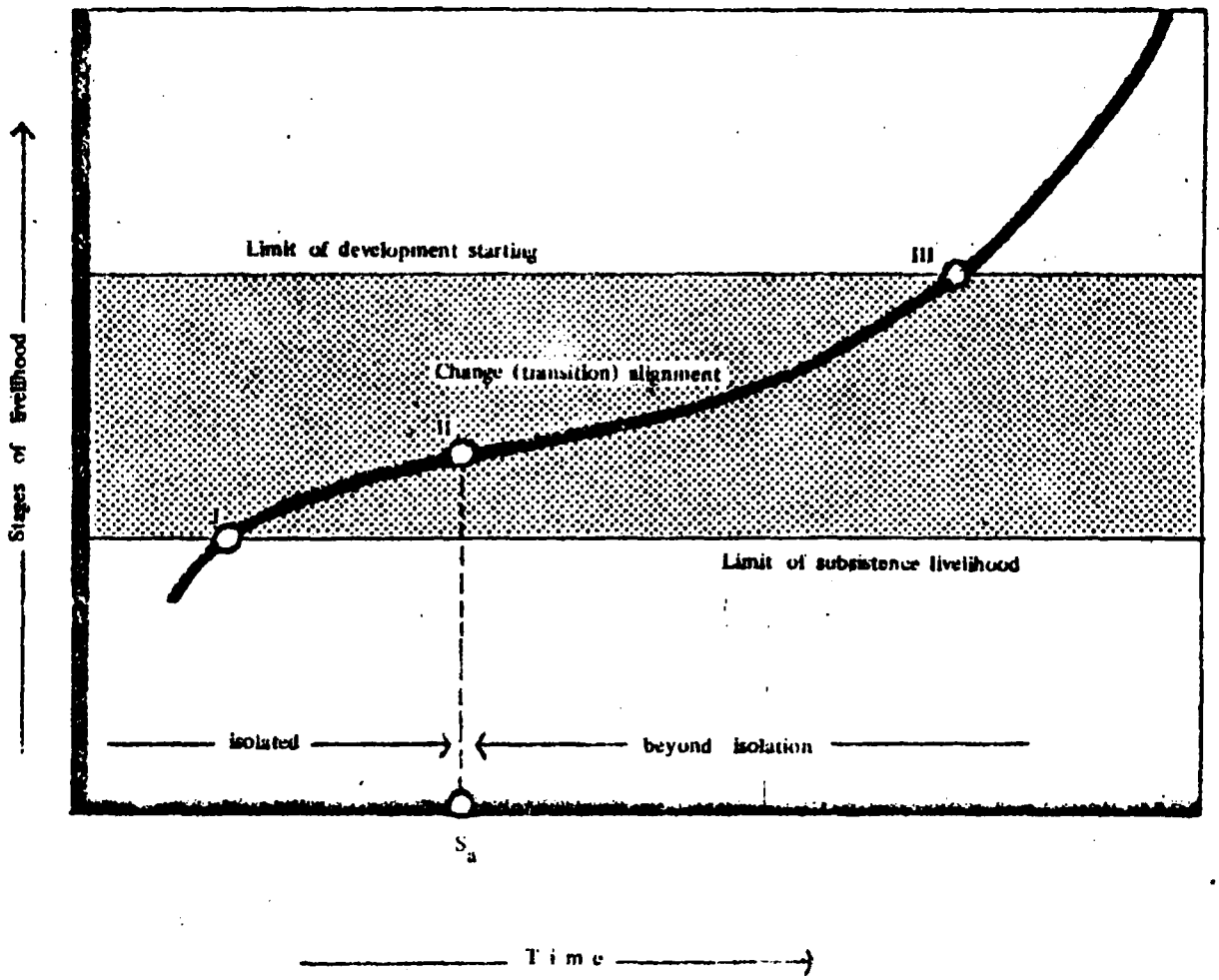
Table 2 : The Amount Of Population Carrying Capacity at Year 20 From Now.

No	Province	KK	No.	Province	KK
1.	D.I. Aceh	133.344	10.	Kalimantan Tengah	1.459.487
2.	Sumatera Utara	–387.312	11.	Kalimantan Timur	897.306
3.	Sumatera Barat	– 28.427	12.	Kalimantan Selatan	–377.443
4.	Riau	662.073	13.	Sulawesi Utara	–123.898
5.	Bengkulu	21.821	14.	Sulawesi Tengah	533.194
6.	Sumatera Selatan	234.299	15.	Sulawesi Tenggara	137.818
7.	Jambi	282.723	16.	Sulawesi Selatan	–197.673
8.	Lampung	–515.627	17.	Maluku	770.122
9.	Kalimantan Barat	2.165.968	18.	Irian Jaya	2.634.640

Table 3 : Transmigration Settlements Plan 1979 – 1999 (Gross). Province : Aceh

Group	WPP (Partial Development Region)	Population Carrying Capacity (KK)	Level of Development Importance of the SWP (Unit of Development Region)		Accessibility Level (A)	Final Value		Transmigrants Plan		Notes
			Value Group	Value WPP		R 20 (K x W)	P 5 (A x W)	R 20 (KK)	P 5 (KK)	
I. Banda Aceh										
1. Banda Aceh	I	14.000	5	1	5	5	5	–	–	
	II	12.000	5	1	4	5	4	–	–	
	IV	18.600	5	1	4	5	4	–	–	
2. Meulaboh	V	59.000	5	5	4	25	20	50.000	23.800	
	XVIII	9.700	5	1	3	5	3	–	–	
II. Lhoksemawe										
1. Lhoksemawe	VII	22.000	3	2	4	6	3	–	–	
	VIII	11.000	3	1	5	3		–	–	
	IX	22.000	3	2	4	6	8	–	–	
III. Langsa (To Medan)	X	25.000	3	2	4	6	8	–	–	
	XI	16.600	3	1	4	3	4	–	–	
IV Kutacane (To Medan)	XII	12.400	4	1	3	4	3	–	–	
	XIII	46.000	4	4	4	16	16	40.000	–	
V. Tapaktuan (To Medan)										
1. Tapaktuan	XVII	17.400	5	2	3	10	6	15.000	–	1980/1981
	XVI	8.700	5	1	3	9	3	5.000	–	
	XIV	22.000	5	2	3	10	6	20.000	–	
	XV	10.800	5	1	2	8	–	–	–	
Total		327.200						130.000	23.800	

FIGURE I : SCHEMATIC FIGURE OF CHANGES AT THE STAGES OF TRANSMIGRATION LIVELIHOOD

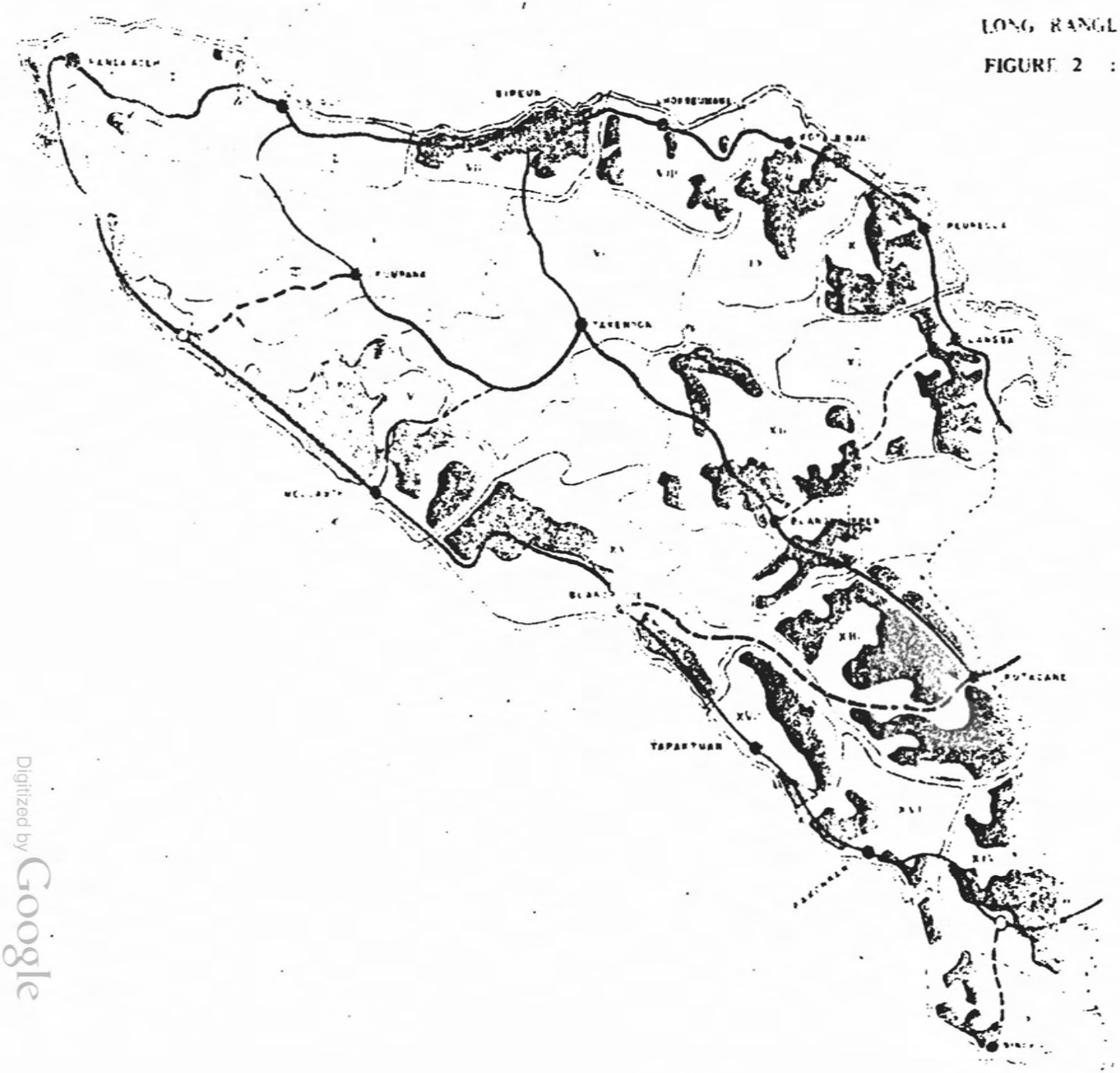


S_a = The starting of "real access"

= Transition period

LONG RANGE PLAN (20 YEARS)

FIGURE 2 : TRANSMIGRATION SETTLEMENT



EXISTING PLANED

- Arterial SWP ROW
- Arterial WPP ROW
- City Of Development Central.
- Partial Development Region (WPP)
- Transmigration Protential Regions.

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FIGURE 3

TRANSMIGRATION PROGRAM PELITA III

PROVINCE : J A M B I

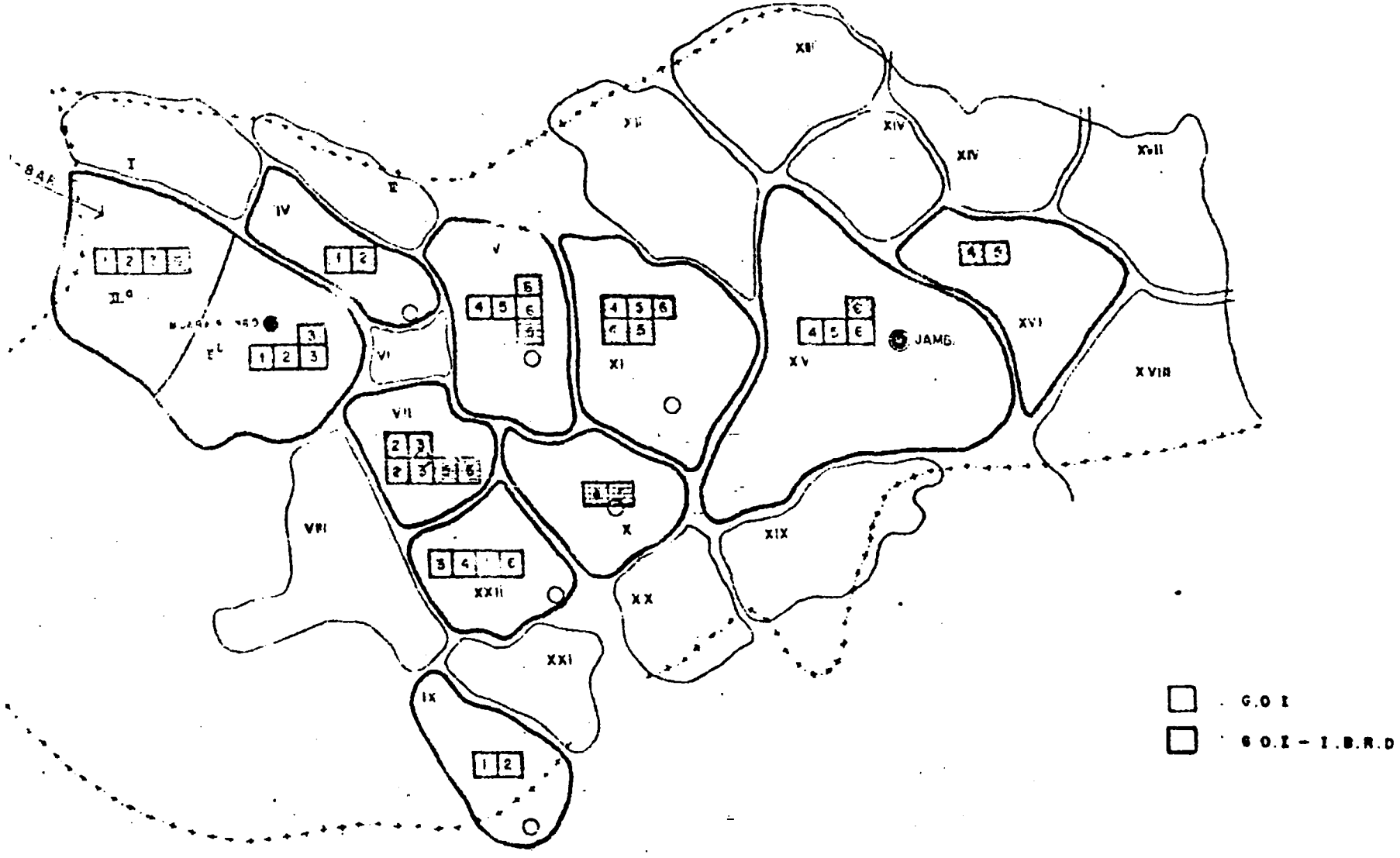
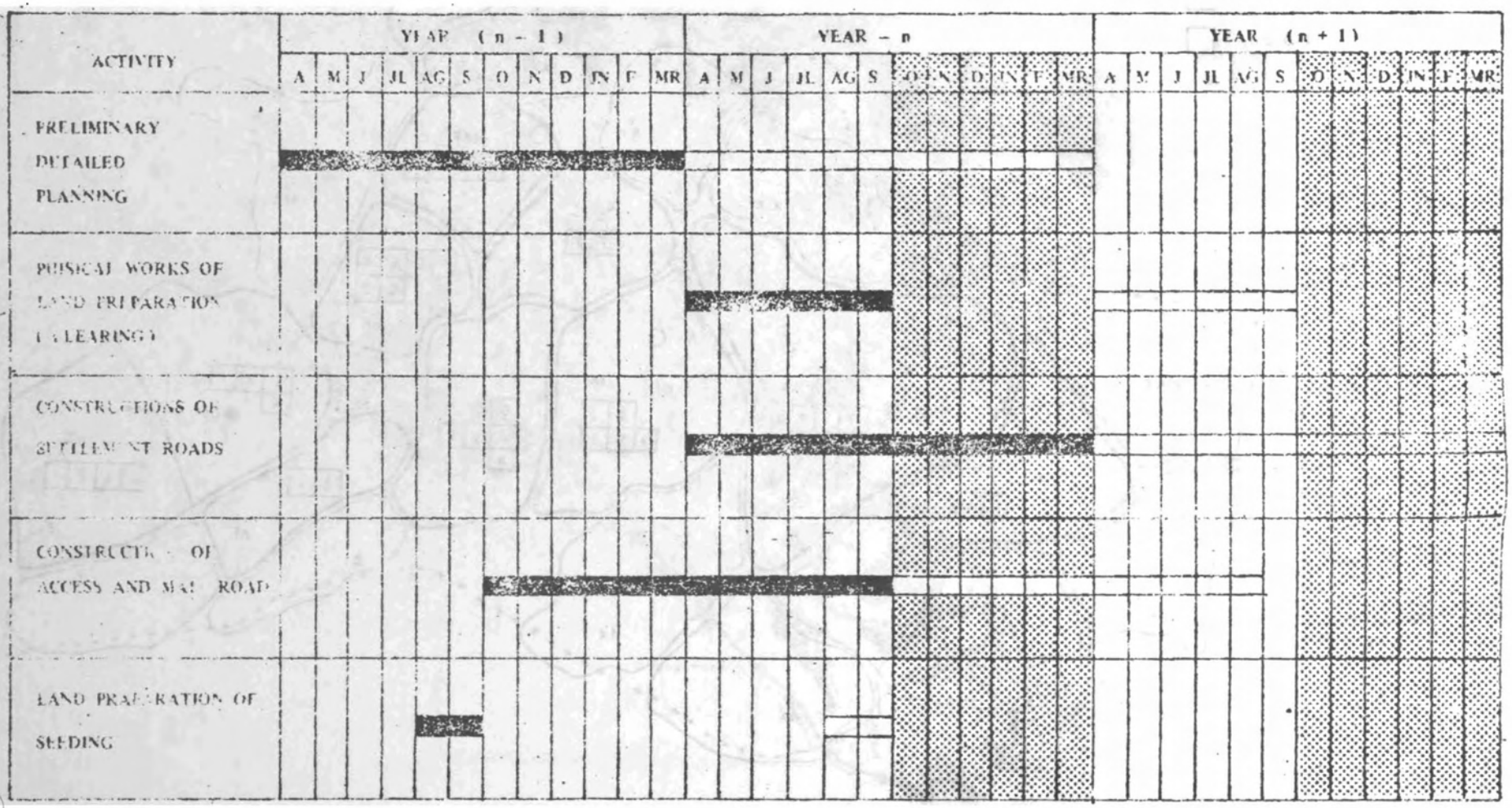


FIGURE 4 : STANDARD SCHEDULING



NOTE

PLANTING PERIOD

FOR YEAR n

FOR YEAR n+1

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Terminal Report

LAND AND WATER RESOURCES DEVELOPMENT IN SOUTHEAST SUMATRA

INDONESIA

PROJECT FINDINGS AND RECOMMENDATIONS

UNITED NATIONS DEVELOPMENT PROGRAMME

FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS ROME, 1976

AG:DP/INS/69/518
Terminal Report

LAND AND WATER RESOURCES DEVELOPMENT IN SOUTHEAST SUMATRA

I N D O N E S I A

PROJECT FINDINGS AND RECOMMENDATIONS

Report prepared for
the Government of Indonesia
by
the Food and Agriculture Organization of the United Nations
acting as executing agency for
the United Nations Development Programme

UNITED NATIONS DEVELOPMENT PROGRAMME

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 1976

The Food and Agriculture Organization of the United Nations is greatly indebted to the organizations and individuals who assisted in the implementation of the project by providing information, advice and facilities.

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GLOSSARY

Adat	Custom, tradition
Air	River
Alang-alang	*Imperata cylindrica*, a coarse rhizomatous grass
Belukar	Secondary forest
BUUD	Village farmer cooperative group
Danau	Lake
Dinas Peternakan Daerah, Propinsi Sumatra Selatan	Animal Husbandry Department, South Sumatra
DITTOP	Direktorat Topografi
Direktorat Gizi Dinas Penelitian	Directorate for Nutrition, Research Department
Direktorat Jendral Kehutanan	Directorate General of Forestry
Dinas Pekerjaan Umum (DPU)	Public Works Department
Hutan	Forest
Hutan marga	Forest pertaining to the marga
ITB	Institut Teknologi Bandung
Kabupaten	District or country
Kecamatan	Subdistrict
Kuala	Mouth of river
Lebak	Back swamp behind river levee
Marga	A subsubdistrict usually centred in a large village
Muara	Mouth of tributary river
Penghijauan	A system of afforesting grassland, using strip planting
PUSRI	Palembang fertilizer factory
Sawah	Wet-rice field
Seru	A species of tree - *Schima bancana*
Sungai	River
Sumba	A scheme for cattle breeding by smallholders
Taungya	A system of tree cropping interspersed with food crops
USDA	United States Department of Agriculture
Way	River

1. INTRODUCTION

1.1 BACKGROUND

By the late sixties, Indonesia had entered a transitional period of economic reconstruction and the Government had given the highest priority to agriculture. Furthermore, the urgent need to relieve by transmigration the population pressure on the land in Java, in addition to meeting the increasing demand for more food and agricultural products, had focussed attention on sparsely populated and agriculturally underdeveloped areas in the country. Southeast Sumatra was one such area, in particular the coastal deltaic lowlands. These, still largely under virgin swamp forest, appeared to offer prospects for growing rice, utilising irrigation by tidal inundation. The vast but comparatively empty hinterland, subjected to shifting cultivation for many years, was also thought to have considerable potential for agricultural expansion.

In the past, attempts had been made to reclaim land through the construction of irrigation and drainage canals, and to distribute it to transmigrants from Java or local farmers. However, these works were not successful, mainly because of inadequate planning, and lack of adequate technical preparation and maintenance.

At the request of the Government of Indonesia, the Asian Development Bank sent a technical assistance mission in early October 1967 to analyse the bottlenecks in the production and marketing of food crops and to recommend short- and long-term measures to overcome them. At about the same time the World Bank also sent a mission to study the economic difficulties facing the country and to recommend measures for their solution. In January 1968 the Government submitted a request to the United Nations Development Programme to explore agricultural resources on 3 million ha of relatively flat, partly marsh land between Palembang and Telokbetung. This request was examined by the UNDP and it was decided to send a UNDP/FAO mission with a view to assessing the agricultural potential of the above area. This mission arrived in the country in June 1968 and, after a concentrated reconnaissance survey, helped the Government to prepare a reformulated request.

1.2 OFFICIAL ARRANGEMENTS

The request was approved by the Governing Council of the UNDP in June 1969. The initial Plan of Operation for a project of two years' duration was signed in December 1970. FAO was designated the executing agency and the Department of

Agriculture the government cooperating agency. A revised project document signed in August 1974 extended the duration of the project to four years and nine months, to end in September 1975. The UNDP contribution amounted to US$ 1 9[illegible]0 458 and that of the Government to Rp 267 166 500 in kind plus Rp 117 331 000 in cash 1/.

1.3 OBJECTIVES

The long-term objectives were essentially to stimulate increased agricultural production of food crops and to assist the Government's transmigration programme in southeastern Sumatra.

The immediate objectives, initially, were:

(a) to draw up a master plan for agricultural development in the project area;

(b) to make feasibility studies to the extent and detail required for a decision on financing of two specific projects, namely Belitang irrigation scheme and Cintamanis agricultural development;

(c) to provide Indonesian counterpart staff with in-service training and fellowships so that the Government, by using this trained personnel would be able to extend their development planning to other areas of Indonesia.

These were augmented in the project revision to include type development studies whereby development of crop production would be initiated in certain distinctive areas (e.g. upland rainfed crops and irrigated rice in the floodplains).

1.4 IMPLEMENTATION

The project area comprised some 4.5 million ha located as shown in the Figure.

Field work started in late 1971, but prior to this, the Government had provided, in the Department of Agriculture, Palembang, suitable office and store facilities and had appointed or recruited technical and administrative staff. To assist and facilitate the project's activities in Jakarta, at national level, a coordinating committee was appointed and in Palembang, at provincial level, an advisory committee.

The project commenced work with a set of provisional and general objectives, but it was not until early 1972, after review missions, visits and discussions with the Government, UNDP and FAO, that the above objectives were finally defined.

Initial activities concentrated on finding out the extent and nature of the resources of the area. Subsequently, from this information and data, plans were to be made which would mitigate or remove the constraints to agricultural expansion and improvement.

1/ US$ 1.00 = Rp 415.00 (as at 23 August 1971).

Starting in June 1972, with an agronomy fellowship, five Indonesian technicians went overseas for further instruction and training in soil science, drainage and irrigation design, agronomy and hydrometeorology.

While equipment arrived on time, enabling the field data to be collected, examined and evaluated, there were delays in the arrival of technical experts and consequently some studies were finalised later than originally planned.

During the life of the project, the Government decided to accelerate the transmigration programme and accepted planning assistance directly from the UNDP and the World Bank. This consequently modified the original work plan. The project ceased work on planning for transmigration settlement, particularly of upland rainfed cropping, but continued to provide the new planning organisations with data, advice and field assistance.

To meet the Government's wish that they should have some items and studies developed to the stage where they could request adequate funds from a financing organisation, the engineering consultants, Nippon Koei Ltd. of Tokyo, were engaged by FAO to carry out the following studies:

Feasibility study of the Belitang Proper Irrigation Scheme

Feasibility study of the Cintamanis Agricultural Development Project

Reconnaissance study of agricultural development in the Belitang extension area.

This field work was carried out from February to August 1972. The project entered into close collaboration with two other ongoing projects, Land Capability Appraisal (UFS/72/011) and Planning and Development of Transmigration Schemes (INS/72/005), and received considerable assistance from other projects, notably the Aerial Photography Project (INS/69/522).

.5 REPORTS

Three contractors' reports on the above-mentioned studies were presented to the Government in May 1975 after thorough review at FAO Headquarters.

Three formal technical reports were finalised in late 1975:

1. Land, water and forestry resources
2. Socio-economics, land tenure and agricultural and fisheries production
3. Plan of development

These are referred to in Appendix 4.

The project also generated 22 informal technical reports, as listed in Appendix 5.

2. FINDINGS AND CONCLUSIONS

2.1 SOCIO-ECONOMIC SITUATION 1/

The following summarises the salient features as given in Technical Report 2. Indonesia has a total land area of 2.03 million km^2 and an estimated population of 132 millions 2/. It is further estimated that 76.1 percent of the population live in Java and Madura, which constitute only 6.4 percent of the total land area. The project area carries an estimated population of 2.31 million, or 1.6 percent of the national population, on 2.25 percent of the land area. Of the total national work force, 62 percent are employed in agriculture, and in the project area, 80 to 90 percent.

The national accounts of 1973 show that the Gross Domestic Product was US$ 15 916 million, the national income US$ 13 528 million and the per caput income US$ 108.56. The contribution of agriculture (including fisheries and forestry) to the GDP was 39.8 percent. Of this, the largest component was the farm food crops subsector which contributed 23.5 percent, followed by non-farm food crops, 4.9 and forestry, 4.8 percent.

The value of all agricultural exports in 1973, excluding fishery products, amounted to US$ 1 401 million or 43.6 percent of the value of all exports. Forestry products comprised 41.8 percent of the value of agricultural exports and 18.2 percent of the total value of all exports. Rubber was the leading agricultural export up to 1971 but subsequently receded to second place, being overtaken by forestry products, and in 1973 amounted to only 12.2 percent of the agricultural exports.

The land resources can be classified into the following four agro-climatic zones:

	'000 ha
Coastal and deltaic zone	1 500
Lebak zone	500
Old terrace zone	1 650
Mountain zone	650
Total	4 300

1/ See Technical Report 2 and Ref. 20, 21.

2/ Projection to 1975 of 1971 census figures of 119.2 million at 2.1 percent annual increase.

The outstanding feature of agricultural production in the project area is the predominance of subsistence farming with accompanying gross underemployment, and generally poor returns. The latter is primarily the result of land limitations to agriculture and the practice of shifting cultivation itself.

In the coastal and deltaic zone, paddy is cultivated in the rainy season using tidal inundation, and is a form of shifting cultivation with diminishing returns. Cassava and other root crops are also grown in this zone further from the coast. The main rice growing area is the lebak zone where rice is grown during the drier season under climatically unreliable conditions. In these two zones, the farmers are employed in agriculture for only six months of the year.

Rubber and other tree crops are grown in the old terrace zone. These smallholdings are badly maintained and low yielding. Food crops such as maize, groundnuts and vegetables are produced in this zone, under shifting cultivation during the wet season. Little attempt is made to crop these lands during the drier season.

The mountain zone is largely under forest cover but there are about 21 000 ha under coffee and pepper.

The state of agriculture is generally poor throughout most of the project area, being restricted by poor soils and lack of water control, resulting in low yields and low incomes. The farming population is underemployed in agriculture and environmental conditions including individual farmer's physical capacity prevent the expansion of farm holdings.

An important factor in socio-economic development planning 1/ is a government-directed programme of transmigration from densely populated Java to Sumatra. Another is the substantial inflow of foreign capital for joint ventures in forestry and agriculture. Furthermore, mining is likely to be expanded and the petro-chemical industry is already expanding.

2 [illegible] RESOURCES AND LAND USE

2.1 [illegible] under cultivation 2/

[illegible] rugt mountainous zone in the west of the project area, totalling some [illegible] a, is still largely covered by forest. However, extensive areas are [illegible] crops such as coffee and pepper, and limited areas of gently sloping and [illegible] are used for rice and vegetable growing. Steep forested slopes are

---

1/ [illegible] Technical Report 3, Plan of Development.

2/ See Technical Report 1 and Ref. 3, 19.

still being cleared for cropping with resulting acceleration of soil erosion. The lower, undulating, heavily dissected old terrace formation of some 1 650 000 ha has been subjected for centuries to shifting cultivation of food crops. In this zone are found the rubber plantations, areas of abandoned rubber, a vast expanse of alang-alang grass (Imperata cylindrica), remains of dryland forests and much belukar (secondary forest). It is estimated that 80 000 ha are cultivated for food crops such as hill paddy, cassava, sweet potatoes and maize.

The lebak zone of some 500 000 ha, lying in the floodplains of the Rivers Ogan and Komering, upstream of Palembang and in the floodplain of the River Tulang Bawang, is cultivated by the indigenous riverine people for about six months of the year - the rest of the year, the land is deeply inundated. Downstream of Palembang, over the delta of the Musi and wide coastal lowlands, in the Musuji basin and in the lower reaches of the Tulang Bawang, lies the mainly swamp jungle zone of 1 500 000 ha. Clearings are made for rice-growing contiguous to the main watercourses and tidal creeks. An indication of the low potential of the soil is that these clearings once abandoned do not revert to the original jungle, but remain sparsely covered by acid-tolerant vegetation.

2.2.2 Soils 1/

A reconnaissance soil survey was carried out revealing the following extent and location of the main soil groups:

	Soil group	Occurrence	Area ('000 ha)
	Lowland soils		
1.	Saline hydromorphic soils	Coastal plains	81.0
2.	Hydromorphic alluvial soils	River banks	149.6
3.	Recent alluvial soils	River banks and floodplains	70.7
4.	Hydromorphic soils	Marshes, swamps and depressions	1 945.1
	Upland soils		
5.	Lithosols, regosols, andosols	Hills and mountain slopes	63.9
6.	Latosols	Undulating to steep uplands	230.7
7.	Red/yellow podzolic soils	Rolling to undulating areas	1 747.1

In general, the soils of the swampy areas after clearing and development show a marked and rapid tendency to acidification and the soils of the old terrace zone, over which shifting cultivation has been practised for centuries, have become acid and lacking in plant nutrients.

It is concluded that the area has a definite potential for some specific types of land use as indicated in Section 2.2.3.

1/ See Ref. 5, 10, 12.

9.7.2 Land suitability 1/

Interpretations of basic soil and land data for suitability classification are only meaningful in relation to specific land uses. Such interpretations of land suitability are detailed in Technical Report 1, and are summarised as follows, for the five specified land use alternatives:

LAND CLASSIFICATION FOR SPECIFIC USES

(ha)

Land use type	Suitable 2/ land	Conditionally 3/ suitable land	Unsuitable 4/ land	Mixed 5/ suitability
1. Unimproved upland shifting cultivation	1 257 614 (29.3%)	-	2 636 092 (61.5%)	394 416 (9.2%)
2. Improved upland crop cultivation	1 754 391 (40.9%)	1 973 105 (46.0%)	104 129 (2.4%)	456 497 (10.7%)
3. Improved pasture	2 173 050 (50.7%)	634 093 (14.8%)	104 129 (2.4%)	1 376 850 (32.1%)
4. Improved tree crop cultivation	1 775 896 (41.4%)	2 059 847 (48.0%)	104 129 (2.4%)	348 250 (8.2%)
5. Improved paddy (wetland) cultivation	335 161 (7.8%)	76 704 (1.8%)	1 888 321 (44.0%)	1 987 936 (46.4%)

1/ See Ref. 2, 3.

2/ Land on which sustained use (for the defined land use type) is expected to yield benefits (ranging from high to low) that will justify required recurrent inputs.

3/ Land having characteristics which, at present, make it unsuitable for sustained use (for the defined land use type) but which, with various very special management practices, could become suitable.

4/ Land having characteristics which preclude its sustained use (for the defined land use type) or which would create production, upkeep and/or conservation problems requiring a level of recurrent inputs unacceptable at the present time.

5/ Land with very mixed suitable, unsuitable and conditionally suitable areas.

The present low ability to produce crops is a legacy from the poor, inefficient farming of the past. Cultivation methods used in most of the project area are crude, subsistence-oriented and basically shifting in character. Shifting cultivation has resulted in widespread soil degradation and the development of a vegetative cover dominated by alang-alang. Land preparation prior to planting is minimal, burning is widespread, and fertilisers are rarely applied. The above factors have resulted in soil exhaustion. Weed, pest and disease control is minimal and the planting material used is often low yielding. Neither machine nor animal power is used for cultivation and over the potential wet rice areas there is no water control. Improvement in the productive capacity of the land and actual yield increases can result only from the adoption of improved farming practices and civil works aimed at improving water control.

2.2.4 Land tenure 1/

A basic requirement for successful agriculture is the assurance in a farmer's mind that the land he works is his own. At the moment, the Government cannot give this essential security of tenure.

In the rural areas, there are few written records of land ownership. Ownership rights over sawah, gardens and permanent plantations are recognised by the village community. The remainder of the marga land is considered as the common domain of the community and such land is allocated to individuals by the village community council (dewan marga) for shifting cultivation. When abandoned after a few seasons of shifting cultivation, the land reverts to the marga. Occasionally such temporarily occupied land becomes 'owned', but the acquisition process is not precisely defined by land rules.

Recent legislation, Presidential and Ministerial decrees, especially over forest exploitation, have had the effect of overriding the traditional land alienation authority of the dewan marga.

Registration of land, even in urban areas, is far behind owing to the lack of trained staff and funds.

Land use and land tenure maps were made by the Directorate of Agraria during 1965 to 1971. These maps are reasonably accurate, but there is inconsistency in that tenure is shown over large areas which are known to have reverted to the marga.

There is a pressing need for alienation of land, but the process must take into account:

i. The rights of village communities under adat law to the communal, but mostly undeveloped, land within the boundaries of each marga.

1/ See Ref. 18.

ii. The rights of entrepreneurs who have signed Forest Exploitation Agreements under the Basic Forestry Law No. 5 of 1967.

iii. The claim of individual indigenous people to undeveloped land within marga boundaries that has, according to adat law, reverted to the marga.

iv. The form of tenure under which allotments should be alienated to transmigrant settlers.

.2. Agricultural practices 1/

Except for areas under tree crops and small areas within and around the villages, the upland of the project area has been subjected to the age-old practice of shifting cultivation. In this form of cultivation the soil receives only minimum working and no fertiliser or lime. The burning-off of vegetation at clearing time destroys much of the valuable humus content of the soil. The areas are abandoned for cultivation when the soil fertility is almost exhausted and crops cannot be raised.

In areas close to permanent settlement some manuring of plots is done but in most cases the villager cannot afford to buy commercial fertilisers or lime. In the sawah areas, a start has been made on seed selection and fertilizer use.

Crop rotation aimed at maintaining the soil fertility is practically unknown. Neither are farming methods aimed at topsoil conservation practised to any extent.

With tree cropping, in the majority of areas only sufficient work is done to permit access to the trees for harvesting. There is little use of fertilisers, or good clones and varieties.

In the lowland areas, increasing acidification of the soil is a potential danger. Failure to adopt the necessary water and soil management methods to preserve humus and prevent over-drainage will result in sterility of the lands now influenced by tidal movement.

2.2.6 Pests, weeds and diseases 1/

Birds, pigs, bears, monkeys, rats and insects all attack the crops, and any off-season crop, such as paddy grown within a fallow area, will be devastated by these pests. Poisoning, scaring and shooting are all methods used to protect the crops but, particularly when dealing with rats, poisoning has to be conducted over large areas at one time. To clear a small area is useless, as reinfestation from surrounding areas is rapid.

1/ See Ref. 22.

Outbreaks of insect pests and diseases have been successfully dealt with by spraying with a suitable pesticide but such operations are largely beyond the means of the farmer. Spraying has to be organised over large areas and usually at the expense of the Department of the Agriculture. At present such activities are restricted by shortage of funds.

The pernicious grass weed, alang-alang, infests some 500 000 ha of the higher area and its elimination is most necessary as a preliminary to rainfed agriculture. Many methods, including the use of herbicides have been tried but the conclusion is that the most effective will be use of pasture grasses and legumes with mechanical ploughing of the soil. Cost effectiveness is, however, the crucial issue.

2.2.7 Animal husbandry 1/

Intensively managed water buffalo, cattle, sheep and goats are usually housed and fed indoors or herded along the roads and canal banks. Extensively managed water buffalo and cattle are found in most villages on the old terrace zone and on fringes of the seasonally flooded area. Cattle are left unattended in the forest for periods of up to three years and only rounded up on rare occasions.

Untamed water buffalo wander in certain forests and are casually rounded up for slaughter or work training.

Pigs are reared in urban areas to satisfy the needs of the non-Muslim groups.

Chicken rearing for eggs and table is practised intensively around Palembang, but throughout the villages and settled areas poultry of very inferior types are kept, mostly on free range.

Ducks are reared extensively in Delitang irrigation area, entirely by farmers originating from Java.

Meat and eggs form part of the diet but few people can afford much of this food. Ranching has just been started at km 34 of the Palembang-Perabumulih road. There is no organised milk production, collection or distribution except for one herd at Pusri, Palembang, but a small quantity of milk products is prepared from some water buffalo herds. About 25 000 kg per year of hides and skins are exported.

2.2.8 Forestry 2/

It is estimated that productive forest resources and other scattered forest areas amount to 156 000 ha of exploitable forest, carrying an estimated 7.2 million m^3 of timber. In addition, the 1.1 million ha of compact swamp forest complex adjacent

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1/ See Ref. 15.

2/ See Ref. 4.

to Palembang holds an estimated 500 000 ha of exploitable forest, carrying an estimated 30 million m^3 of commercial wood.

Utilisation within the project area (and S. Sumatra Province as a whole) is extremely poor and very selective with regard to species. Sawmilling is of a very elementary standard, but is being improved, along with plywood manufacture. Seasoning and timber preservation are not practised.

For improved and continuous exploitation of the forests, it is necessary to:

i. establish a fire control organisation;
ii. control shifting cultivation;
iii. control erosion on steep lands;
iv. widen the range of species trials and improve silvicultural techniques;
v. establish plantations of fast growing general purpose timber in the Baturaja-Martapura area;
vi. make a forest inventory and carry out timber utilisation studies in the Palembang swamp forest complex and then establish a large integrated forest industry;
vii. eliminate eventually log export.

2.3 WATER RESOURCES

2.3.1 Rainfall 1/

The area has a tropical monsoon climate, being hot and humid throughout the year. The heavy rains occur during the northeast monsoon, between December and April. In the periods late April to June and September to November, the area is influenced by southeast trade winds. The bulk of the rainfall (80 percent) occurs between October and May. During June to September (the drier season), very little rain from a weak southwest monsoon falls in the area. Average annual rainfall ranges from 1 800 mm on the coast to 3 200 mm in the western mountainous zone. However, the drier season can be quite wet with a fairly even rainfall distribution throughout the period, the start of the rainy season can be delayed and there can be dry periods during the wet season.

The rainfall pattern and storm analyses (important for drainage design), including intensity and distribution, are recorded in Technical Report 1.

2.3.2 River flows and water quality 1/

Heavy rainfall brings a quick response in the river flows. The flows in the main Rivers Ogan, Komering and Tulang Bawang crossing the project area follow the rainfall distribution pattern. High flows occur in the wet period November to April and the flows are at their lowest in August and September.

1/ See Ref. 9, 16.

The flows are considerably in excess of irrigation needs during the wet season, but during April to September, the dry weather flows will not be sufficient for all the planned off-season irrigation needs, especially if rice is grown extensively in this season. Dry weather flow regulation, utilising storage, will be necessary for the irrigation development envisaged by the project (see Section 3.2).

Throughout the area excepting the lower courses of the Musi and Tulang Bawang, the water is of suitable quality for irrigation.

Salt-water intrusion has been recorded in the Musi up to some 40 km from the mouth. This is an indication that great care will be needed in the selection of pumping station sites for any irrigation development in the coastal and deltaic zone. Land inundation by high tides occurs in the lower river courses but there is no insuperable physical difficulty in completely excluding this flooding.

2.3.3 Groundwater 1/

Over the coastal deltaic zone and the lebak, groundwater rarely falls below 2 m from the surface. This groundwater, particularly in the coastal zone, is acid and saline and unsuitable for human consumption.

Over the old terrace zone where rainfed agriculture will be practised the groundwater has not been quantitatively determined, but the use of such water will certainly be economically unfeasible for agriculture for many years. Its use will be limited to domestic supplies for transmigrant villages.

2.3.4 Fisheries 2/

Natural aquatic resources are extensive and generally well utilised but an increase in production will depend on intensifying the harvest in the less accessible, under-exploited areas.

Culture of fish, shrimp and other aquatic animals has attractive possibilities in several locations of the project area. However, the knowledge of how to do this is lacking, even in the government department concerned. Other fish culture, utilising available waters and food materials, appears to be biologically and economically feasible and could become very important in providing the animal protein needed to meet the nutritional requirements of the expanding human population in the project area.

1/ See Ref. 6.

2/ See Ref. 8.

2.4 INSTITUTIONS AND SERVICES

Facilities for agricultural experimentation and simple trials in the project area are totally lacking. A centre for this purpose should be established and personnel trained for its operation. Basic agricultural research is and should be continued by the Central Agricultural Research Organization, Bogor.

The output of university agricultural graduates from Palembang University it not only very poor, but the present facilities are very inadequate. Similarly, the output of high school graduates is insufficient to meet the requirements of the extension service. It is necessary to expand and improve these teaching institutions.

The agricultural extension staff at all levels need to be strengthened considerably as the present field coverage is poor. This cannot be done until more personnel are trained.

The role of the cooperatives in the development of the rural agrarian society is very important. At present most of the supply sources in a BUUD (village cooperative unit) are private and this results in higher costs for the farmer.

3. RECOMMENDATIONS

The survey and other data collated by the project were used primarily to prepare an overall development plan of the project area. Details of the 30 separate and individual components of the plan are given in Technical Report 3. The recommendations that follow summarise these components within type groupings, and indicate complementary infrastructural improvements necessary for their implementation.

3.1 LAND ALIENATION

The highest priority and urgency should be given to allocating to the smallholder sufficient land for his future well-being and prosperity. The farmer to be successful needs to have security of tenure and to know that the piece of land he works is his own. To achieve this, particularly for transmigrant settlement, it is recommended that Presidential Decree No. 2 of 1974 be rigorously applied and the land alienating authorities (Department of Agraria) in association with the Directorate General of Transmigration undertake the following:

i. Have the lands declared a transmigration area.

ii. Acquire any lands falling within this area that are claimed by individual farmers.

iii. Permit the holders of Forestry Exploitation Agreements to execute their operations in step with the transmigration programme.

iv. Enable the provincial Governor to release from a down marga the land required by the transmigration programme.

v. Negotiate with international organisations prepared to undertake development projects in transmigration areas.

vi. Establish the necessary infrastructure, buildings, roads and train the necessary personnel.

As a prerequisite to alienation the size of the farm unit must be decided upon; this will be largely determined from consideration of cropping plans and capacity of family labour, with or without power assistance. For areas outside transmigration schemes, which are in the main potential irrigation areas, cadastral work should be put in hand, so that a clear picture of land alienation is ready prior to any development planning.

4.2 DRAINAGE AND IRRIGATION DEVELOPMENT

4.2.1 Irrigable lands

A total of 11 individual schemes are proposed. They are listed below with estimated costs up to the year 2000, in five-year periods, which include the necessary expenditure on feasibility studies. Special importance and urgency are given to items 1 and 11; the economics of the latter, however, are based only on reconnaissance-level survey data.

Location No. on Figure	Scheme	Area (ha) Total 292 200	Investment per 5-year period million US$ 1976-1980	1981-1985	1986-1990	1991-1995	1996-2000	Total cost
1	Belitang Proper Irrigation Scheme	20 600	11.24	-	-	-	-	11.24
2	Manggala Irrigation Scheme	2 700	2.67	-	-	-	-	2.67
3	Bakung Irrigation Scheme (near Manggala)	3 700	1.24	2.42	-	-	-	3.66
4	Sukarajo Irrigation Scheme (near Manggala)	7 500	0.06	7.35	-	-	-	7.41
5	Ogan - Keramasan Stage I Irrigation Scheme	3 200	2.55	-	-	-	-	2.55
6	Ogan - Keramasan Stage II Irrigation Scheme	6 000	0.05	4.74	-	-	-	4.79
7	Ogan - Keramasan Stage III Irrigation Scheme	4 000	0.01	2.12	1.05	-	-	3.18
8	Muncak Kabau Irrigation Scheme	7 200	1.51	4.53	-	-	-	6.04
9	Belitang South Extension (Right Bank Komering) Irrigation Scheme	16 000	0.06	6.78	6.72	-	-	13.56
10	Belitang Proper Irrigation Scheme, peripheral extension	21 300	-	-	-	0.16	17.90	18.06
11	Drainage and irrigation development of the lebak area 1/	200 000	3.50	32.0	58.50	62.50	45.00	201.50
Total expenditure/5-year period			22.89	59.94	66.27	62.66	62.90	274.66

1/ The proposal for a project to enable the necessary feasibility study to be carried out under subcontract has already been submitted to UNDP, Jakarta, should be implemented.

3.2.2 Swamp and coastal area

There is still considerable uncertainty on how to develop some 300 000 ha of deltaic swamp associated with the Musi and Tulang Bawang (No. 18 on the Figure) and for what crops. The Government wishes to develop the area for rice growing, but FAO has considerable doubt that this is the optimum use for the land. In order to test alternative proposals it is recommended that a 100-ha pilot scheme be established at Cintamanis (No. 7). The Palembang Rice Estate is currently carrying out experimental work which will show what drainage/irrigation/farm management system is needed for development of rice growing, but there is uncertainty as to whether this work will be continued to give a conclusion.

Furthermore, continued observation of the project's test plot on Upang Island could show that a tree crop with an undercrop is a viable alternative to rice cropping.

In the rest of the forested deltaic and coastal area, modern forest management should be introduced (No. 16). The steps needed to be taken are:

1. No further concessions or licences should be granted for the time being.
2. A forest inventory should be carried out.
3. Silvicultural research aimed at finding the best method for natural and/or artificial regeneration of the forest, should be undertaken.
4. Based on the above findings a pre-investment survey should be carried out to define the costs and benefits of setting up forest industries, supplied with wood raw material through a suitable logging system, with the forests managed under a sustained yield concept and with due regard to the natural and/or artificial regeneration of the forests.

3.3 RAINFED AGRICULTURE

3.3.1 Smallholders

Rainfed agriculture, including tree cropping, is recommended in the main for transmigrants who will occupy the following areas either for mixed farming or nucleus estates:

Location No. on Figure	Scheme	Area (ha)	Remarks
12	Pematang Panggang - Cahaya Bumi	75 000	Under development 6/75 by Directorate-General of Transmigration with FAO assistance
12	North of Menggala across River Tulang Bawang	100 000	By Directorate-General of Transmigration with assistance from World Bank
13	Centred at Rusaringkih east of Martapura Baturaja road	30 000	" "
14	Revised schemes covering largely abandoned transmigrant areas at Way Abung, Way Hitam and Cahaya Bumi	7 000	Need to integrate new settlers with few old established settlers
15	Mesir Hilir	10 000 nucleus 10 000 for smallholders	Under preparation by Directorate-General of Transmigration 5/75 for rubber
15	Peninjauan	10 000	For rubber, oil palm
24	Estates for annual crops, similar to maize growing operation by Matsugoro in Lampung	Units of 4 000 ha	Farm families will provide labour to private estates as well as operating their own smallholdings

3.3.2 **Estates**

In addition to those included in No. 24 above, there are larger areas which are recommended for alienation for estate-type production of rubber and oil palm, e.g. 20 000 ha near Gunung Meraksu, Baturaja (No. 30).

3.3.3 **Rehabilitation**

Assuming that the Government's policy decision will be rehabilitation rather than diversification, the following is recommended.

Location No. on Figure	Scheme	Area (ha)	Remarks
	Coffee estate rehabilitation, South Sumatra, Lampung	15 000 7 000	Rehabilitation also could include complete replanting
	Smallholder rubber rehabilitation (and replanting)	180 000	It is recommended that proposals by Mr. M.E.L. Rabey in a report of 1974 to the Directorate-General of Estate Crops be adopted
27	Pepper garden rehabilitation	10 000	To include replanting

3.4 FOREST DEVELOPMENT AND EXPLOITATION

3.4.1 Swamp forest

One scheme is envisaged covering nearly one quarter of the project area.

Location No. on Figure	Scheme	Area (ha)	Remarks
16	Introduction of modern forest management through limiting present felling, carrying out a forest inventory, silvicultural research on regeneration and a feasibility study on forest industries development	over 1 million	Future forest management must be based on sustained yield concept. The area offers scope for future investment, foreign or local

3.4.2 Dryland forest

Three schemes of widely differing objectives are recommended.

Location No. on Figure	Scheme	Area (ha)	Remarks
20	Establishment of forests for future domestic timber	40 000	Selection trials for suitable species are a necessary preliminary
28	Establishment of forest and wildlife reserve in head waters of River Masuji	70 000	Only block of virgin dry forest left, but is being exploited. Holds valuable herd of 70 elephants
29	Stopping cultivation on steep lands and allowing them to revert to natural cover	20 000 in many locations	No replanting is recommended.

3.5 ANIMAL PRODUCTION

The main expansion of this industry will come from the establishment of mixed farming in the transmigrant areas where each family is expected to keep a few animals for draught and food supply. Two specific projects are recommended.

Location No. on Figure	Scheme	Area (ha)	Remarks
22	Expansion of buffalo herding and milk products	1 000	Would probably be successfully operated as a cooperative
23	Ranching for beef production	20 000	The apparent success of P.T. Gerbis Pratiwiya encourages establishment of more enterprises of this nature

3.6 INLAND FISHERIES

There is an urgent need to investigate pram culture so that the present industry can continue and expand.

Location No. on Figure	Scheme	Area (ha)	Remarks
21	Pram culture pilot scheme	20	Existing pram stocks are in danger of being over-fished

3.7 DEVELOPMENT INFRASTRUCTURE

The successful implementation of the various component plans will depend heavily upon concomitant improvement of related services and infrastructures, particularly extension work.

3.7.1 Agricultural extension, research and cooperatives

Cadres of the agricultural extension services should be up-graded and expanded.

Facilities at the Sriwijaya University, Palembang, should be improved so as to increase the present annual average output at four graduates in agriculture to numbers needed to meet the development requirement.

There is only one High School of Agriculture for the whole Province of Sembawa, producing 60-70 diploma graduates annually. A second School of Agriculture should be established in order to provide village level agricultural extension workers. Alternatively, the existing school could be expanded.

Staff and physical facilities for agricultural research are inadequate. Action should be taken to remedy this. A substation of Bogor with resident research staff should be established within the project area.

The cooperatives should be more directly associated with the supply of inputs, and possibly credit, to the farmers so as to reduce the cost of inputs, and also of marketing. Supplies could also include consumer goods, apart from agricultural inputs.

3.7.2 Medical and educational facilities

Medical institutions and educational facilities at all levels are inadequate. A programme of social development should be initiated in parallel with the agricultural development programme.

3.7.3 Transportation

Transportation facilities in the project area are poor. This is a factor which can seriously militate against the development of market-oriented agriculture and satisfactory farm incomes. The improvement of road and river transport is therefore imperative. This requires a special study to identify priorities and formulate a suitable programme of development.

3.8 FURTHER AGRONOMIC AND RELATED STUDIES

A development centre for rainfed agriculture should be set up in the Baturaja-Martapura area 1/.

The Government has indicated its intention to keep the laboratory going; this is important for the soils studies envisaged in the bridging project.

In hydrology and agrometeorology, it is recommended that a branch of the Institute of Hydraulic Engineering be set up in South Sumatra 2/.

A feasibility study for two years is recommended as an urgent preliminary for the very important project "Drainage and Irrigation Development of the Lebak" (No. 11).

The operation of Cintamanis padi pilot scheme as proposed by the subcontractor Nippon Koei is recommended, but cognisance must be taken of the parallel and similar activity of the Palembang Rice Estate. If this latter work continues, the Cintamanis pilot scheme is not needed.

The controlled-drainage test plot at Upang now needs close attention and observation as there is strong evidence that a tree crop with undercropping may be the optimum way to utilise the coastal and deltaic lands.

Species selection for use on the old terrace lands near Baturaja and Martapura should be started by the Forest Department, with effective permanent fire protection.

3.9 SUMMARY OF MAIN RECOMMENDATIONS

The main plans and other recommendations are summarised below for easy reference:

1/ To bridge the gap between the end of this project and this proposal, a small-scale UNDP project, "Agronomic Trials - South Sumatra", involving an agronomist and a soil scientist has been formulated.

2/ It is understood that the Public Works Department is already taking action on this.

Drainage and irrigation development

i. Steps should be taken to enter into a contract for final design and construction of the Belitang Proper Irrigation Scheme (No. 1).

ii. The feasibility study for the drainage and irrigation development of the lebak area, of two-year duration, should be started in 1976 (No. 11).

iii. The programme of studies leading to completion by the year 2000 of the proposed irrigation projects should be started (Nos. 1-11).

Rainfed agriculture

i. Properly planned transmigration settlement, incorporating mixed and tree-crop farming, now started, should continue over the proposed extensive areas, near Batu Raja, Cahaya Bumi and north of Manggala - on the understanding that expensive and long-sustained inputs are necessary (Nos. 12-15).

ii. Commercially run estates for rubber, oil palm and annual crops are proposed for extensive areas, but the Government needs to give every facility to encourage this development (Nos. 24, 30).

Forest development and afforestation

i. The swamp forest complex should be exploited under modern concepts of forest management based on sustained yield (No. 16).

ii. Afforestation of some 40 000 ha should be started as soon as possible, in anticipation of future domestic timber needs (No. 20).

Environment protection

i. Cessation of shifting cultivation on steeper slopes in the hilly region so that vegetation can regenerate naturally (No. 29).

ii. Establishment of major forest and wildlife reserve over headwater catchment of Musi River, 70 000 ha (No. 28).

Studies and programmes by Government Departments

i. Culture needs of freshwater shrimp (No. 21).

ii. Tree species selection for afforestation schemes.

iii. Improvement of agricultural extension and irrigation services.

iv. Soil and water management needs for permanent agriculture over the lowlands (deltaic and coastal).

v. Thorough investigation of present commercial activity of ranching possibilities in the area (No. 23).

Appendix 1

PROJECT STAFF

Name	Assignment	Arrival	Departure
1. Internationally recruited experts			
D.J. Goodier	Project Manager	November 1969	August 1975
A.G. Pike	Hydrologist	October 1970	July 1972
A.A. Grunberg	Associate expert (hydrology)	July 1971	June 1973
B.A.P. Gemmell	Hydrometrist	November 1972	April 1973
D.R. Harris	Soil surveyor	January 1971	January 1972
R.G. Manca	Soil scientist	May 1971	June 1973
		and March 1974	June 1975
T. Vivekananthan	Water resources engineer	June 1971	December 1971
D. Cirio	Water resources engineer	January 1973	June 1975
F.B. Brown	Agronomist	August 1971	March 1973
M. del Pozo Tronboni	Agronomist	April 1973	March 1974
[illegible] Varga	Agronomist	July 1974	June 1975
[illegible] Tokunaga	Agricultural economist	April 1972	May 1973
S.M. de Silva	Agricultural economist	January 1975	September 1973
M.G.J. Rore	Survey engineer	December 1970	July 1972
[illegible] Poole	Associate expert (soils)	May 1973	February 1974

2. Staff from subcontractor Nippon Koei Ltd., Japan engaged during period August 1972 to [illegible] 1974 both in the field and head office, Tokyo

T. Ide	Hydrologist
S. Nomoto	Soil surveyor
T. Komuro	Drainage and irrigation engineer
T. Kobayashi	Economist
A. Kojima	Irrigation engineer
I. Komatsu	Rice processing expert
T. Kudo	Design engineer and surveyor
H. Kuronuma	Irrigation engineer
K. Onaka	Soil chemist
K. Koeda	Senior irrigation engineer
T. Tajima	Surveyor
S. Tsuda	Design engineer and surveyor

Name	Assignment	Arrival	Departure
T. Terai	Soils engineer		
Y. Tsugawa	Rural sociologist		
H.J. Schophuys	General agriculturist		
M. Sheno	Institutions and extension specialist		
M. Sugawara	Soil chemist		
K. Yamada	Agronomist		
S. Yano	Project engineer		

3. Consultants

H.M. Ernest	Hydrology		
L.W. Ryde	Groundwater	April 1974	
H.S.T. Kere	Tree crops	June-September 1973	
R.W. Larimore	Inland fisheries		
R.G. Dixon	Forestry		
W.J.A. Payne	Animal production		
R.T. Ratnatunga	Land tenure	May-August 1974	
M. Molina G.	Hydrology and agrometeorology	June-November 1974	
F.J. Dent	Land capability	May 1973	February 1974

4. Senior Counterpart Staff

Tjo'Mat M. Jusuf	Co-Manager	November 1969	September 1975
Hatta Hargadalam	Assistant Co-Manager	November 1969	September 1975
Muslimi	Water resources development engineer	December 1970	August 1972
Masalan Hasan	Water resources development engineer	March 1974	June 1975
Sudijarto	Drainage and irrigation engineer	August 1972	June 1975
E. Praptodi Muljo	Hydrologist	October 1970	September 1975
Rasidi	Hydrologist	April 1971	May 1975
Hilman Komasih	Agrometeorologist	August 1971	August 1975
M. Rianto	Agrometeorologist	April 1971	February 1974
Ibrahim Busnawi	Soil surveyor	June 1971	February 1975
Suprapto (Lt. Indonesian Army)	Engineer/topographer	April 1971	July 1972
Isbudiatmo (" ")	" "	July 1972	April 1973
Teguh (" ")	" "	March 1973	March 1974
Sutarno (" ")	" "	April 1974	October 1974
Rosyad (" ")	" "	September 1974	March 1975
Pramono Djojodarmodjo	Agronomist	October 1970	January 1975
Nasir A. Lubis	Agronomist	June 1972	March 1 1975
Rasjid Hanafiah	Agronomist	January 1975	September 1975
Don Purjono	Animal husbandry	April 1972	September 1975
Hamawi Ngabehi	Soil chemist	December 1972	February 1974
A. Ghaffar	Soil chemist	April 1974	September 1975
Saad Nasuhim	Agricultural economist	April 1972	September 1975
Husin Ali	Land tenure	February 1971	September 1975

Appendix 2

FELLOWSHIPS AND STUDY TOUR

1. Fellowships

Name	Subject	Country	Period
E. Priptodi Mulyo	Hydrology	Netherlands	October 1972 to September 1973
Pramono Djojodarmodjo	Agronomy	Philippines and Malaysia	June 1972 to June 1973
Nazir A. Lubis	Agronomy	U.S.A., Egypt and India	March 1975 to March 1976
Ibrahim Busnawi	Soil surveys	Australia	January 1973 to February 1974

2. Study tour

With generous assistance from the Directorate-General of Irrigation and Drainage, Ministry of Agriculture and Lands, Malaysia, the following senior personnel made a study tour of agricultural development projects in West Malaysia in March 1972.

Tjo' Mat M. Jusuf	Co-Manager
Abdurrahman	Head, Department of Agriculture, South Sumatra Province
Pramono Djojodarmodjo	Counterpart agronomist
Mursaha	Drainage and irrigation engineer Dept. of Public Works, South Sumatra
Muslimi	Counterpart water resources engineer

Appendix 3

LIST OF MAJOR ITEMS OF EQUIPMENT PROVIDED BY UNDP

	Value (US$)
Hydrological equipment	24 842.68
Meteorological equipment	4 022.39
Vehicles, boats and spares (10 vehicles, 4 hulls and 6 outboard engines)	32 381.92
Survey equipment and camping supplies	16 536.93
Soils survey equipment	1 493.66
Laboratory equipment and supplies	18 427.22
Office equipment	3 025.12
Agronomy equipment and supplies (seeds, pesticides, etc.)	36 039.14
Total	**136 769.06**

Appendix 4

ABSTRACTS OF KEY TECHNICAL REPORTS

FAO. Land and Water Resources Development in Southeast Sumatra, Indonesia. Land, water and forestry resources. Rome, 1976. 164 p., 40 figs, 10 maps. AG:DP/INS/69/518, Technical Report 1.

The Government of Indonesia together with the United Nations Development Programme and the Food and Agriculture Organization of the United Nations carried out a project in Southeast Sumatra during 1970-75. Objectives included making a basic technical inventory covering the water resources (hydrometeorological aspects, water quality and groundwater), land suitability, and forests and forest production, of an area of 4.5 million ha.

Problems in the planning of water resources concern uneven distribution of rainfall in time, indicating the need for supplementary irrigation, and constant annual flooding making intensive cropping during rainy months hazardous. The high water-table presents a difficulty in water management. Except in areas where tidal waters intrude, the water in the project area is of good quality and can be used to irrigate any type of plant or soil group. The most favourable areas for potential groundwater development are the anticlinal structures near Palembang, Parabumulih and Muara Enim and in the vicinity of Baturaja. Other possible sites are where the Muara Enim coal, the Air Benakat sand and clay, and the Baturaja limestone or the Talang Akar shale outcrop or lie at relatively shallow depths. A systematic investigation is required to determine the quantities of groundwater available. The potential for utilising groundwater for dry-season irrigation is sufficiently favourable to warrant further investigation into hydrogeological conditions.

A land suitability classification was developed for unimproved shifting cultivation and, under improved practices, for upland crops, pasture, tree crops and paddy (wetland) rice.

In the forestry sector, the basic requirements have been pinpointed as regional rural fire control; control of shifting cultivation; erosion control on steep lands; species trials; the establishment of plantations of fast-growing general purpose timbers in selected inland areas; forestry-inventory and timber-utilisation studies in the Palembang swamp forest complex, and the establishment of an integrated forest industry.

Appendix 5

LIST OF OTHER DOCUMENTS

(a) Working papers and end-of-assignment reports prepared on the project:

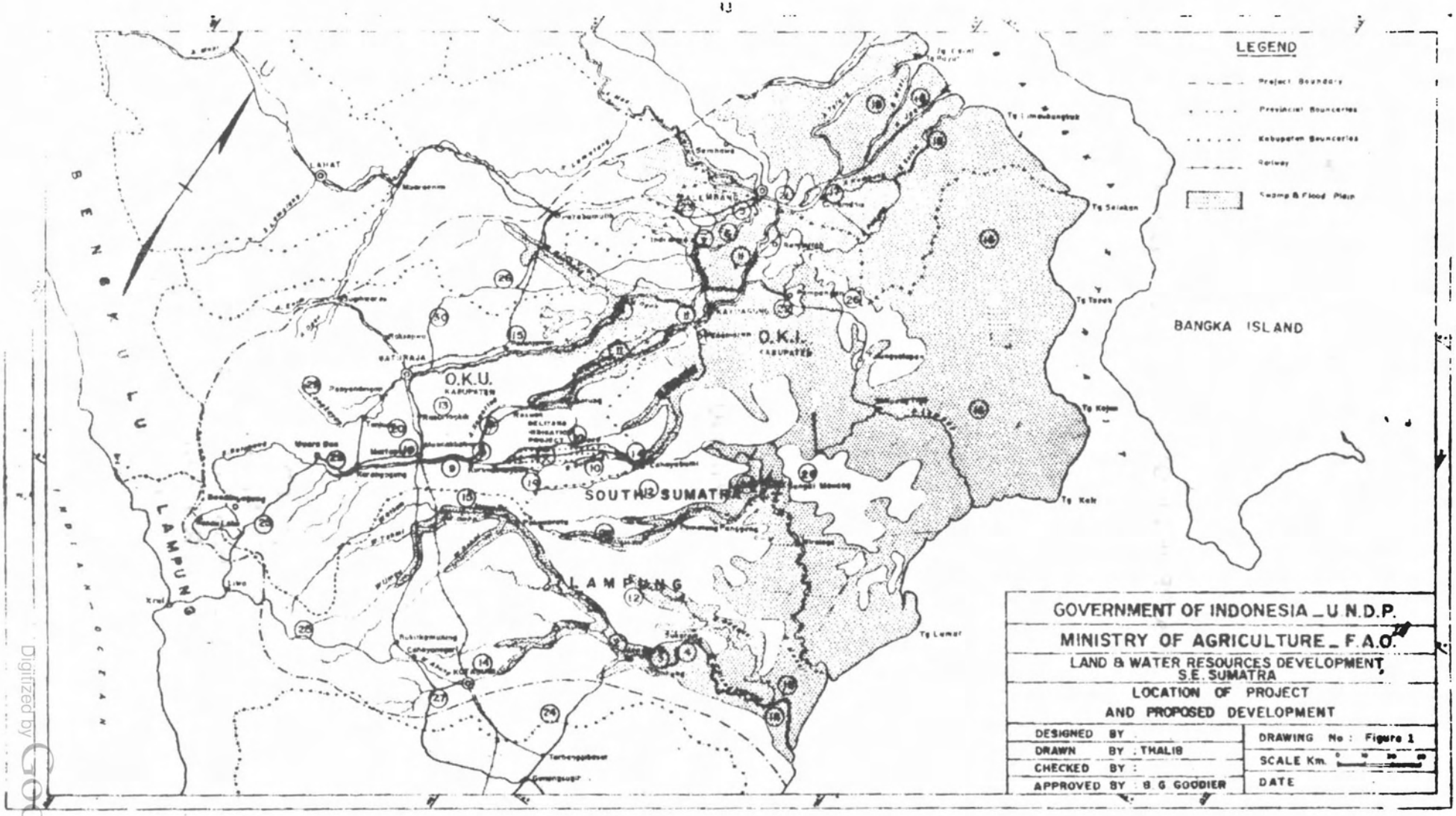
Reference No.	Principal author and date of issue	Title	Office where copy deposited
1	F.R. Brown February 1973	Interim report on rice cultivation	Dept. of Agriculture, S. Sumatra
2	D. Giric June 1975	Menggala I.S. Feasib. Study Ogan Keramasan I.S. " Muncakkabau I.S. " Lebak area Reconnaissance	Dept. of Agriculture, S. Sumatra Ministry of Agriculture, Jakarta FAO, Rome SAA
3	F.J. Dent February 1974	Land capability	SAA FAO, Rome Project INS 72/011, Bogor Ministry of Agriculture, Jakarta Transmigration Department Office of Governor, S. Sumatra
4	R.G. Dixon June 1973	Forestry in Southeast Sumatra	FAO, Rome Department of Forestry, Jakarta and Palembang Department of Agriculture, S. Sumatra Office of Governor, S. Sumatra
5	D. Harris and R.G. Menon January 1973	Reconnaissance and semi-detailed soil surveys (Report and 8 appendices)	Soils Research Institute, Bogor Dept. of Agriculture, S. Sumatra FAO, Rome
6	L.W. Hyde June 1974	Reconnaissance investigation of groundwater resources potential	FAO, Rome Ministry of Agriculture, Jakarta SAA

Reference No.	Principal author and date of issue	Title	Offices where copy deposited
7	H.S.T. Kerr September 1975	Tree crops	Dept. of Agriculture, S. Sumatra SAA FAO, Rome
8	R.W. Larrimore December 1972	Fisheries in S.E. Sumatra	Dept. of Agriculture, S. Sumatra Governor of S. Sumatra Dept. of Fisheries, Jakarta and at Palembang Ministry of Agriculture, Jakarta FAO, Rome
9	Medardo Molina G. November 1974	Hydrometeorological analyses and evaluation	FAO, Rome Hydrology Section, P.W.D., S. Sumatra Lampung Hydrological Project, Tanjung Karang Ministry of Agriculture, Jakarta
10	R.G. Menon February 1975	Changes in acidity and salinity of soils from Upang Island during dry season 1974	Dept. of Agriculture, S. Sumatra Ministry of Agriculture, Jakarta FAO, Rome
11	R.G. Menon March 1975	Laboratory studies on effect of lime on 2 soils and fixation of phosphorus by 3 soils from S. Sumatra	Dept. of Agriculture, S. Sumatra Ministry of Agriculture, Jakarta FAO, Rome SAA
12	R.G. Menon April 1975	Work and investigation in soils laboratory	Dept. of Agriculture, S. Sumatra Ministry of Agriculture, Jakarta FAO, Rome SAA
13	R.G. Menon May 1975	Effect of micronutrients on growth and yield of rice plants grown in 2 soils in greenhouse	Dept. of Agriculture, S. Sumatra Ministry of Agriculture, Jakarta FAO, Rome
14	R.G. Menon July 1975	An assessment of water quality in rivers of S.E. Sumatra	Dept. of Agriculture, S. Sumatra Ministry of Agriculture, Jakarta

Reference No.	Principal author and date of issue	Title	Offices where copy deposited
15	W.J.A. Payne June 1972	Possibilities for livestock development in S.E. Sumatra	Dept. of Animal Husbandry, Jakarta and S. Sumatra FAO, Rome Ministry of Agriculture, Jakarta
16	A.G. Pike July 1972	Interim summary of hydrological and meteorological data	Hydrology Section, P.W.D., S. Sumatra Institute of Hydraulic Engineering, Bandung FAO, Rome
17	R.L.H. Poels February 1974	Salt rise study (incomplete)	Dept. of Agriculture, S. Sumatra
18	R.T. Ratnatunga August 1974	Land tenure	SAA Transmigration Dept., Jakarta Dept. of Agraria, Jakarta Ministry of Agriculture, Jakarta FAO, Rome
19	M.G.J. Rose August 1972	Topographic and photo-grammetric surveys	Dept. of Agriculture, S. Sumatra
20	R.M. Tokunaga December 1972	Population forecasts	Dept. of Agriculture, S. Sumatra
21	R.M. Tokunaga February 1973	Food self-sufficiency	Dept. of Agriculture, S. Sumatra
22	R.D. Verma June 1975	Agronomy of project area	Dept. of Agriculture, S. Sumatra SAA FAO, Rome

(b) Reports prepared by Nippon Koei Co., Ltd., Tokyo, 1973

1. Feasibility study of the Belitang Proper Irrigation Scheme
2. Feasibility study of the Cintamanis Agricultural Development Project
3. Reconnaissance study of agricultural development in the Belitang extension area.



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DRAFT

A PROFILE OF RURAL CONDITIONS IN INDONESIA

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PRESENTED AT THE BRAINSTORMING SESSION
OF THE NATIONAL ACADEMY OF SCIENCE AND
PEPUNAS PANEL ON SCIENCE AND TECHNOLOGY
FOR INCREASING RURAL PRODUCTIVITY
JAKARTA, JUNE 5 - 8 - 1979

A PROFILE OF RURAL CONDITIONS IN INDONESIA

by

Sediono M.P. Tjondronegoro*)

The Country

Presumably any attempt to present a profile of such a vast archipelago as the Republic of Indonesia - comprising approx. 13,660 bigger and smaller islands with an estimated total land surface of 190 million hectares-will be guilty of rough generalisations and is bound to overlook many of the local specificities.

Yet on the other hand without such a generalised presentation of the current state of affairs it many not be possible for foreign and interested scholars to acquire a more substantial, though still in broad terms, understanding of Indonesia's rural problems.

The following delineation is meant to provide the reader a reference frame, which he may want to use in dealing with more specific problems to which the present brainstorming session has been devoted.

The country, declared as an independent republic on August 17, 1945, stretches some 5, 110 kilometres from east to west along the equator from Sabang in the Province of Aceh to Merauke in the southern part of the province of Irian Jaya, and some 1,888 kilometres from north to south. It lies astride the main shipping channels joining the Middle East and Europe with Asia and the Pacific.

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Faculty at the Social Economics Department, Bogor Agricultural University.

Among the bigger islands are Kalimantan with 28 percent of Indonesia's total land area; Sumatra: 25 percent; Irian Jaya: 22 percent; Sulawesi: 10 percent; Java and Madura: 7 percent; Nusatenggara: 4 percent and Maluku 4 percent.

For administrative purposes the Republic has been subdivided into 27 provinces with the inclusion of the youngest province of East Timor. The term province also refers to socalled "special regions" (daerah istimewa) such as Aceh, Yogyakarta and Greater Jakarta.

For historical as well as political reasons these provinces and autonomous units have been created coinciding with at least the major ethnic and linguistic groupings.

Provinces and special regions alike have been further uniformly subdivided into some 241 Kabupatens (districts) and 49 municipalities, all with some regional autonomy.

Moreover, kabupatens comprise smaller administrative units known as Kecamatan (sub-district) which comprise a varied number of desas or villages.

According to recent counts of the Department for Interior the number of Kecamatans and that of villages amounts to 3,258 and 60,645 respectively.

In provinces of Java this administrative hierarchy has been known for longer than a century, while in outer provinces of Indonesia autonomy was given under Dutch colonial administration to indigenous communities such as Marga, Nagari and others.

The country is still predominantly agriculture in character with around 10 percent of the total population living in urban centers. The small town is the more typical conglomerate of urban dwellers; the near-million or million cities are fewer in number and include Semarang. Yogyakarta, Bandung, Medan, Ujung Pandang and Surabaia, all of them provincial capitals.

The capital city of Jakarta with an estimated population of around 5 million, is by far the most metropolitan in nature, bearing characteristics of an Asian primate city.

With improving infrastructure and means of communication over land, sea and air, geographical mobility of the population between islands and between rural areas and urban centers are increasing rapidly. However, the main stream of population movements is perhaps from the bigger islands to densely populated Java; to a lesser extent from Java and Bali to nearby provinces on other islands across the Java sea. Many of the latter category has been referred to as 'transmigrants', both subsidized by the government and spontaneous ones i.e. moving partly or wholly on their own initiative and depending on their own financial resources.

It should be noted that inmigrants (to Java) consist by and large of a non-farming population, whereas the bulk of the out-migrants (from Java) are usually subsistence farmers and landless farm laborers.

Few comprehensive studies of a national scope-if any-have so far been undertaken on the composition of rural-urban migration. The rush for higher level education and also for white collar jobs among the educated young has been recognized*).

As the farming population is concerned there are few indications regarding more precise percentages of rural-urban migrants who are virtually landless or are still subsistence farmers owning a small piece of cultivable land, however, inadequate to sustain a family of five for the whole year even if the accessibility of irrigation water enables the farmer to have two harvests annually. This latter category of farmers has been associated with cultivators on holdings of about a quarter of a hectare or less.

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*) Suharso etal, Rural-Urban Migration in Indonesia. Jakarta, LEKNAS, LIPI, 1976. Monograph Series.

Topography and Climate

The islands of the Indonesian archipelago are mountainous with a central range running almost their entire length. Considerable volcanic activity, however, occurs recurrently in the Sumatra - Java - Bali - Nusa Tenggara chain, but more particularly on Java and Bali the younger volcanoes due to eruptions are supplying the fresh layers of fertile soil.

This process of natural rejuvenation of the soil has made Java and Bali one of the world's most fertile islands, attracting large numbers of population and enabling the maintainance of high population densities in a traditional setting.

On the island of Java the central mountain range leaves a wider coastal strip to its north. Since many bigger rivers run to the north forming estuaries along Java's coast they appear to supply the abudance of water needed for wet sawch rice cultivation in the northern plain. Even prior to the establishment of the Dutch colonial regime, simple irrigation systems were already constructed by villagers in low land areas. Mountain slopes have been cultivated somewhat later.

One fortunate fact is that Java has not had to cope with serious drainage problems as have some of the other bigger islands such as Southeast Sumatra, Southern Kalimantan and Southern Irian Jaya.

On map 1 swamp lands of Indonesia*) the areas with tidal influenced swamps are indicated roughly. There has been ideas in circles of the Public Works Department to develop about one million hectares of these tidal areas for new settlement areas or transmigration areas. Over the period of Pelita II (2nd Five Year Development Plan) 1974/75 - 1978/79 surveys had been carried out by university based soil scientists and agronomists. Research stations were established in South Sumatra and South Kalimantan provinces.

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*) Courtesy of Dr. William L. Collier.

In the subsequent Table 1*) hectareages of land in different types of terrain by major island groups are presented to acquire an overall impression of amounts of land as related to topography and their agricultural potencies.

For more detailed scrutiny Table 2 showing estimated hectareages and distribution of soil types by major islands of Indonesia, is worth studying.

While most of Java's northern plains have become vast well irrigated rice producing areas, Sumatra's southeastern lowlands are still suffering of drainage problems. Sediment disposal of bigger rivers in Java tend to widen the coastal area sometimes up to tens of meters into the sea, creating new opportunities for milkfish cultivation in brackish water ponds and even cultivating second crops such as peanuts and some corn. Gradually coconut trees may grow.

On hill slopes at higher altitudes smallholders as well as larger estates cultivated with perennial crops making considerable profits on the world market such as tea, cocoa, cinchona but also coffee and rubber.

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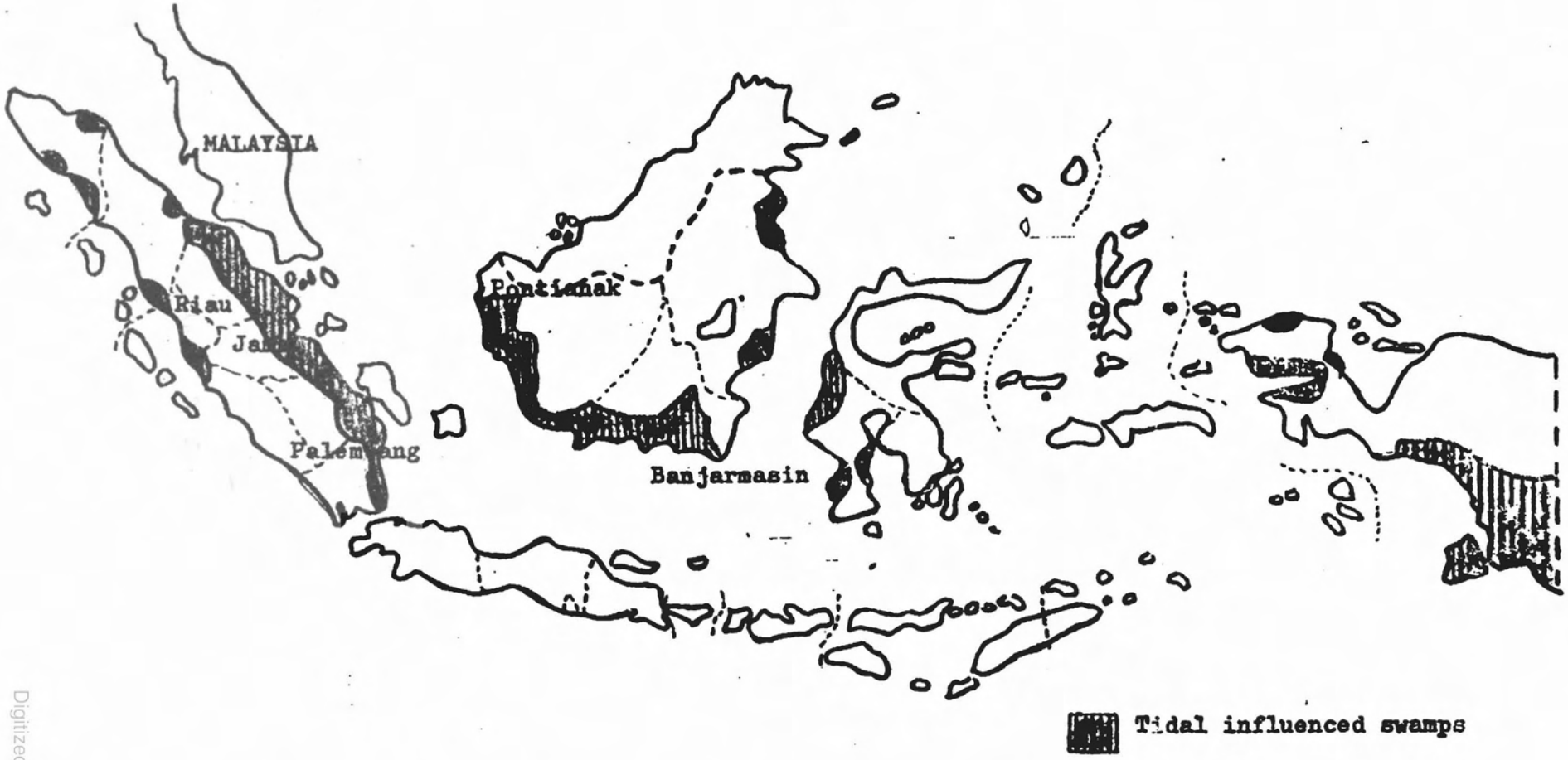
*) Courtesy of Dr. William L. Collier.

MAP 1

SWAMPS LANDS OF INDONESIA



Source: WILLIAM L. COLLIER, "Resource use in the tidal swamps of Central Kalimantan: A Case study of Banjarese and Javanese rice and coconut producers". Presented the International Symposium of Tropical Ecology, Kuala Lumpur, 1979.

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Table 1 : Amount of Land in Different Types of Terraine and Soils by Islands

Islands	Terraine and Soil Types (in million of Ha)							
	Swampy land mainly organic soils and alluvials		Almost level or gently undulating to hilly land a/		Mountainous land b/		Total	
	Total area	Area with ag. potential	Total area	Area with ag. potential	Total area	Area with ag. potential	Total area	Area with ag. potential
Java, Madura, Bali	4.6	3.7	4.1	3.2	5.3	1.1	14.0	8.0
Sumatra	17.9	1.8	17.7	14.2	16.4	3.3	52.0	19.3
Kalimantan	18.7	3.7	14.0	11.2	22.3	2.2	55.0	17.1
Sulawesi	1.8	1.1	5.4	4.3	15.8	1.6	23.0	7.0
Nusa Tenggara and Maluku	.5	.2	8.8	7.1	5.7	.6	15.0	7.9
Indonesia (excluding Irian Jaya)	43.5	10.5	49.3	40.0	65.5	8.8	159.0	59.3
Presently cultivated								17.5

Source: Indonesia Agricultural Sector Survey, IBRD, 1974, Annex 1, p. 20.

a/ mainly red-yellow podzolics, ferrasols, red-brown mediterranean soils and regosols.

b/ mainly lithosols and andosols.

Table 2 : Estimated Hectareage and Distribution of Soil Types by Major Islands of Indonesia (x 1,000)

Soil Types Indonesian (USDA)	Java/ Madura	Bali	Sumatra	Kalimantan	Sulawesi	Irian Jaya	Nusatenggara	Maluku	TOTAL
Organosol (Histosol)	25	-	6,781	6,469	-	10,875	-	-	24,150
Aluvial (Entisol)	2,550	31	6,238	5,644	1,363	2,575	281	488	19,170
Regosol (Entisol/ Inceptisol)	1,431	219	831	150	294	-	688	294	3,907
Rensina (Mollisol)	38	-	394	-	138	369	13	719	1,671
Grumusol (Vertisol)	1,481	-	-	-	56	-	263	-	1,800
Andosol (Inceptisol)	844	-	2,725	1,225	156	-	94	12	5,056
Mediteran (Altisol)	1,625	56	-	-	2,938	106	3,068	50	7,843
Latosol (Inceptisol/Oxisol)	2,831	250	6,788	4,469	2,856	356	313	519	18,382
Podsolik Merah-Kuning (Ultisol)	325	-	15,950	14,525	1,494	12,002	-	3,231	47,526
Podsol (Spodosol)	-	-	931	4,081	-	-	-	-	5,012
Kompleks (Bagian besar Podsolik)	2,069	-	6,725	17,437	9,800	15,313	2,319	2,162	55,822
Other	-	-	-	-	-	605	-	-	605
T O T A L	13,219	556	47,363	54,000	19,095	42,200	7,038	7,475	190,946

In parenthesis USDA Soil Taxonomy, 1974

Source: Paper by S. Koljasi and K. Soepraptohardjo presented at the Symposium on the Prevention and Upgrading of Marginal Lands in the Context of Area Development in Jakarta, 27-29 Oktober 1975. Soil Research Institute, Department of Agriculture in Bogor.

Vegetation

According to Karl J. Pelzer*): "Rainfall rather than temperature regulates agricultural activity in Indonesia. Temperatures are nearly constant, differing only a few degrees between the warmest and coolest months, and they range from a daily low of 74°F to a high of about 88° in the plains and between 64° and 80° on the interior plateaus. Rainfall, however, varies greatly in timing, distribution and amount. All of Borneo, all of Sumatra except for portions of its northern tip, eastern and southern Celebes, New Guinea, and the Moluccas have an average rainfall of 80 inches or more. Northern and eastern Java and northern Celebes receive between 60 and 80 inches, while the lesser Sunda Islands, closest to Australia, have only 40 to 60 inches. As we have seen, the amount of rain received by an area depends to a considerable degree on its relation to the moisture-bearing monsoon winds".

Heavy rainfall has no doubt contributed to the growth of dense tropical rain forest which still covers large parts of Indonesia's land surface. (Table 3)

Estimates by Hatin Soedarma of the Directorate General for Forestry in the mid-seventies indicate that some 121 million hectare (approx.63 percent) is still covered with forest.

Forest area under exploitation represents only about 26 percent of total forest land, while hydro-orological forest area with a protective function constitute approx.42 percent:

Total waste land comprises some 13 percent of total forest area, and in several provinces part of the idle savanah grass land is allocated to transmigrants for new human settlements.

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*) Karl J. Pelzer, "Physical and human resource patterns" in Ruth Mc Vey, Indonesia. New Haven, HRAF Press, 1963. p.4

In order to get an impression of agricultural possibilities in the country one should study Table 4 more carefully in which figures relevant to distribution of land capabity (LC) by major islands are presented.
It is perfectly clear that the Ist through IIIrd class soils are largely found in Java, Sulawesi and parts of Sumatra.
Yet even in Java and Madura these soils are relatively scarce and constitute about 12 percent of the total landsurface of Java and Madura. In Sulawesi it is only 5.6 percent, and much lower in Sumatra.

The classes IV to VIII are in much greater abundance, indicating that once primary and secondary forests have been cut, intensification of agricultural practices using improved technologies becomes inevitable, even more so if increased yields are targeted.
The ecological conditions of Indonesia's plans have enabled man to cultivate the staple food crop rice in a variety of ways ranging from rainfed sawah to well irrigated field and even floating rice cultivation in swampy area such as in South Sumatra.

Almost everywhere where Javanese farmers settle themselves horticulture seems to develop rapidly. Cultivation of fruit trees, vegetables as well as other plants for the benefit of their flowers, leaves or even roots are customary.

With the very uneven population distribution in the country, "about 9 percent of the land area supports nearly two-thirds of the population; or, reciprocally, more than 90 percent of the land supports approximately one-third of the population"*).

The Javanese and Balinese farmers have adapted themselves to rice cultivation on "terrace as an ecosystem", its extraordinary stability or durability being the degree to which it can continue to produce year after year, and often twice in one year, a virtually undiminished yield.

*) C. Geertz, Agriculture Involution; The process of ecological change in Indonesia. Berkeley, University of California Press, 1963. p. 12. Op.cit. p. 29.

Table 3 : Hectareage of Forest Land by Province in Indonesia

No.	Province	Total Land Surface (Ha)	Total Forest Land (Ha) (tentative)	Forest Under Exploitation (Ha)	Hydro-Orological Forest (Ha)	Nature Conservation (Ha)	Other Forest Land (Ha)	Waste Land (Ha) Shrub	Waste Land (Ha) Idle (incl. savanah grass land	Notification
1.	Aceh	5,539,200	4,179,700	1,720,700	850,000	836,800	3,007,500	-	490,000	
2.	North Sumatra	7,078,700	3,078,423	532,263	1,571,266	200,336	774,557	-	1,559,475	
3.	West Sumatra	4,977,800	2,360,000	697,960	1,665,000	16,149	-	65,000	160,000	a) Incl.
4.	Riau	9,800,00	6,600,000	2,300,000	1,000,000	500,000	2,800,000	600,000	300,000	approx.
5.	Jambi	4,492,400	3,697,500	27,700	363,275	-	1,358,105	792,228	113,175	3,500 ha
6.	South Sumatra	10,500,821	5,458,324	878,067	583,259	-	2,000,000 Reserve	-	2,000,000	under exploitation
7.	Bengkulu	1,944,900	820,000	207,983	611,060	957	-	53,000	20,000	
8.	Greater Jakarta	3,558,400	1,011,303	385,325	294,840	330,900	295,000 Reserve	150,000	350,000	b) Incl. approx. 8,000 ha
9.	Greater Jakarta	56,000	1,133	395	40	63	-	587	-	under exploitation
10.	West Java	4,738,397	996,600	529,305	309,412	97,882	-	40,020	291,830	
11.	Central Java	3,420,628	656,487	518,105	134,415	3,967	-	- a)	-	
12.	S.R. Yogyakarta	318,577	16,714	15,120	1,488	23	83	- b)	-	c) Presently
13.	East Java	4,792,200	1,342,447	680,200	633,100	107,429	-	96,000	-	considered
14.	West Kalimantan	14,676,000	9,760,000	2,500,000	5,000,000	30,203	2,250,000 c)	100,000	400,000	as forest
15.	Central Kalimantan	15,477,600	13,075,400	2,476,000	4,016,000	684,000	5,898,400 c)	50,000	200,000	under
16.	South Kalimantan	3,690,030	2,036,960	1,299,800	757,160	30,000	-	90,000	444,060	exploitation
17.	East Kalimantan	20,244,000	17,292,000	7,612,335	6,960,000	328,500	2,391,165 c)	30,000	470,000	
18.	South Sulawesi	6,079,972	3,065,313	263,013	1,278,777	10	-	500,000	700,000	
19.	Southeast Sulawesi	3,814,000	1,716,000	392,189	1,323,802	9	-	75,000	1,790,000	
20.	Central Sulawesi	5,403,300	3,998,505	1,910,120	1,677,958	198	410,229	146,100	370,286	
21.	North Sulawesi	3,606,228	2,150,000	950,000	1,300,000	6,171	-	70,000	450,000	
22.	Maluku	8,572,800	6,000,000	1,800,000	1,500,000	80	2,500,000	100,000	100,000	
23.	Bali	548,406	124,999	29,092	95,907	22,272	-	12,224	-	
24.	West Nusatenggara	2,078,900	774,027	75,522	649,505	49,000	-	100,000	300,000	
25.	East Nusatenggara	4,787,900	928,708	46,608	882,100	50,500	-	100,000	300,000	
26.	West Irian	41,600,000	31,000,000	5,000,000	18,000,000	1,000,000 c)	4,000,000 c)	1,000,000	2,000,000	
	INDONESIA	192,435,000	121,089,000	31,926,684	51,399,263	4,295,480	27,695,05	4,070,139	12,508,827	

Source: Annex to paper by M. Hatin Soedarma presented at the Symposium on the Prevention and Upgrading of Marginal lands in the Context of Area Development in Jakarta 27-29 October 1975. Directorate General for Forestry, Department of Agriculture.

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Table 4 : Estimated Hectareage and Distribution of Land Capability by Major Islands of Indonesia (X 1,000 ha)

Class LC	Jawa/ Madura	Bali	Sumatra	Kali-mantan	Sula-wesi	Irian Jaya	Nusa tengga-ra West/Est	Maluku	TOTAL
I	275	-	-	-	-	-	-	-	275
II	344	19	-	-	275	-	94	-	732
III	969	-	631	-	806	-	138	25	2,569
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	22,543
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
TOTAL	13,219	556	47,363	54,000	19,095	42,200	7,038	7,475	190,946

Note: Class LC I to VIII accord. Soepraptohardjo (1964)
I - III similar to S (Suitable))
IV - VI similar to CS (Conditionally Suitable)) accord. LPT/FAO (1975)
VII/VIII similar to US (Unsuitable))

Source: Paper by D. Muljadi and M. Soepraptohardjo presented at the Symposium on the Prevention and Upgrading of Marginal Lands in the Context of Area Development in Jakarta, 27-29 October 1975. Soil Research Institute, Department of Agriculture in Bogor.

As Geertz describes it: "The answer to this puzzle almost certainly lies in the paramount role played by water in the dynamics of the rice estate. Here, the characteristic thinness of tropical soils is circumvented through the bringing of nutrients onto the terrace by the irrigation water to replace those drawn from the soil, through the fixation of nitrogen by the blue-green algae which proliferate in the warm water; through the chemical and bacterial decomposition of organic material, including the remains of harvested crop in that water; though the aeration of the soil by the gentle movement of the water in the terrace; and, no doubt; through other ecological functions performed by irrigation which are as yet unknown".

Apparently the supply and control of water is the most important aspect of irrigated rice cultivation, and given the adequate control of water supply paddy will grow in a wide range of soils and in many climates.

Thanks to the development of vaster irrigation systems in lowland areas of Java in particular after the middle of the 19th century it was also possible to grow sugar cane and in the 20th century also rosella and cotton.

Finally, with regard to climate it may be said that although all of Indonesia is pratically characterized by a tropical rain forest with high humid climates, and high temperatures around 30° centigrade with heavy rains, the Western part is wetter than the islands to the east.

Table 5 shows figures related to landuse and vegetation*) partly by major islands.

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*) Courtesy of Dr. W.L. Collier.

Table 5 : Land Use and Vegetation (in million of Ha)

			TOTALS
1. Forested land			
Primary Rain		80.0 a/	
Mix		1.5	
Secondary		19.6	
Mangrove, Coastal and Swamp		17.7 a/	
Kalimantan	6.1		
Sumatra	6.9		
Sulawesi	-		
Java & Madura	.1		
Maluku	.1		
Nusa Tenggara	-		
Irian Jaya	4.5		
Teak Plantation		.9	
Non-Teak Plantation		.3	120.0
2. Agricultural Cropland (harvested or planted)			17.5
3. Other lands			
Secondary grasslands		n.a.	
Natural savannah		n.a.	
Rocky wilderness		n.a.	
Urban settlement		n.a.	
Mining and Quarrying		n.a.	64.4
Total			201.9

Source: Indonesia Agricultural Sector Survey, IBRD, 1974, Annex 1, p. 22 and Annex 6, Appendix 1.

a/ This includes areas which were once forests but are now open grassland, cultivated or in some other way converted.

Landuse and Agriculture

By and large outside Java and Bali land utilization is featured by extensive ways in view of labor shortage. Map 2 shows the distribution of unproductive and less productive lands for agriculture, indicating the need for more intensive farming with improved technology in the near future. Practically all of Java, Madura and Bali is being cultivated in types of sedentary agriculture today, and it is conceivable that with growing population desities villages found a permanent location. As was previously explained they became the smallest administrative units, not only in Java but throughout the country.

Given the wide distribution of unproductive and less productive soils landholding and farmsize need to be larger than has been the case for the average farmer in Java.

Presumably based on such considerations migrants moving to transmigration settlements in Sumatra, Kalimantan, Sulawesi and even Irian Jaya have been allocated at least two hectares. Several more recent transmigration schemes have even allocated up to 5 hectares in order to provide the farmer a more substantial asset for the future. The hope is that subsistence farmers will develop themselves into better entrepreneurs capable of running a mixed farm, not merely concentrating on the cultivation of staple food crops but also on cashcrops, perennials and making some headway in the direction of animal husbandry or poultry farms.

Small holders rubber cultivation and cattle breeding have now come to be the new pattern of transmigrant farms in South Sumatra.

Rice cultivation, however, remains widespread also in transmigration settlement areas. Over the past two Pelita periods since 1969 the government has embarked upon a policy to achieve a state of self sufficiency in rice production.

MAP 2

Approximation of the Distribution of Unproductive and Less Productive Lands for Agriculture in Indonesia

Naturally unproductive (dry, cold, hot lava)

Naturally less productive (histosol, spodosol, ultisol, litosol)

Unproductive soils due to mining

Source: MAP in a paper by D. Muljadi and M. Soepratohardjo presented at the Symposium on the Prevention and Upgrading of Marginal lands in the Context of Area Development in Jakarta, 27-29 October 1975 Soil Research Institute, Department of Agriculture in Bogor.

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However, with population growth and the increase of number of rice consuming families in the country the target of selsufficiency seems to be further away than ever.

Extension of the cultivable area, irrigation rehabilitation, land reclamation through tidal swamp area development (pasang surut) are part of the government's high priority programs for the past 10 years.

High yielding variety paddy seeds are being imported and local seeds further developed into resistant varieties to with stand the leafhopper (Nilaparfata Lugens) from destroying the rice harvests mercilessly, which it has been doing in potential rice producing areas of Java, but also outside it.

Table 6 shows a classification of areas potentially able of producing rice under various ecological conditions*) in Indonesia.

Rice varieties in swamp areas usually are of the long maturing variety, however, in certain areas it is still possible to harvest twice a year. Excessive rainfall and floods are a constant danger.

An idea of the structure in the agriculture sector can be obtained from the comparison of the two agricultural census data conducted in 1963 and in 1973.

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*) Courtesy of Dr. W.L. Collier.

Table 6 : Present (1978) Classification and Area of Rice Land in Indonesia

Classification	Area (Ha)	Rice crop/ Year	Crop area Ha/Year
1. Upland (padi gogo)	1,168,360	1	1,168,360
2. Irrigated Lowland (Pengairan Padi Sawah:			
a. Guaranteed (teratur)	1.070,780	2	2,141,560
b. Partial (setengah teratur)	839,840	1 - 2	1,557,220 a/
c. Simple	1,981,530	1 - 2	2,972,290 b/
3. Rainfed Lowland (tadah hujan)	1,772,470	1 - 2	2,215,580 c/
4. Swamp (lebak)	253,869	1 - 2	317,340 c/
5. Tidal (pasang surut)	557,823	1 - 2	697,280 c/
6. Polder (polder)	9,640	1 - 2	12,050 c/
T o t a l	7,704,500		9,913,310

Source: Compiled from various sources by Drs. Haeruddin Tasliri, Central Research Institute of Agriculture.

a/ Assumed 75% double cropping

b/ Assumed 50% double cropping

c/ Assumed 25% double cropping

Table 7 : Agricultural Structure

Item and Year	Small holders (X 1,000)	Large estates (X 1,000)	TOTAL (X 1,000)
Number of farm units			
1963	12,236.5	1.1	12,237.6
1973 a/	14,253.7	1.7	14,255.4
Land Surface			
1963	12.9	1.6	14.5
1973	13.9	2.2	16.1

Source: Draft Agricultural Development, Pelita III, 1978

a/ Excluding Maluku

In the following Table 8 more data are presented pertaining to hectareages per farm unit by major islands.

Table 8 : Average Hectareage Per Farm Unit By Major Islands

Island	Smallholders farm		Large Estate	
	1963	1973	1963	1973
Indonesia	1.1	0.98	1,420	1,222.2
Java & Madura	0.7	0.64	823	876.5
Sumatra	1.8	1.34	2,925	2,212.7
Kalimantan	2.6	2.71	1,180	697.1
Sulawesi	1.1	1.38	199	542.4

Source: Draft Agricultural Development, Pelita III, 1978.

Similarly based on the above census data more elaborate calculations have been performed to show Gini ratios of sawah and dry land distribution for the year 1963 and 1973.

Table 9 : Gini Ratio of Sawah and of Dry Land in 1963 and 1973

Land Type	1963	1973
Wet rice field (sawah)	.4163	.4327
Dry Land	.6137	.6206
Sawah and dry land	.5529	.5527

Source: Draft Agricultural Development, Pelita III, 1978.

It can be read from the above Table 9 that over a period of ten years, between two consecutive agricultural censuses the distribution of types of landholdings has not changed significantly.

The Gini ratio for each land type was relatively larger in 1973, indicating larger disparities if compared to the 1963 situation.

Taking the two landtypes together, however, the figures suggest a slight distributional improvent over the same decade. The conclusion can also be drawn that sawah field is somewhat more equitably distributed than dry land. One reason may be the fact that approximately 37 percent of all dry land is on Java, where the individual dry land holdings are very tiny.

Indonesia has more often been perceived by laymen as a highly fertile country with great agricultural potencies, however, soil scientists do not all share this optimistic view.

According to Muljadi and Soepraptohardjo*) red-yellow podzolic soils constitute about 47.5 million hectares, while

*) D. Muljadi and M. Soepraptohardjo. Ibid.

organic soils about 24.2 million hectares. Both soil types are found in the vast plains but while the former are found in dry areas the latter are found on wet areas.

These soils are categorized as socalled marginal lands or also referred to as problem soils with low agricultural capabilities varying between class IV - V, in the classification which Soepraptohardjo applied. Map 2 shows the distribution of such problem soils widely distributed over the islands of the archipelago, and covering about 37.7 percent of the total land area.

Over the period of Pelita I and II since 1969/70 agricultural infrastructure as well as technology have undoubtedly been expanded and considerably improved.

Rice intensification has made rapid progress in the 1974 - 1977 period such that the total harvested area rose from 3,724,000 hectares in 1974 to 4,229,000 hectares in 1977. After intensification total rice production increased from 8,458,000 tons in 1974 to 9,557,000 tons in 1977.

As regards second crops such as cassava, sweet potatoes, peanuts and beans the total harvested area in the first 4 years of Pelita II tended to decline, however, in terms of production there was a slight increase e.g. 2.44 percent for cassava; 0.73 percent for sweet potatoes; 8.92 percent for peanuts and 5.47 percent for beans.

Production figures of corn and soybeans over the same period on the other hand showed a decline of 3.89 percent and .39 percent respectively.

As Indonesia's staple food is concerned, intensification of paddy cultivation brought about an increase of rice production between 1974 - 1977. The following Table 10 shows figures of

rice production in tons per hectare. It should be noted that the 1977 figures were tentative, and that the brown leafhopper (Nilaparvata Lugens) plague affected potential areas in Java badly as of 1974/75.

Table 10 : Rice Yields After Intensification per Hectare, 1974 - 1977

Intensification Method	1974	1975	1976[a]	1977[b]
Sinar (regular)	2.22	2.11	2.19	2.10
Sinar (improved)	2.36	2.33	2.49	2.45
Average	(2.33)	(2.29)	(2.45)	(2.38)
Inmas (regular)	1.98	1.82	2.06	1.98
Inmas (improved)	2.21	.09	2.32	2.23
Average	(2.12)	(2.01)	(2.23)	(2.15)

Source: Annex to Presidential speech on the eve of Independence Day, August 16, 1978.
Note: a) corrected figures
b) tentative figures

Other infrastructural conditions in the rural areas and in support of intensification have been improved by the government as can be seen from Table 11.

Table 11 : Infrastructural Conditions in Village Unit Areas, 1974 - 1977

Number of	1974	1975	1976	1977	Average 1974 - 1977
Village Unit Areas	3,500	4,832	[illegible]	7,961	5,67[illegible]
Field Extension Workers	4,525	4,343	[illegible]	8,434	6.02[illegible]
BRI village branches	2,539	2,824	2,988	[illegible],159	2.[illegible]
KUD - NKD (corps)	2,119	3,67[illegible]	3,911	4,159	3,7[illegible]6
Fertilizer Silos	4,0[illegible]	5,39[illegible]	[illegible],77[illegible]	7,833	[illegible]

Source: BIMAS Central Management Body, Bank Rakyat [illegible], and Directorate General for Cooperatives.

Another potential resource in agriculture which can be further developed is certainly fisheries, both in land and along the coast in brackish water fishponds.

Table 12 : In Land Fishery

Type of Culture	Production (in Metric Tons)*)
Fresh Water Pond	54,739
Sawah Cultivation	24,811
Brackish Water Pond	66,756
Cage Cultivation	503
T O T A L	146,809

Fresh water ponds are additional in come resource, and for that matter usually owned by the better off farmers with larger landholdings. They need less care and advanced technology in comparison to the brackish water ponds along the coast. More labor is needed and in order to make the enterprise more profitable greater investments are needed. The more profitable ponds are seldom less than 1 hectare in size**).

Sea or Marine fisheries are bigger enterprises but also need higher technology, better organisation, more capital investment such that it is basically no longer a small farmer's operation.

Fishermen living in coastal villages and who are in marine fishing business are often the laborers rather than entrepreneurs.

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*) Statistical Pocketbook Indonesia, 1976. p. 131

**) See Harjadi Hadikoesworo's contribution on brackish water fishponds in Indonesia, in Interim Report on Land Problems . Office of the Minister of State for Research. 1978.

Man and Land

As has been reported above the population has been growing at an annual rate 2.3 percent; overall national fertility seems to be constant and death rate declining although it is expected that by the end of Pelita III (1983/84) the growth rate should have been reduced to 2.0 percent*).

Agricultural extensification in Java, Madura and Bali are no longer an adequate answer to Indonesia's population problem, such that large scale transmigration or inter island migration, particularly away from Java and Bali has been programmed for the future. Already under Pelita II the number of transmigrants to be moved under government sponsored and subsidized settlement schemes was targeted at 1.25 million people or about a quarter of a million families.

Although 50.000 or so families were actually migrated to the outer provinces, the target for Pelita III has been stepped up to 500,000 families, perhaps world's most ambitious programme resettlement.

Since the early nineteen seventies the idea has no longer been correcting the uneven population distribution in the country; the government has very much in mind a large scale area development through the establishment of new settlement areas. Part of such settlements are located off the connecting highways now under construction such as the trans-Sumatra Highway.

Most of the projected transmigration settlement-except for land reclamation in tidal swamp areas-will no longer depend on irrigation systems, but will be developed into larger farms on upland.

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*) Presidential speech on the eve of Independence Day. August 16, 1978.

Transmigration as a national program has been increasingly integrated, and the coordinating function in this concerted effort between a number of Departments (Public Works, Agriculture, Interior and Transmigration Manpower) is in the hands of the Minister for Transmigration and Manpower.

After completion of the entire process of recruiting, moving and settling the transmigrants settlements will be handed over to the provincial administration concerned. Governors are also requested to state their needs for additional manpower (= transmigrants) and indicate where they could best fit in the context of area development*).

Despite these efforts it is felt that transmigration has not successfully relieved Java and Bali from the burden of their population pressures.

Generally speaking the government approach toward area development in rural hinterland is believed to be integrated and based upon two principles, one is economic potency and the other is administrative division.

Not only is the country subdivided into 10 economically potential regions, but down to sub districts there are "village unit areas" sustained by 600 - 1,000 hectares of sawah. The physical borders of such a village unit do not have to coincide with administrative borders of a village, however, in actual practice the administrative units i.e. Kecamatan and desa still prevail in the management of natural as well as human resources.

Successes recorded by the Family Planning programmes to reduce births in rural areas are still being scrutinized. Some demographers question whether it is a temporary slow down of births, or whether the sample areas were not adequately representative for even Java, Madura and Bali.

*) See J.M. Hardjono, Transmigration in Indonesia. Kuala Lumpur, Oxford University Press, 1977. Directorate General for Transmigration. Transmigration in the context of Are Development. Jakarta, 1974. Directorate General for Transmigration. The Role of Transmigration in National and Regional Development. Jakarta, 1974.

Meanwhile average population densities have reached around 630 people per square kilometre in Java and Bali (1975), further increasing to 760 per square kilometre in 1985 and 1960 in the year 2000*).

The agricultural sector contributed almost 37 percent to GDP. Medium range projection**) indicated that the contribution of agriculture will decline to 28 percent in 1985, and 20 percent in the year 2000. It is envisaged that other non-agricultural sectors (manufacturing, industry and services) will grow and attract more manpower.

In absolute terms, however, agriculture will grow one and a half times between 1975 - 1985, and three and a half times in the remaining decade up to the year 2000.

Agriculture is expected to remain a major source of income for a larger portion of the population. Twenty five million people or 66 percent of the labor force still found a living from agriculture in 1971. Absolute numbers are to increase to 28 million in 1985 and 34 million in 2000, however, percentagewise there will be a decline to 50 percent (1985) and 40 percent (2000) of total labor force.

With a growing population and increasing (fertile) land scarcity, farmers practicing sedentary agriculture in outer islands are in need of either larger farms or more capital and a profitable market for their produce.

Land has become increasingly competetive outside Java and Bali because of differences in landutilization and farming practices.

In his book Agricultural Involution, C. Geertz has made a clear distinction and presented an excellent description of the two prevalent types of ecosystems***), where inner and outer Indonesia are contrasted.

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*) Office of the Minister of State for Research. Interim Report on Land Problems, Jakarta, 1978.

**) LEKNAS, Study of the Long Range Perspective of Indonesia's Economy up to the year 2000.

***) C. Geertz, Agricultural Involution; The Process of Agricultural Change in Indonesia. Berkeley & Los Angelos, University of California Press, 1963. Chapter 2, pp. 12-37.

The former refers to Java, Madura and Bali, while the latter to the socalled "outer islands" i.e. Sumatra, Kalimantan, Maluku, Nusa Tenggara and also Irian Jaya.

The two ecosystems have also given way to a development of distinct agricultural patterns, and population densities.

Java and Bali's soils and irrigation net works even prior to Dutch colonisation had been capable of sustaining greater numbers of sedentary rice cultivators. On the island of Java it was only West Java which adopted a sedentary agricultural pattern less than 200 years ago. Swidden cultivation was then more wide spread.

After the middle of the 19th century Dutch and British economic interest established large estates for the cultivation of perennial crops such as tea, cocoa, rubber and coffee.

In the plains of Java to the north and south of the central mountain range irrigation systems were developed-sometimes by connecting existing in digenous and simpler systems-for the cultivation of rice, sugar cane, and later also of rosella and cotton.

It was this ecosystem that enabled the country to support nearly two-thrids of its population on the basis of 9 percent of the country's land area. Or, reciprocally, more than 90 percent of the land area supports approximately one third of the population only.

Put in density terms, Indonesia may have about 71 persons per square kilometer; Java has around 700, and the more crowded areas of the central and east-central parts of the island more than a thousand.

On the other hand the outer islands have an average density of about 30 people per square kilometer, and as Geertz hilariously

described it: "if ever there was a tail which wagged a dog, Java is the tail, Indonesia the dog*).

Land problems have in the course of time taken more serious proportion. The landreform problem in fact became a challenge to many cabinets in the first decade of Republican rule. A Basic Agrarian Law (No. 5) was passed in 1960 and implementation and enforcement of landreform laws started a few years later. Conceivably it became an issue in the political party struggle up to the abortive coup in September 1965. Since than the landreform issue has been perceived as a program of leftist parties. However, as development plans in the nineteen seventies also required land for infrastructure expansion and construction of government as well as private factories and plants, the landreform question revived.

Land purchase and speculation for unproductive purposes became alarming and often both have been stimulated by both income disparities and inflationary trends. Investment in land is considered to be the best form of saving.

Toward the end of 1977 the President requested the landreform issue to be studied since part of the social discontent is believed to root in the land question.

The Minister for Interior has made statements underlining the validity of the Basic Agrarian law of 1960, and that it could function as the basis for today's Indonesia's land policy. So far, however, the approach of the government toward landreform is looking for solutions to urgent cases, rather than reenforcing the laws and regulations in a comprehensive fashion and nationwide.

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*) C. Geertz. op.cit. p. [illegible].

Human Settlements

Different types of human settlements seem to have developed along with ecological differences in inner and outer Indonesia. In Java and Bali villages comprise fairly large compounds of individual houses occupied by nuclear families. Such villages are located in most cases close or adjacent to the sawah field and there is a sophisticated balance between the number of population and the available sawah average. There is a tendency among a younger generation of villagers to leave the villages and look for non-agricultural jobs in nearby towns.

Indebtedness in Java's villages is believed to be widespread and serious, and albeit hard to de lineate in figures, the role of the middle-man as a go-between urban interest on the one side and rural needs on the other is a complex net work which also hinders the growth of strong rural cooperatives.

Monetized economy is gaining wider domains of influence, further eroding traditional institutions. One example may be the "shared poverty system" which seems to be gradually replaced by more rational ways of purchasing. This-as W.L. Collier argues-includes the customary group harvesting (derep)and the traditional reward in kind (bawon) being gradually replaced by pre-harvest purchase of maturing paddy (tebasan).

Some problems ensuing from it are lesser opportunities to supply the family rice bowl, concomitant with loosening loyalties in rural communities. More adult members of the family are now forced to find work outside the villages, and bring in additional income from non-agricultural jobs. Presumably this is one reason why the informal sector in urban centers is growing.

Settlement patterns in outer Indonesia are somewhat different. Population densities may be around 30 people per square kilometre.

The term kampong is more popular to refer to villages, but the term desa has been formalized to refer to bigger and smaller rural agglomeration of individual households. Such kampungs are usually located along provincial and smaller roads passable for motorized traffic, and sometimes for animal drawn carts only.

Since by and large swidden cultivation is the basic agricultural pattern in outer Indonesia the kampong can also be seen as the permanent major dwelling place. However, the shifting cultivator and his wife are often staying outside the kampong, particularly during the rainy season until harvest time.

More in land and uphill shifting cultivators build their wooden or bamboo cottages on stilts amidst dense to secondary forest. They come in smaller groups of 6 or 10 families staying separately somewhat distant from one another, but in the same area. Each individual'homestead' (Umbul or talang) is surrounded by a fence of stumps and branches to protect the field against wild swine and other animals. Administratively these outposts on swidden plots are not recorded as hamlets even.

Although the average shifting cultivator can also be considered as subsistence farmer in his ecological systems, by and large he is better off than the Javanese subsistence farmer, since he owns more cultivable land. A newly opened forest area of about one hectare is first used to grow upland paddy varieties; this may be continued to 3 consecutive years or longer, depending on the soil fertility.

As yields decline the plot is transformed into a coffee garden, and lastly into a rubber "forest", practically left without maintenance until the trees can be tapped.

Meanwhile the shifting cultivator has moved to find new rice plots somewhere else, allowing nature to heal the wounds of the slash and burn system.

Given the scarcity of manpower and abundance of land as well as low technology, the swidden cultivation is by far the most rational way of utilizing natural and human resources.

Presumably the rubber tree has been selected for several reasons, of which the first is its productivity to provide additional money income; second is their capability to compete against the growth of other trees in the forest, and third is its age or survival, enabling the cultivator to use it as a clear token for reclaiming his swidden plot.

In areas where the soil consists of better podzolics swidden cultivators have a greater choice. Pepper trees are cultivated on better soils, and although they can be productive until over 20 years, they certainly do need a more intensive cultivation, including frequent weeding and cover trees. Moreover, some additional manpower for weeding is usually needed; such that the owner of a small holder's pepper estate is willing to hire farm laborers.

Often pepper and coffee producing regions invite seasonal weeders; or indigenous pepper and coffee growers offer to spontaneous migrants a piece of land in exchange for certain labor inputs.

One swidden cultivator may usually have only a one hectare plot for food crop, however, his coffee, pepper or rubber plots may reach a manifold of that size: 10 hectares or more.

In several areas where irrigation systems are developed, swidden cultivators-the natural guardians of their Marga land-often maintain sawah field also worked by Javanese migrants on a 50 - 50 basis.

Cultivation of food crops comes natural to the Javanese farmer, while perennial cash crop cultivation and part of the marketing come more natural to the outer Indonesians.

Apart from the two main settlement patterns as described above there are still the rather isolated spots where socalled "alienated clans" are surviving at a technologically low level. In the southern part of Sumatra, the east and central parts of Kalimantan and Irian Jaya efforts are undertaken by the Department for Interior to resettle such "alienated clans" and bring them closer to towns where they also get access to the modern infrastructure e.g. roads, markets, educational and health facilities.

New modern styled Kampongs are designed and built by the government where in effect traditional dwelling patterns are being replaced by an agglomeration of houses for nuclear families.

There are a number of considerations on the part of the government to implement such resettlement programs. One is accelerating the process of socialization into a technologically more advanced society, another consideration is to discourage the clans from practising swidden cultivation, and a third consideration is to put them under more effective administration. Particularly in the border areas of for instance Kalimantan, the third consideration becomes even more important in the context of securing such areas from smuggling and communist infiltration.

Pelita III

Planned development into the nineteen eighties, or popularly known as Pelita III has taken a pronouncedly different course presumably under the pressures of a mix of domestic and international factors.

It was preceded by a difficult period for the government of having to solve the Pertamina crisis, to overcome the hurdles in food production and to fight morbid corruption [illegible] ranks of its bureaucracy*).

In the international scene problems pertaining to the world's energy crisis and the continuing economic recession including the monetary crisis.

Domestically the prelude to the general elections of [illegible] 1977 showed indications of socio-political discontent [illegible] in or around bigger provincial capital cities; the [illegible]ral areas remained seemingly unaffected by the major crises [illegible]erred to above**).

The overwhelming victory of the government party, Golkar, was anticipated; it placed the party in a strong position but not without difficult and very crucial problems for the duration of the current, and perhaps also coming, Pelitas to solve.

One of those problems is how to overcome staple food shortages with an increasing number of rice consumers. Already now Indonesia has become the world's biggest rice importer.

Another crucial problem is that of poverty and serious underutilisation of labor. The increasing numbers of capital intensive textile, cigarette, chemical and vehicle/assembling factories have apparently not provided adequate job opportunities to the millions of unemployed, many among them rural based.

*) S.M.P. Djondronegoro, "Recent Indonesian Rural Development: Dilemma of a top-down approach" in Southeast Asian Affairs 1978. Singapore, ISEAS, 1978. pp. 139-150.

**) [illegible] Liddle, "The 1977 Indonesian Elections and New Order Legitimacy" in Southeast Asian Affairs 1978. Singapore, ISEAS, 1978. pp. 122-138.

Poverty studies in urban and rural studies have been undertaken since 1972 and the research findings and conclusions have come up with a growing number of measurements e.g. money income, equivalent rice consumption and (researches are well on their way to define not only the rice but the totality of) "consumption basket"*).

A more precise specification of the content of the "basic needs" is being elaborated by various government and private research institutes.**)

Meanwhile the discussion about the "poverty line" continues; the offical figure being 30 percent of the population living under the poverty line***). Several university researchers have come to higher figures by using different measurements.

For all the above reasons the third Pelita which has started only recently has besides maintaining high targets in terms of production also strongly emphasized distributional aspects, such that it has more often been referred to as the national program for greater equity.

Indeed eight avenues to ward equity have been outlined i.e.:

(a) meeting the basic needs of the many, more particularly food, clothing and housing;

(b) equitable access to education and health;

(c) equitable income distribution;

(d) equitable access to employment opportunities;

(e) equitable chances in entrepreneurial undertakings;

(f) equitable opportunity to participate in development particularly for the youth women; and

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*) See Sajogyo's Report on Applied Nutrition Program. Bogor, LPEP, 1974, and Hendra Esmara, Pertumbuhan Ekonomi, Pembagian Pendapatan dan tingkat Kemiskinan di Jawa-Madura, 1967-1976. Padang, LPER, Andalas University, 1977. _____, Pembagian Pendapatan dan Kemiskinan di Jawa-Madura, 1970-1976. Padang, LPER, Andalas University, 1977.

**) See Soedjatmoko, "National Policy Implications of the Basic Needs Model" in Prisma, 1978. _____, "Development and Freedom" (Ishizaka Memorial hectures, 1979).

***) Presidential Speech on the opening session of the People's Council, January, 1979.

(g) a more even distribution of development efforts over the entire country;

(h) equitable access to justice.

Yet the first steps to ward greater equity may take three to four Pelita's to realize targeted goals.

In line with the current "spirit of equity" a variety of programs in the social sector is also being implemented e.g. austerity program; anti corruption drive; revelation of the Panca Sila State doctrine for all members of the bureaucracy etc.

All efforts are geared to the achievement of seven goals to which the President has referred to as Sapta Krida*):

(1) social justice
(2) economic growth
(3) national stability
(4) a clean and respected bureaucracy
(5) National integration and unity
(6) general election in the spirit of Panca Sila democracy
(7) active non-aligned foreign policy to strengthen national resilience.

Whatever hurdles may have to be overcome the basic philosophy of Pelita III has created a foundation, which-if consistently guiding the steps of program implementation-will have far reaching implications, not as yet fully realized by policy makers and executives in rural areas.

Bogor, May 28, 1979

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*) Presidential speech on the eve of Independence Day, August 16, 1978.

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CONCLUSIONS
OF
1978 ENERGY WORKSHOP
ON
ENERGY SUPPLY FOR RURAL AREAS *)

Prospective Energy Sources for Rural Areas in the Third Five-Year Plan.

The Workshop concluded that the most prospective energy source which could be made available in rural areas during the Third Five Year Plan (Repelita III) would be firewood, agricultural waste and electricity.

Production of firewood and agricultural waste in the past 10 years were:

Year	Jawa (tons)		Outside Jawa (tons)	
	Production	Consumption	Production	Consumption
1967	1,427,119	21,692,860	35,011,278	11,831,863
1971	1,370,729	27,764,186	47,957,264	15,959,768
1976	1,257,046	37,126,680	51,866,492	21,264,842

Waste products which continued to increase outside Jawa Island need to be utilized through processing into a form suitable for consumption. In Java where environmental conditions require careful attention, planting of wood intended for firewood and processing of agricultural waste are a must.

If these two could be implemented, then in the next stage the effect that could be expected would be savings in the consumption of oil products.

The role of firewood and agricultural waste in terms of the role of oil can be observed in the following table, in million tons of coal equivalent (TCE) :

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*) Organized by the Indonesian National Committee of the World Energy Conference, Jakarta, 24 - 25 May, 1978.

Year	Firewood and agricultural waste consumption (million TCE)	Oil Consumption (million TCE)	Total Energy consumption (million TCE)	Firewood & agricultural waste as % of Total
1967	15.922	7.375	23.297	68.3
1971	17.531	9.549	27.080	64.7
1976	19.720	18.420	38.140	51.7

It is obvious from the table that the contribution of firewood in fulfilling energy needs has decreased percentage wise, due to among others the provision of subsidies to oil products such that they are accessible to rural communities, with the aim of reducing environmental damage as a consequence of use of firewood.

Therefore it is recommended that :

a. to utilize agricultural waste as an energy resource for rural areas there needs to be improvements in transportation capability or logistical aspects as well as in its technology (for instance improvements in furnaces using saw-dust waste).

b. to continue to supply firewood for rural energy needs by increasing its supply by improved planning, implementation and regulation of tree planning schemes, for instance planting of the species Caliandra.

In this way the growth in the consumption of oil products could be checked and the spreading of deforestation of river banks and mountain slopes could be prevented.

It is clear that utilization of electricity to meet rural energy needs is simple and efficient, especially for illumination. It could be expensive, however, if not well planned, built and operated.
The formulation of a good rural electrication program will entail several policies, among others

(a) assigment of locational priorities
(b) financing
(c) planning and construction
(d) management and development, and
(e) people's purchasing power.

To avoid delay in the electrification of rural areas the posibility is always open to local governments and other institutions to introduce electricity in rural areas as an interim electrification before particular areas could be reached by the national PLN network.
The Workshop commended the plans drawn up for fiscal year 1977/1978 i.e. construction of generating plants in 142 villages in the whole of Indonesia and for the year 1978/1979 in 231 more villages, as well as the targets set up for the Repelita III namely all "swasembada" (self-sufficient) villages.
This program should be part of an overall national electrification program with full assistance and support from the Government and the society as a whole.
For this purpose due attention should be given to the problems of capital, management, operation and develoment. both at the production end as well as consumption end, among others by the development of the small-industries sector in rural areas.
As energy source for electricity branching from the public network could be used or alternatively from micro-hydro power stations.

The role of solar energy needs to be considered to assist in overcoming lack of energy. At this stage it could be used for telecommunications purpose, such as microwave relay stations. The large scale use of solar energy could possibly be achieved in the not too distant future. In advanced countries houses have been built which utilize solar energy as an energy source.

The use of geothermal energy should be done to the maximum extent possible. As regards the possibility of using other energy forms, such as coal, wind, bio-gas and bio-mass energy, research activities need to be increased by making experimental projects in larger scale.

In the implementation of using all forms of energy sources, attention needs to be paid and sufficient steps need be taken to protect and conserve the soil and the environment.

Jakarta, 26 May 1978.

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