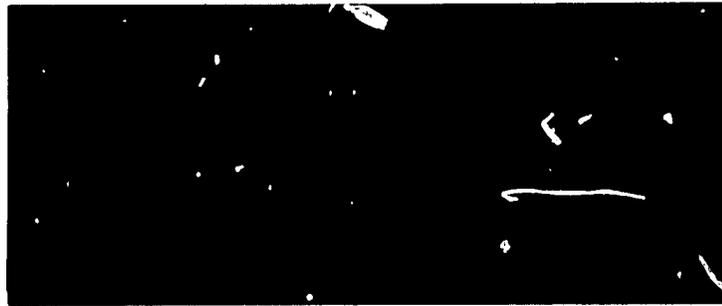


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The basis for  
US applied  
Crypto Research  
Prog

497-0302



Multinational Agribusiness Systems Incorporated

REVIEW OF THE PROPOSED APPLIED CROP  
RESEARCH PROJECT  
FOR  
KALIMANTAN, SULAWESI AND  
MALUKU, INDONESIA

Submitted to the Agency for International Development  
in Fulfillment of Work Order No.5  
Contract #AID/SOD/PDC-C-0218

April 4, 1980

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# Multinational Agribusiness Systems Incorporated

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April 4, 1980

Mr. Walter Tappan  
Chief, USAID/Agriculture  
Jakarta, Indonesia  
U.S. Agency for International  
Development  
Department of State  
Washington, D.C. 20523

Dear Mr. Tappan:

We are pleased to submit the enclosed assessment of Indonesia's agricultural research capabilities. The report represents an appraisal of a proposed project aimed at strengthening the national agricultural research network, as well as of priority problems and constraints to development. Conclusions and recommendations for certain possible courses of action are suggested in the summary assessment.

MASI wishes to thank you for considering our firm for this assignment and hopes the report will serve a useful purpose in your planning efforts.

Sincerely,

Gaylord L. Walker  
Vice President & Director  
Development Services Division

GLW/KAT  
Enc.

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## ABBREVIATIONS

USAID	-	United States Agency for International Development
MASI	-	Multinational Agribusiness Systems Incorporated
AARD	-	Agency for Agricultural Research and Development
CRIA	-	Central Research Institute for Agriculture
LP3	-	" " " " " (Indonesian acronym)
GOI	-	Government of Indonesia
CR&DIFC	-	Central Research and Development Institute for Food Crops (consolidation of CPIA & HRI)
HRI	-	Horticulture Research Institute
ICRI	-	Industrial Crops Research Institute
ECRI	-	Estate Crops Research Institute
IFRI	-	Inland Fisheries Research Institute
FTRI	-	Fisheries Technology Research Institute
FRI	-	Forestry Research Institute
SRI	-	Soils Research Institute
AHRI	-	Animal Husbandry Research Institute
ADRI	-	Animal Disease Research Institute
FPRI	-	Forest Products Research Institute

PREFACE

A team, recruited by Multinational Agribusiness Systems Incorporated, a Washington based consulting firm, was sent to Indonesia for USAID. The team members were Dr. Hiroko Horikoshi-Roe, anthropologist from the University of Washington, Mr. Michael Cremer, fisheries specialist from Auburn University, Dr. Willem Van Eck, forester from the University of West Virginia and Dr. Roy L. Lovvorn, retired agronomist from North Carolina State University, Team Leader. The team was contracted to ".....assess, verify and make recommendations as to the feasibility of proposed projects which aim at strengthening the national agricultural research capability by increasing the network of regional research stations in Kalimantan, Sulawesi and Maluku Islands, designed to address particular crops or crop combinations as they might be influenced by specific agro-climatic factors peculiar to the conditions on those islands". In this context agricultural research was defined as including food crops, estate crops, industrial crops, animal husbandry, fisheries and forestry. The team was also asked to review the organizational structure of the Agency for Agricultural Research and Development of the Department of Agriculture, and to determine the needed authority and responsibility of inter-island operations and necessary linkages with other institutions, extension services, and universities.

Cremer, Horikoshi-Roe and Lovvorn arrived on January 23 and departed March 9. Van Eck arrived January 28 and left March 2. Dr. Subijanto, Head of Horticultural Research, Agency for Agricultural

Research and Development, served as the local expeditor for contacts and arrangements. The team was directly responsible to Mr. Walter C. Tappan, Chief Agricultural Officer, USAID/Jakarta.

Briefings began in Jakarta where Mr. Tappan outlined the needs of AID in making the feasibility study and continued in Bogor where all of the Central Research Institutes were visited, the latter for the purpose of learning more of their research programs and more specifically of their anticipated research in Kalimantan, Sulawesi and Maluku. The team visited 5 proposed research sites in South Kalimantan, 2 in Central Kalimantan and 3 in East Kalimantan. They also visited 8 proposed sites in South Sulawesi, 2 in North Sulawesi and 2 on Ceram. A detailed itinerary is included in Annex I.

It should be noted that since all members of the team did not see all proposed sites a slightly different format developed among them.

I. SUMMARY ASSESSMENT AND RECOMMENDATIONS RELATIVE TO RESEARCH PROPOSALS

A. Introduction

This report is basically divided into three sections:

The first section entails a general overview of research in the agricultural, forestry and fisheries sectors of Kalimantan, Sulawesi

and Maluku. included as annexes are descriptions, analyses and recommendations for the individual research institutes and experiment stations. Where applicable, these annexes will treat the fisheries sector.

The second section of the report examines the AARD, its organization and the role it plays in the agricultural sector. Also treated as integral links in the country-wide research system are universities and extension activities.

The final section deals with a social and economic analysis of research needs in Indonesia and discusses the feasibility of sites for proposed research and experiment stations.

## B. Technical Assistance

### 1. General

A total of 151.7 person-months of short- and long-term technical assistance has been requested for the agricultural research strengthening project (Table I). While technical assistance is given a first priority rating by the team, particularly for its usefulness while local scientists are away training, many of the requests for technical assistance are considered excessive. Appropriate recommendations on a station-by-station basis have been made and are included where necessary in the individually appended station reports (Appendixes A - G). A summary of recommended technical assistance provides for 124.5 person-years of foreign technical

TABLE I  
 Technical Assistance (TA) Requests  
 Agricultural Research Strengthening Project

Discipline Location	Requested TA		Recommended TA	
	Long-Term <sup>a/</sup>	Short-Term <sup>b/</sup>	Long-Term <sup>a/</sup>	Short-Term
Food Crops				
Bogor	35	74	35	74
Banjarbaru	20	-	15	15
Maros	8	30	8	30
Fisheries				
Tenggarong	7.5	-	6	3
Maros	18	-	12	6
Forestry				
Dalikpapan	14	-	14	-
Maros	8	-	8	-
Animal Husbandry				
Tambang Ulang	9	12	9	12
Animal Diseases				
Banjarbaru	20	30	5	10
<b>TOTAL</b>	<b>139.5</b>	<b>146</b>	<b>112</b>	<b>150</b>

<sup>a/</sup> person-years

<sup>b/</sup> person-months

expertise (Table I). The majority of assistance will be required by the food crops research institutes in Bogor, Banjarbaru and Maros, with lesser amounts to fisheries, forestry, animal husbandry and animal diseases. No technical assistance has been requested by either the Industrial Crops or Estate Crops Research Institutes.

In reviewing the proposed budgets for technical assistance, a good deal of variation was noted among disciplines concerning the cost of technical expertise. Estimates ranged from \$40,000 to \$214,000 per person-year of technical assistance. A cost of \$75,000 per person-year of assistance is suggested as a reasonable figure for budgetary estimates. AARD should make an effort to standardize its budget requests with respect to foreign technical assistance.

Should the technical assistance portion of the project be handled as a package unit, rather than by discipline, it is recommended that at least one full-time administrative assistant be brought in for the duration of the technical assistance contract. With the large number of technical advisors proposed under this project, such personnel will be essential to handle logistic and administrative support for field-based advisors.

## 2. Communications

Communications between proposed experimental farms and stations and the research institutes planned for Banjarbaru and Maros are limited due to the great distances between stations and the

current limitations of the telecommunications systems in Indonesia. Telephone service is presently operating at Maros, however, and will be available at Banjarbaru which will link these sites with the rest of Indonesia via an expanding satellite communications system. Many of the proposed field sites are also relatively near communities that have telephone service, and reasonably expeditious messenger and mail services are available at sites located near airports. Mail service is available in the vicinity of all proposed sites. It is felt that problems arising at field stations requiring prompt attention from the research institutes will be able to be adequately dealt with considering the available communications network. This conclusion is based on the availability of transportation at all sites so that staff are not restricted to travel by local transport.

### 3. Salary Incentives

The team made no special study of salaries for research workers. Nevertheless the subject did surface many times. The old adage, "you get what you pay for" certainly holds true for scientific personnel. If the many Indonesians now studying overseas are to be effectively utilized upon the completion of their graduate programs, ways must be found to pay competitive salaries. This problem will be particularly acute in the outer islands that we visited because apparently they are not attractive to people from Java or Sumatra. Adequate housing will help in the recruiting program but the government should pay attention to salaries if it is to get maximum value from its

investment in graduate training, buildings and other research expenditures. The achievement of national agricultural goals will be directly related to the salaries paid its workers.

#### 4. Selecting Sites for the Agricultural Experiment Stations

The USAID feasibility team that studied the Sumatra Agricultural Research Project developed a set of criteria for use in selecting sites. These criteria have been used in our study and they are as follows:

- a. Soil topography and meteorological conditions must be satisfactory for the programs to be conducted and should be typical of as large an area as possible.
- b. Land must be available in sufficient quantity to fill present and projected needs.
- c. Water must be available in sufficient quantity and of acceptable quality to meet domestic and experimental needs.
- d. The source of common labor must be identified and an adequate amount assured.
- e. Highly desirable, though not absolute requirements, are location on an asphalted road, reasonably close proximity to shopping center, schools through the 12th grade, rail service, telephone, and electricity.

TABLE II

RECOMMENDED PRIORITY LISTING - RESEARCH INSTITUTES, STATIONS AND FARMS

Name	Priority	Reference Annex
Central Research Institute for Agriculture, Bogor	First Level	A-1
Maros Research Institute, South Sulawesi	First Level	A-2
Mariri, North Luwu, Experiment Station, South Sulawesi	First Level	A-6
Kalase Experiment Station, North Sulawesi	First Level	A-7
Makariki Experiment Station, Ceram, Maluku	First Level	A-9
Banjarbaru Research Institute, South Kalimantan	First Level	A-10
Handil Manarap Experimental Farm, South Kalimantan	First Level (for equip. & vehicles)	A-11
Barambai Experimental Farm (Kuala Kapuas), Central Kalimantan	First Level	A-12
Lemake Experimental Farm, East Kalimantan	First Level	A-13
Makariki Experiment Station (Industrial Crops), Ceram, Maluku	First Level	C
Maros Experimental Farm (Fisheries), South Sulawesi	First Level	F-1
Tenatarang Experiment Station (Aquaculture & Fishery Management), East Kalimantan - Note: This station recommended as Third Level for Aquaculture	First Level	F-2
Forest Research Center (Balikpapan), East Kalimantan	First Level Conditional	G-2
Maros Forest Research Center, Sulawesi	First Level Conditional	G-3

Name	Priority	Reference Annex
Bontobili Experimental Farm, South Sulawesi	Second Level	A-3
Lanrang Experiment Station, South Sulawesi	Second Level	A-4
Tambang Ulang Experiment Station (Animal Husbandry), South Kalimantan	Second Level	D-2
Banjarbaru Experiment Station (Animal Diseases), South Kalimantan	Second Level	E
- - -		
Dumoga Experiment Station, North Sulawesi	Third Level	A-8
Handil Manarap Experimental Farm, South Kalimantan	Third Level for site construction & buildings	A-11
Bili-Bili Experimental Station (Animal Husbandry), South Sulawesi	Third Level	D-1
- - -		
Tambang Ulang Experimental Farm (Estate Crops), South Kalimantan	Conditional Refer to Annex B	B
Ryamkanaan Forestry Research Center, South Kalimantan	Funding not Recommended	G-1

- f. Desirable, but lower in priority, are nearness to a university with an agricultural faculty, and proximity to other agricultural research centers, extension and other public agricultural service centers.

## II. OVERVIEW OF THE AGRICULTURAL SECTOR

The economy of Indonesia is agriculturally based in as much as 75 percent of its population is dependent upon and involved in agriculture and agriculture-related activities. The agricultural sector contributed 31 percent of the gross domestic product and 40 percent of the total foreign exchange earnings in 1976.

Though the country is rich in land and manpower resources and has a favorable climate, it still imports food, especially rice. Over 2 million tons of rice were imported in 1978 and only slightly less in 1977. Rice, a major crop, has increased in production since 1969. The increase was achieved through improvement of crop yields at the rate of 2.9 percent annually and through expansion of the area planted to wetland rice at 1.6 percent annually.

Other crops have received less attention, and even though yields have increased slightly, actual plantings have decreased, resulting in little or no increase in total production of corn, cassava, and sweet potatoes.

Dearth of new technology has undoubtedly been a factor in this lack of progress. Indonesia ranks last among countries of Asia in indicators for agricultural research, having only 2 scientists per

million agricultural population and .02 percent of agricultural GDP allocated to agricultural research. The national goals of strengthening agricultural research capabilities would seem well justified.

To date much of the research has been concentrated on Java with current expansion taking place on Sumatra. Present policy makes clear the need for expanding the agricultural research into the other islands.

In making assessments of the research needs of the outer islands the team was fully aware of the imbalance between budget requests and anticipated funding. It firmly supports the building of strong research centers or research complexes as referred to by AARD. It would go further and hope that in many instances the complex could be situated at one site and become an integrated station for all associated agricultural research.

In some instances the team gave a priority rating level of two to existing substations even though they do need additional facilities. The rating was based on a total assessment of the needs and not because of lack of appreciation of the particular substation.

The team was also aware of the World Bank considerations for strengthening agricultural research in Indonesia. All donor support should be fully coordinated so that the limited funds are efficiently utilized. The AID-supported programs should be complementary to those financed by the Bank.

A. Eastern Indonesia

The Maros Agricultural Research Center was the outgrowth of a Joint Agricultural Research Survey Team in 1969. It was relocated in 1971 and since that time has made a significant contribution to the agriculture of South Sulawesi. In more recent years its program has expanded into North Sulawesi, and now its role is truly a regional one.

The professional staff has increased from 51 to 123 and the total staff from 132 to 271. Likewise it has grown in terms of buildings and other research facilities. Even so the total manpower and facilities allocated to research are small in comparison to the vastness of the area and the complexity of the problems.

At the present time Maros is operating two substations and conducting extensive research on farmers' fields. Additional stations are needed to represent the many ecological zones in the region.

Plans call for an agronomist, entomologist, plant pathologist, soil scientist, agricultural economist and a manager, each with a master's degree, for each of the contemplated substations. This would appear to be a reasonable goal except for the economics discipline. The economics research would be more meaningful if a strong unit was developed at the Institute at Maros rather than having them scattered throughout the region.

Even though the center at Maros is doing good research work, the team was struck by the lack of scientific equipment and libraries.

The new proposals call for increases in equipment that is absolutely essential. AARD is promoting a massive overseas training program to upgrade its staff. This is commendable but perhaps not necessary. Most of the crops grown in Indonesia are grown in many parts of the world and there are extensive research programs on rice, corn, soybeans, peanuts and industrial crops, the results of which could be made known to the local staff through adequate library facilities.

Future plans should also provide for training the staff in the care and maintenance of the research equipment, both field and laboratory. In many cases observed equipment was non-functional, either from lack of repair parts or the necessary skills for operational use. The expatriate personnel requested in the AARD's proposals should include technicians for using specialized equipment, librarians, office management specialists and systems research experts in addition to the traditional scientific staff.

#### B. Kalimantan

Except for forestry and fisheries, agriculture is much less well developed on Kalimantan than Sulawesi. Nevertheless the potential is there. The station at Banjarmasin has made significant contributions considering its short tenure and its limited staff and facilities. A strong station should be developed in South Kalimantan serving as the regional center for all of Kalimantan.

South Kalimantan has some unique problems associated with its tidal swamp lands and its vast areas covered with alang-alang grass. Both problems need to be tackled with intensity.

Substations are needed in other parts of Kalimantan to represent the varied ecological zones and to provide practical information for the new areas being settled by transmigrants.

The need for adequate equipment and library facilities as outlined under the Eastern Indonesia section is equally important here. Not only must equipment be made available but the staff must be trained in its use and maintenance. At many of the sites the simplest of equipment was not available including such things as small threshing machines for rice and other crops. This also means that electricity is essential if an acceptable research program is to be developed.

As badly as facilities are needed the greatest need in developing a strong research program is trained manpower. This subject will be covered in another section but suffice to say here that once the technicians are trained there must be a program of keeping them productive through professional societies, in-service training and access to the scientific journals of their discipline. To expend funds for training and then fail to provide up-to-date information is a waste of resources for the institution and a frustration to the individual.

### III. OVERVIEW OF FORESTRY SECTOR

#### A. Prologue

"Government needs advice on very specific ways whereby the rural poor will be fully involved as active participants in the development of rural areas in which forests constitute an integral component, and will have a fair share in enjoying the productive as well as the social function of forests. For it is only when the forests are effectively and purposefully managed and used for the benefit of people as a whole, including the rural communities, that the people will call for a halt to their destruction and evolve wise conservation practices and national policies." <sup>1/</sup>

#### B. Forestry Education

The oldest academic programs in forestry are at IPB in Bogor (formerly the agricultural faculty of the University of Indonesia) and at Gajah Mada University (GAMA) in Jogjakarta. In recent years, state universities were established in all parts of Indonesia, many of them with forestry programs which until recently required students to complete their degree on Java. In 1979-80 all universities had assumed full responsibility for education to the Ir.-degree. These universities offering the Ir. degree are:

<sup>1/</sup> From "Forests for People" address by Adam Malik to 8th World Forestry Congress, 1978.

TABLE III  
STATISTICAL DATA

Forest Data

(x 1 million hectares)

	Land area	Production forest	Production forest	Other	Total % Forest
Sumatra	47.4	16.2	5.3	7.0	28.4 60
Java	13.2	1.8	0.6	0.4	3.0 23
Kalimantan	53.9	29.2	5.9	6.3	41.5 77
Bali & Nusa Tenggara	7.4	0.2	1.2	0.5	2.0 27
Sulawesi	18.9	3.4	3.3	3.1	9.9 53
Maluku	7.4	3.2	2.0	0.8	6.0 81
Irian Jaya	42.2	1.0	0.0	30.5	31.5 75
Indonesia	190.5	55.0	18.4	48.8	122.2 52

Forest Production

(x 1,000.000 m<sup>3</sup>)

Year	<u>Production</u>		<u>Export</u>	
	Total	Industrial	Logs	Sawn timber
1960	80.8	5.3	0.1	-
1965	90.4	5.6	0.1	-
1970	110.7	10.9	7.4	0.1
1973	134.3	26.3	19.4	0.3
1975	128.7	16.3	13.9	0.4

Universitas Lambung Mangkurat (UNLAM) Banjarbaru  
Mulawarman University (UNMUL) Samarinda  
Hasanuddin University (UNHAS) Ujung Pandang  
Universitas Cendrawasih (UNCEN) Manokwari

Only IPB and GAMA offer the Ph.D. degree in forestry.

Forest ranger training used to be through the 3-year SKMA program following SMP (Jr. high). In the last ten years this was changed to the 1-year KKMA program following SMA (sr. high). The two top graduates of either program could then proceed to a university degree program. Because of unsatisfactory results with the KKMA, there is movement to return to SKMA. At present, ranger schools are located in Bogor, Madiun (now run by Perhutani), Kalipaten (private), Pematangsiantar, Pakan Baru, Palangkaraya (private), Samarinda and Ujung Pandang.

In 1977 Indonesia had 1340 foresters with academic training, most of whom were employed on Java. In addition, there were about 2600 SLTA (SKMA) forest rangers.

### C. Forestry Research

The Forest Research Institute (FRI) was established at Bogor in 1913 by the Dutch colonial government. Originally, its main purpose was to provide solutions to silvicultural problems in the regeneration and establishment of *pati* (*Tectona grandis*) on Java. Later, it was concerned with the technical properties of the wide range of timber

species collected from the many forest expeditions to the other islands. The discovery of Pinus merkusii (the only pine species to cross the equator on its own) on North Sumatra induced research into its silviculture to aid in the reforestation of denuded or abandoned lands.

The intensive botanical research in tree species led to the establishment of at least 14 experimental or demonstration arboreta on Java. For example the one at Bogor, started in 1956, is 29 hectares in size consisting of mostly square blocks of 50 x 50 m, each planted to one of 93 tree species representing 36 families. Over half of the species are native to tropical Africa and America or are from other Asian countries. Another experimental arboretum was started in 1940 at Jasinga, 60 km from Bogor, where there are 29 hectares with 127 blocks, representing 32 species from 16 genera and 8 families, but used primarily for the purpose of studying the silviculture of the commercially important Dipterocarpaceae.

FRI is now planning to establish two more arboreta on Sumatra. Since 1977 it has also managed a 500 hectares section of old-growth Dipterocarp forest at Wanariset in East Kalimantan, 38 km north of Balikpapan. There used to be a forest research station at the Ambon site outside Manokwari on Irian Jaya but the site is now occupied by the Faculty of Agriculture of the Universitas Cendrawasih. The former FRI director Ir. Soedianto once proposed the establishment of a forest research station at Kupang in Nusa Tenggara Timur to handle specific forest problems of the savannah region.

The Ministry of State for Development Supervision and the Environment is developing a national network of "Centers for Natural Resource Management and Environmental Studies" at selected universities. Some of these will be specifically concerned with forestry research, viz. Bogor Agricultural University with forest ecosystems, University of North Sumatra with tropical forest ecosystems, Mulawarman University with lowland tropical rainforest ecology. Staff at the older established forestry faculties (IPB and Gajah Mada University) and their students have carried on forest-related research for many years, most of it under contract to a variety of government departments. Of indirect interest to forestry but operating independent of FRI are the Center for Watershed Research (P2DAS) and the Center for Remote Sensing Studies, both at Gajah Mada University. Several universities have their own research forests (e.g. the 300 hectare Lempake forest outside Samarinda to serve Mulawarman University, and the newly acquired Bengo-bengo forest of 1300 hectares, 40 km east of Hasanuddin University in Ujung Pandang).

Of the more than two hundred concessionaires exploiting forests in Indonesia, it is only known that the International Timber Corporation of Indonesia (ITCI) carries on an ambitious and aggressive research program in conjunction with its 600,000 hectare concession. Of the 50,000 hectares planned for artificial reforestation, 4,000 have been completed mostly with Pinus caribaea, Eucalyptus deglupta, Albizia falcataria and the Kalimantan native Anthocephalus chinensis. Current good prospects are Acacia mangium and Eucalyptus tereticornus. These plantings allow for extensive data collection

on the growth, silviculture and economics of plantation species. In addition, they are investigating the effects of the Indonesian selection cutting method (TPI) on growth and composition of the natural forest, and also the potential of enrichment planting with nursery-grown Dipterocarp seedlings. The silvicultural work is backed by an excellent soils laboratory. Research results have been reported in a series of reports and summaries. ITCI has a formal research agreement with the Faculty of Forestry at IPB.

In 1960, the research in forest products technology and chemistry and in forestry exploitation was separated from FRI. At present, the Forest Products Research Institute (FPRI) is physically adjacent to FRI in Bogor. It has carried on ambitious research programs across the country, and at least 30 percent of this is directly identifiable with Kalimantan.

The Forestry Research organizations' structure follows:

Forest Research Institute (FRI)

Divisions

- Administration
- Botany
- Forest Influences
- Silviculture
- Forest Protection
- Forest Mensuration
- Sericulture

Current Staff: Ph.D. - 2, M.Sc. - 2, Ir. - 33, B.Sc. - 12 (one Ph.D. on study leave), 115 permanent employees (technical and administrative).

Annual Budget: (1980) Rp 326 million project budget (DIP)

Rp 180 million routine budget (DIK)

### Forest Products Research Institute (FPRI)

#### Divisions

Administration

Engineering and Transportation

Harvesting

Biology (pests, pathology, preservation)

Utilization (technology of wood and wood products)

Chemical Processing

Marketing and Production Management

Current Staff: Ph.D. - 1, M.Sc. - 7, Ir. - 40, B.Sc. - 12

(three on study leave), 265 permanent employees

(143 technical and 122 administrative)

Annual Budget: (1979) Rp 403 million project budget (DIP)

Rp 179 million routine budget (DIK)

#### D. Feasibility of Establishing Three New Forestry Research Centers

The FRI/FPRI request is part of the "Applied Crop Research" project support request for Kalimantan, Sulawesi and Maluku, submitted by AARD to USAID. The team met with FRI Director Soerjono to discuss the proposals submitted for three new forestry research centers. It was explained that on Kalimantan forestry was guided by

a policy of maintaining native germplasm of forest species while converting substantial areas to plantation forest. The associated research problems should deal with (a) forest exploitation, (b) forest regeneration, and (c) the socio-economic impact of (a) and (b). Also, there was concern for the destructive effects of shifting cultivation of forest and soil resources, and research should provide useful techniques to combine tree production with food crop agriculture (agro-forestry). While the station proposed for East Kalimantan would deal specifically with research in the lowland tropical rainforest, the South Kalimantan station would emphasize species trials for reforestation of alang-alang fields, partly in cooperation with animal husbandry and veterinary services staff.

It was mentioned that the request for East Kalimantan would supplement the FRI investment in their recently-started station at Merdika (Waraniset forest reserve), 37 km north of Balikpapan on the main road to Samarinda. The request for a station on Pulau Laut was made in order to provide a site for research on the effectiveness of TPI (Indonesia selective cutting method) and to study the silviculture of planted Dipterocarp species. Director Soerjono stated that the proposal was now changed to request a site near Ryankanan, 60 km northeast of Banjarmasin, where research would emphasize the reforestation of alang-alang areas.

The request for a Sulawesi station stresses the uniquely different flora, fauna and people. There are forest problems that relate to shifting cultivation, transmigration, and reforestation of rained

lands and of sensitive watersheds, as well as to the protection of nature reserves and the sources of minor forest products (rattan, resin, silk, bamboo, fancy woods). The original request made for Makariki was changed to Bili-bili or Maros. Research would emphasize species selection for afforestation and reforestation, wildlife and vegetation management, agro-forestry techniques and surveys of minor forest products.

The Kalimantan request is partly linked to a FRI "Master Plan for East Kalimantan, 1979-2000", a 33-page document published in 1979 which states major forestry problems, research strategies, research activities, project time schedules by annual quarters, manpower needs and projections for facilities and budget. No such plan exists for either South Kalimantan, Sulawesi or Maluku.

When asked if the request represented, in its amended form, the wishes of FRI, Ir. Soerjono mentioned that he felt least strongly about South Kalimantan and that he had hopes of eventually establishing a branch station on Nusa Tenggara.

#### IV. OVERVIEW OF FISHERIES SECTOR RESEARCH

Fish provides an estimated 65% of the total protein in the average diet of the Indonesian populace. Increased production of fisheries products has received priority attention from the Government of Indonesia in the past two 5-year development programs (REMPITA I & II) and a 34% increase in total fish production has been targeted for REMPLITA III. In support of this goal, an improved and expanded program in fisheries research has been proposed, to be administered

under the newly-created AARD. Priority has been given to the development of facilities and manpower for fisheries research.

The AARD manages three research institutes under the Central Research Institute for Fisheries (CRIF). These three institutes - Marine Fisheries Research Institute, Fisheries Technology Research Institute and Inland Fisheries Research Institute - have responsibility for all government-supported fisheries research in Indonesia. The Marine Fisheries Research Institute (MFRI) at Jakarta carries out research on resource surveys, fishing methods, craft and gear use, mariculture and socio-economic implications. The Institute operates two field stations - one at Semarang for demersal fisheries resource surveys and one at Tanjung Pinang for mariculture. The Fisheries Technology Research Institute (FTRI) at Jakarta conducts research on fish processing, preservation and packaging, fish by-products, and production for fish culture.

The Inland Fisheries Research Institute (IFRI) at Bogor has responsibility for research aspects of fresh and brackish fish, prawn and shellfish culture and seed production and management of fisheries stocks in natural water. The IFRI has primary responsibility for programs and facilities addressed in this report (See Annexes F-1 and F-2).

The IFRI currently operates five research substations and three field stations, in addition to its administrative and laboratory facilities at Bogor. The responsibilities of these stations are as follows:

## Substations

1. Palembang, South Sumatra - open water and riverine fish production.
2. Jatiluhur, West Java - man-made reservoir fish production.
3. Depok, West Java - lowland aquaculture, including integrated fish/animal/fruit crop production, mono- and poly-culture in ponds, and fish nutrition.
4. Pasar Minggu, West Java - macrobrachium shrimp breeding, nutrition and culture.
5. Ujung Pandang, South Sulawesi - all disciplines with responsibility for all of Eastern Indonesia.

## Field Stations

1. Cibalagung, Bogor - carp breeding, nutrition and production (primarily running-water culture).
2. Lido, Bogor - floating net, pen and cage culture.
3. Kamal, Jakarta - macrobrachium shrimp culture.

A sixth substation has been proposed on Bali for sabalo (*Chanos-chanos*) and for other brackish water and marine species, spawning and culture research.

Of the existing research-, sub- and field-stations, those on Java are most active. Research programs at these facilities are generally well-planned. Most programs are applied or adaptive in nature with a high degree of applicability to local conditions. Research work is published in quarterly bulletins and special subject publications. Staff at the stations cooperate closely with the extension service and universities. Local farmers adopt the technology developed at the stations through promotion and assistance from the extension service. Numerous graduate students conduct their research at the stations and the research staff serve as secondary advisors to the students. All stations have, however, limited staff, equipment and laboratory and pond facilities. Expansion prospects are limited due to the severe land use and ownership pressures exerted by over-population. Research is largely limited to industry-related problems on Java and is not applicable to the Outer Islands (eg. running-water carp culture, macrobrachium shrimp culture, and development of high protein feeds for intensive aquaculture systems). Research at all stations is directed toward fresh water fisheries. No research on brackish water fisheries is being conducted anywhere in the country, despite its being the largest pond culture industry in Indonesia (+ 180,000 hectares).

The brackish water research station at Japara (Central Java), formerly assisted by the FAO, remains under the jurisdiction of the Director-General of Fisheries and is no longer operated as a research facility.

Inland fisheries research outside of Java is almost non-existent. The IFRI-managed substations at Ujung Pandang (South Sulawesi) and

at Polabong (South Sumatra) have few permanent research facilities. Staff and operational budget are limited. The situation in Sulawesi should improve in the near future as World Bank assistance for a new 40 hectare fresh-water research institute at Moros (South Sulawesi) has been proposed and is awaiting final negotiations. Staff at the present at Ujung Pandang research station, now housed in a small extension-owned building with no pond facilities, will move to this new facility when it is completed.

The future for other areas is less clear. Little or no fisheries research has been conducted on the major islands of Sumatra and Kalimantan. There are no projects to expand research capabilities on Sumatra. Fisheries research on Kalimantan will receive support for the first time under this presently-addressed AID-assisted project. Emphasis will be on stock assessment and management in swamp and lake regions (See Annexes F-1 and F-2). (Aquaculture development on Kalimantan is not given priority consideration due to the very large wild-capture fisheries, economic and marketing constraints, and limited population.) This AID-assisted project will also address the need for a brackish water pond research facility on Sulawesi. With more than 42,000 hectares of brackish water ponds in the Sulawesi region, development of brackish water production - oriented research is badly needed. Research developed at such a station would have value for expanding brackish water milkfish and shrimp culture industries in other parts of Indonesia, as well, although it would require field testing and adaptation to local conditions.

A lack of adequately trained manpower to staff fisheries research facilities is also a major problem facing AARD and the Central

Research Institute for Fisheries. CRIF currently does not have a single research worker with Ph.D. degree and only a few senior researchers have M.Sc. or Ir. degrees. An effort was started recently to upgrade current staff with two members now studying in the U.S. for Ph.D. degrees and six studying at IPP-Bogor for M.Sc. degrees. Under the proposed World Bank Research II Project, an additional nine Ph.D. and 40 M.Sc. candidates will be trained. An expanded program of recruitment and staff upgrading will continue to be needed. However, to adequately staff current and proposed research facilities, as many staff as possible should receive at least limited exposure to training overseas.

In summary, the IFRI has many gaps to fill in aquaculture- and stock management-related research in Indonesia. The potential for increasing total fish production through aquaculture and wise management of natural stocks exists. However, it will require support from research. The necessary information for private industry to expand and intensify production will have to come from government-supported research, as few fisheries enterprises in Indonesia are large enough to fund their own research programs.

## V. AGRICULTURAL RESEARCH INSTITUTIONS

### A. Agency for Agricultural Research and Development

The terms of reference stated "the consultants will be expected to review the organizational structure of the Agency for Agricultural Research and Development and determine the needed authority and responsibility of inter-island operations and necessary linkages with other institutions .....".

The principal governmental authority for research in the agricultural sector rests with AARD which is an integral part of the Department of Agriculture. The first attempt to bring all agricultural research together was made in 1962. It was not until 1976, however, that the agency controlled its own budget. It was created by presidential decree in 1974. The head of AARD is on the same administrative level as the Directorate Generals for the various departments and reports directly to the Minister.

Plans have been approved for the creation or renaming of the six Central Research Institutes as follows:

1. Central Research Institute for Food Crops
2. Central Research Institute for Fisheries
3. Central Research Institute for Animal Husbandry
4. Central Research Institute for Forestry
5. Central Research Institute for Estate Crops
6. Central Research Institute for Industrial Crops

Each will be headed by a director who will report directly to the head of AARD. There are 24 research institutes as subdivisions of the Central Research Institutes. Of the 24 institutes, 8 are responsible for food crops, 3 for fisheries, 2 for animal husbandry, 2 for forestry, 3 for industrial crops and 6 for estate crops. This reorganization is expected to become effective in March, 1980, and should reduce the volume of reporting to the head of AARD and also permit better coordination within the commodity institutes.

The 24 research institutes include those at Bogor, food crop institutes at Maros (Eastern Indonesia) and Banjarmasin (Kalimantan), and an industrial crops institute at Manado (Sulawesi).

In addition, there are six centers, all located in Bogor, that are designed to serve the entire AARD. They are as follows:

1. Center for Programming and Monitoring
2. Center for Soil Research
3. Center for Agro-Economic Research
4. Statistics and Agro-Data Processing Center
5. Central Library for Agriculture and Biology
6. Agricultural Quarantine Center

All are currently functioning with the exception of the Center for Programming and Monitoring.

AARD is a new organization that has made great strides in pulling 24 separate institutes into a stream-lined organization. Nevertheless, there is still work to be done in creating coordinating mechanisms among Central Research Institutes or between Central Research Institutes and the six centers attached directly to the head of AARD. There is still the feeling among some of the Central Research Institute directors that they can perform their functions if their only relationship to the parent organization, AARD, is a budgetary one. Some have not caught the spirit of integrated research. This attitude is reflected in their requests for separate, single commodity, field research centers.

Another problem facing the new agency is one of divided loyalty. Traditionally the institutes have been associated with the Directorate Generals of their respective commodities and they are still expected to be responsive to these needs. Close administrative attention to this divided loyalty by the head of AARD as well as the respective Directorate Generals should ultimately solve this problem, but it will require patience, hard work, time and, maybe in some instances, personnel changes. There is every indication, however, that the head of AARD is aware of the situation and capable of solving it.

The implementation of the Center for Programming and Monitoring is a much needed step. This Center would need staff to assist the head of AARD in coordinating the research program, in bringing about needed cooperation between the Central Institutes, in providing necessary background material for budget preparation and budget allocation, and in developing plans for program reviews and re-direction of research programs.

One of the needed functions of this office would be to develop a current research information retrieval system so that research information on any commodity for the entire country would be readily available. This retrieval system would not only serve the head of AARD and his staff but would be of use to the scientists themselves.

This Center could also function as a link between AARD and the agricultural programs of the universities. It is conceivable that ultimately the agency might award grants or contracts to certain

universities that offer a needed expertise for AARD. The negotiating officer could be located here but the cooperative work would be developed in consultation with the respective Central Research Institutes.

Expatriates would be needed in the implementation of the Center for Programming and Monitoring, including one for program planning and another for the information retrieval system, for a two-year period. In addition short-term expertise would be recruited as needed.

As far as the team could determine AARD has the necessary authority to perform its functions as shown in its charter. It will require support from the Minister, additional staff in Director's immediate office, hard work and time. The necessary machinery has been created. Support from the World Bank and USAID should facilitate the reaching of its goals.

B. Research Institutes, Substations and Experimental Farms in Kalimantan and Sulawesi

KALIMANTAN

1. Food Crops

- a. Research Institute Food Crops Banjarbaru\*
- b. Substation Bandil Banjarap
- c. Substation Hulu Sungai Selatan, Tanggul

\* Proposed

- d. Substation Hulu Sungai Tengah, Barabai
- e. Experimental Farm Belandean
- f. Experimental Farm Pleihari
- g. Experimental Farm Binuang
- h. Experimental Farm Bukat

2. Forestry

- a. Substation Balikpapan

3. Animal Husbandry

- a. Tambang Ulang\*

4. Animal Disease

- a. Tambang Ulang\*

5. Inland Fisheries

- a. Tenggarong, Samarinda\*

6. Estate Crops

- a. Tambang Ulang\*

\* Proposed

SULAWESI1. Food Crops

- a. Research Institute Food Crops Maros
- b. Substation Bontobili
- c. Substation Lanrang
- d. Substation Jenepono\*
- e. Substation Mariri\*
- f. Substation Kalesey\*
- g. Substation Makariki\*
- h. Substation Kawotobi
- i. Substation Dumoga\*
- J. Experimental Farm Palu
- k. Experimental Farm Kendari

2. Industrial Crops

- a. Research Institute Industrial Crops, Manado
- b. Substation Bajeng
- c. Substation Kayuwatu
- d. Substation Mapanget
- e. Substation Makariki\*
- f. Experimental Farm Paniki
- g. Experimental Farm Pandu
- h. Experimental Farm Kima Atas

\* Proposed

3. Forestry

a. Substation Bili - Bili\*

4. Animal Husbandry

a. Substation Bili - Bili\*

5. Inland Fisheries

a. Substation Maros\*

C. Staffing Considerations

Staffing proposals for AARD stations in Kalimantan, Sulawesi and Maluku call for 18 Ph.D. degree holders, 7 veterinarians, 80 M.Sc. degree holders, and sufficient Ir., B.S., and SPMA graduates to complement this senior staff. AARD currently has 2 staff members with Ph.D. degrees, 2 with M.Sc. degrees and 21 with Ir. degrees at existing stations in these provinces. All are specialized in food crop research. Present and proposed degree holders are as follows:

	Present		Proposed	
	<u>Kalimantan Sulawesi</u>		<u>Kalimantan Sulawesi</u>	
Ph.D	1	1	13 <sup>a/</sup>	12
M.Sc.	0	2	31	49
Ir/Drs.	4	17	<u>b/</u>	<u>b/</u>

<sup>a/</sup> Includes 7 DVM for proposed Animal Disease Research Institute at Banjarbaru.

<sup>b/</sup> Undetermined.

All but two of the proposed Ph.D. degree holders and 64 of the proposed M.Sc. degree holders will be for staffing the two food crops research institutes at Banjarbaru and Maros and their affiliated field stations. The goal, as outlined in the food crops master plan for eastern Indonesia, is to have 1 Ph.D. and 3 M.Sc. for each department at the research institute and 6 technical staff (3M.Sc., 3 Ir.) at each of the respective substations.

The remaining staff holding Ph.D. and M.Sc. degrees will be assigned to fisheries (1 M.Sc. - Kalimantan; 1 M.Sc. - Maros), animal husbandry (3 M.Sc. - Kalimantan), and forestry (1 Ph.D., 3 M.Sc. - Kalimantan; 1 Ph.D., 3 M.Sc. - Sulawesi). Estate and industrial crops have no plans at present for staffing their respective field stations with advanced degree holders. These stations will be managed by general overseeing staff.

The overall staffing pattern for food crops has been satisfactorily worked out and the team concurs with the plans. Fisheries, forestry, animal husbandry, animal diseases, estate crops and industrial crops, however, should look more closely at the intended purpose and scope of their stations and adjust their staffing complements accordingly, both with respect to level of training and number of staff required. Estimates on the number and kind of support staff to complement the research staff need to be detailed for all disciplines at all stations.

#### D. Training for Research Personnel

Manpower development has been given first priority in strengthening the institutional capabilities for agricultural research by the Director of the Agency for Agricultural Research and Development (AARD). Of the approximately 800 research scientists currently working under AARD, only an estimated 100 are sufficiently trained senior and junior research workers. By 1985 AARD estimates that 1,900 agricultural scientists will be needed to adequately staff its central and field research stations. This will require an expanded program of recruitment and graduate training, as well as a general upgrading of present and recruited staff.

New staff at the Ir.-, B.S.-, and SPMA- (senior technical high school/ agriculture) levels will be recruited from the many local and regional universities and agricultural high schools throughout Indonesia. Research currently enjoys close cooperation with many of these universities and high schools by providing technical guidance and facilities for students conducting research on special and graduate study topics. It is felt that recruitment of sufficient junior staff to man the proposed research facilities addressed by this project will not be a problem.

Graduate training at the M.Sc.- and Ph.D.-levels will be addressed by the World Bank assisted National Agricultural Research II Project. <sup>1/</sup>

<sup>1/</sup> Under bilateral agreement, the World Bank will fund donor-assisted long-term training and USAID will fund short-term training.

Under this project, the World Bank will provide funding for training 190 Ph.D. candidates and 525 M.Sc. candidates (Table IV). Approximately one-half of these candidates will be trained abroad, the remainder being trained in-country at universities with graduate programs in agriculture. In addition, AARD currently has 60 staff members studying for Ph.D. degrees and 88 staff studying for M.Sc. degrees, as follows:

	<u>Ph.D.</u>	<u>M.Sc.</u>
Food Crops	22	60
Estate Crops	2	7
Industrial Crops	25	-
Fisheries	2	6
Forestry	1	3
Animal Husbandry	-	12
Animal Diseases	8 (DVM)	-

AARD will assign these staff and the World Bank-trained staff as needed to their central and regional research institutes and experimental stations. A portion of these staff will be assigned to the regional research institutes and experimental stations proposed for Kalimantan, Sulawesi and Maluku.

Short-term training for specialization and general upgrading of present and recruited staff will be provided through USAID assistance under the presently addressed project. Requests have been made by the various research institutes for 1,162 man-months of short-term training for staff at the existing and proposed facilities on Kalimantan, Sulawesi, and Maluku (Table V). The team is in

TABLE IV  
INDONESIA  
NATIONAL AGRICULTURAL RESEARCH PROJECT  
Projected Growth of Senior Research Staff

<u>Staff Related to Com- ponents of National Agricultural Research Project</u>	Present		Additional <sup>a/</sup>		Total at end of project period <sup>b/</sup>	
	Ph.D.	M.Sc./Ir.	Ph.D.	M.Sc.	Ph.D.	M.Sc./Ir.
AARD headquarters	-	3	-	-	-	3
Food crops	2	90	20	75	22	165
Estate crops	5	42	11	64	16	106
Industrial crops	-	48	16	45	16	93
Animal husbandry	1	15	2	15	3	30
Forestry	3	63	12	40	15	103
Fisheries	-	38	9	25	9	63
Other	6	55	11	64	17	119
Sub-Total	<u>17</u>	<u>354</u>	<u>81</u>	<u>328</u>	<u>98</u>	<u>682</u>
Other AARD Staff						
AARD headquarters	-	-	2	20	2	20
Food crops	11	111	5	35	16	146
Estate Crops	-	27	-	35	16	63
Industrial Crops	-	-	4	25	4	25
Animal husbandry	1	17	8	10	9	27
Forestry	-	-	-	20	-	20
Fisheries	1	-	-	25	1	15
Other	-	10	-	19	-	46
Sub-Total	<u>13</u>	<u>165</u>	<u>19</u>	<u>197</u>	<u>32</u>	<u>362</u>
Total AARD Staff						
AARD headquarters	-	3	2	20	2	23
Food crops	13	201	25	110	38	311
Estate crops	5	69	11	100	16	169
Industrial crops	-	48	20	70	20	118
Animal husbandry	2	32	10	25	12	57
Forestry	3	63	12	60	15	123
Fisheries	1	38	9	40	10	78
Other	6	65	11	100	17	165
Sub-Total	<u>30</u>	<u>519</u>	<u>100</u>	<u>525</u>	<u>130</u>	<u>1,044</u>

<sup>a/</sup> Projected output from training program; numbers for the project are based on information provided to the mission; numbers for other AARD staff are based on the difference between the total training program and project requirements.

<sup>b/</sup> Present plus additional staff from training program. Assumes that retirement and resignations are compensated by recruitment of additional senior staff.

TABLE V

SHORT-TERM TRAINING

(person-months)

<u>Location</u>	<u>FC</u>	<u>EC</u>	<u>IC</u>	<u>IF</u>	<u>F</u>	<u>AH</u>	<u>AD</u>	<u>Total</u>
Bogor	108							108
Banjarbaru	130				29		70	229
Handil Manarap	10							10
Kuala Kapuas	6							6
Lempake	6							6
Tambang Ulang						92		92
Maros	496 <sup>a/</sup>			72	54			622
Balikpapan					29			29
Tanggarong				60				60
<u>Total</u>	<u>762</u>	<u>0</u>	<u>0</u>	<u>132</u>	<u>112</u>	<u>92</u>		<u>1,162</u>

<sup>a/</sup> represents request for all food crops stations in Sulawesi and Maluku (Kalase, Dumoga, Lanrang, Mariri, Bontobili, Jeneponto, and Makariki).

FC - Food Crops

F - Forestry

EC - Estate Crops

AH - Animal Husbandry

IC - Industrial Crops

AD - Animal Diseases

IF - Inland Fisheries

agreement with these requests for training, consistent with the recommendations outlined in the individual station reports (Appendixes A-G). There is some discrepancy in the training budgets outlined for individual stations, however, which needs to be resolved. Estimates range from \$1,150 to \$5,000 per man-month of training. While costs will necessarily vary for in-country and overseas training, IARD should attempt to standardize their budgets for location-specific training.

The World Bank Research II Project <sup>1/</sup> provides funding for 1981-1989 as follows:

Food Crops	\$2,740,000
Estate Crops	2,070,000
Industrial Crops	1,820,000
Animal Sciences	460,000
Forestry	1,520,000
Fisheries	1,020,000
Library and Soils	<u>2,070,000</u>
Total	\$11,700,000

<sup>1/</sup> Indonesia Agricultural Research Project staff appraisal Report (World Bank), 1979.

### E. Linkages with other Agencies and Institutions

In addition to the close linkages between research and extension, it is also important that strong ties be developed between research and other agriculturally-related enterprises.

Currently the nation is engaged in a mass transmigration movement. The Director General of Transmigration has been influential in providing funds to some of the research institutes to expedite their programs related to areas being settled by transmigrants. It is important that strong linkages be maintained between AARD and Transmigration so that each agency fully understands its role and its responsibilities.

Equally important is the need for strong linkages between the research institute and the director general for that particular commodity, an example being the Forest Research Institute and the Forest Service or between the Animal Husbandry Research Institute and the Director General for Livestock. The research institutes must be continuously aware of the needs of their respective director generals, but on the other hand, AARD must establish its own priorities and plans for research.

As Indonesia's agriculture develops, agribusiness will increase in importance. Food processing and marketing must be related to the programs of research. The team was disappointed to learn of the

limited contact between the forestry research personnel and the activities of some of the international lumber companies. Each can be complementary to the other without compromising its role in the least.

## VI. AGRICULTURAL EXTENSION

Although our specific assignment was to visit the research sites, or the proposed research sites, the team was fully aware of the necessity of a strong extension program and of close linkages between research and extension. The team made no attempt to evaluate the extension program or the qualifications of its staff. The team was impressed with what they observed.

Team contacts with extension personnel were along two lines. In most of the visits to proposed research sites the local point of contact was an extension worker. He often arranged transportation and in other ways facilitated our visit. He was also helpful in responding to questions about his locality concerning the agriculture, the people and their educational needs.

In other instances we were given thorough presentations on the agriculture of a particular region, its trends and needs in terms of an adequate educational program. Extension personnel also, in some instances, were not only hospitable in terms of local entertainment but also effective in terms of arranging for us to meet governors and other influential leaders.

In every case that we had occasion to observe, the relationship between extension and research was good, both at the local level and at the provincial level. This attitude is commendable and speaks well for both parties. In a country like Indonesia where research and extension is administered nationally by different entities it is absolutely essential that this spirit of cooperation and mutual respect be cultivated and encouraged.

Although we made no particular study of the "on-farm" trials of the research staff of AARD, it was obvious that much of the program is handled in this way. Extension can and should be very helpful in studies of this nature. Obviously, it is to the advantage of both parties.

#### VII. UNIVERSITY LEVEL AGRICULTURAL INSTITUTIONS

The oldest academic programs are at IPB (Institute Pertanian Bogor) and at Gadjah Mada University, Jogjakarta, which both have independent faculties of agriculture and offer complete graduate curricula for M.Sc. and Ph.D. All other universities have the traditional 6-year Ir. program which is a 4-year B.Sc. degree program followed by 2 years (flexible, often longer) Ir. curriculum in which one or more "scripties" (elaborate termpapers) are required. Until recently, many universities offered only the B.Sc. degree and depended on the two Java institutions for the Ir. program, but all have now instituted Ir. programs. However, many are reviewing their curricula to consider if they, as IPB is now doing, should reduce

the study course for Ir. as a possible transition to dropping the degree altogether in favor of a straight B.Sc. - M.Sc. sequence. This would eliminate the current awkward post-colonial hybrid position of the Ir. program.

In the region covered by the team study there are the following universities with agriculture curricula:

Kalimantan:

Universitas Lambung Manjurat (UNLAM) Banjarbaru

Mulawarman University (UNLUM) Samarinda

Sulawesi:

Hasanuddin University (UNHAS) Ujung Pandang

Universitas Sam Ratulanji (UNSEAT) Manado

Maluku:

Pattimura University (UNPAT) Ambon

Irian Jaya:

Universitas Cendrawasih (UNCEN) Manokwari

All of the above offer the standard range of agricultural courses related to general agriculture and plant sciences. It seems that all offer animal husbandry except UNCEN. The animal husbandry program of UNHAS is offered at its branch in Palu, Central Sulawesi,

where the dry climate is suitable for livestock production. Fishery programs are offered at UNHAS, UNPAT and UNSRAT with the first two becoming particularly strong because of the newly-planned government laboratories at their doorsteps. Forestry programs are offered at UNLAM, UMMUL, UNHAS AND UNCEN.

Students usually enter the universities after the normal SD (6 years) - SMP (3 years) - SMA (3 years) sequence of schooling. Some elect to leave SMP to go to the 3 year SPMA (Sekolah Pertanian Menengah Atas - agricultural high school) at the end of which they are equivalent with SMA graduates and grouped by the common acronym SLTA. Indonesian terms to identify their current B.Sc. and Ir. degrees are Sarmud and Sarjana, respectively. Only the top two SPMA students are normally given an opportunity to enter a university degree program.

When inquiring at UNHAS it is explained that the B.Sc. diploma is rated at several levels: paling bagus (excellent), lebih bagus (very good), bagus (good) and kurang (inefficient). Only the first three ratings qualify for passage. The annual cost of tuition and fees is Rp.90,000. Salaries for junior lecturers are Rp.75,000/month, for senior lecturers, Rp.100,000, but most get additional income from various research contracts.

The eight eastern Indonesian institutions have recently formed a regional academic consortium entitled BEK (Badan Kerja Sama or "agency for cooperation"), whose headquarters is at UNHAS. It comprises UMMAS, UMMAL, UNHAS, UNSRAT, and UNCEN, as well as the

teacher's college at Ujung Pandang and Manado. Its purpose is to cooperate in the regional development of curricula and staff in order to avoid unnecessary duplication and to exchange lecturers. It appears that under a recent contract Washington State University will assist various aspects of the consortium.

As representative of the better agriculture programs, here are some additional figures for UNHAS. Its total student body is 8,000, of which 1,300 are in agriculture and forestry, and combined in one Faculty of Agricultural Sciences. The Faculty has a staff over 100 lecturers which include 5 Ph.D's and an additional 7 on sabbatical for Ph.D. study. Practically all the students are from Sulawesi.

The general attitude toward cooperation between the agricultural universities and AARD appeared to be good. In one instance a member of a research institute was a part-time lecturer at the local university. In two instances a member of the university faculty was the research coordinator for the research institute. Many faculty members expressed an interest in more cooperation between the teaching and research staffs within AARD. Additional avenues should be sought for cooperation. AARD would be well advised to utilize university teachers who have a particular expertise needed by the research institute.

#### VIII. SOCIAL AND ECONOMIC ANALYSIS RELATIVE TO AGRICULTURAL RESEARCH

The Indonesian archipelago consists of 13,000 small and large islands and lies along the equator from the northwest tip of Sumatra

to the eastern point of West Irian. It is a homeland for the nation's 135 million inhabitants who divide into at least 300 tribal and ethnic groups. Only ten ethnic groups, however, have more than two million members, and they make up three-fourths of the total Indonesian population. Any traveller, visiting these islands, seeing different customs and traditions and hearing the different tones of the languages spoken, cannot but appreciate the magnitude of the predicament faced by the government in trying to implement programs of modernization and economic development. Today, three and a half decades since independence, the facts of a tropical monsoon climate, ethnic diversity and the insular nature of this country, which in the past were cited as causative factors for political instability and a faltering economy, form the basis of the present government's agrarian national economy.

Indonesians inherited the underdeveloped agrarian economy, particularly on islands outside Java, from the Dutch when they left the archipelago in 1949 after three and a half centuries of colonial rule. Originally interested in monopolizing the famous spice trade along the Java Sea, and later the rubber and coffee plantation crops, the Dutch particularly favored the fertile islands of Java and Sumatra. During the so-called Culture Period in the last half of the 19th century, the Dutch successfully achieved the goal of a colonial economy by forcing the Javanese and the Sundanese farmers to cultivate plantation crops alongside the traditional subsistence crops. The intensive labor inputs, required to meet the demand of such an economic practice and coupled with the necessary expansion

of arable land, resulted in both an increase in agricultural products and a population explosion in Java. The rest of the archipelago (Sumatra, Kalimantan, and the East Indonesian island complex that includes Sulawesi, Maluku and the Lesser Sundas), on the other hand, was left undeveloped except for a few major port cities (Makassar in South Sulawesi, Manado in North Sulawesi, and Ambon in Central Maluku). Even today, 62 percent of the total Indonesian population lives on the island of Java (population density  $624/\text{km}^2$ ), while the rest of Indonesia is only sparsely populated (national population density  $69/\text{km}^2$ ).

The Java-centered political economy, necessary to feed Java's inhabitants, continued even after independence. The two following decades of internal political unrest under the Sukarno regime contributed little toward developing the regional economy of the Outer Islands. The so-called Outer Island Rebellion between 1958 and 1962 expressed the dissatisfaction of regional leaders who felt that they were the producers of export commodities (rubber, coconuts, timber, spices) but were receiving relatively little assistance from the central government for regional development. The new government which emerged in 1965, however, has taken a number of significant steps toward improving the economic and social conditions in the outer islands through a series of five-year development programs. In 1969 the government introduced agricultural intensification projects aimed at improving economic and social conditions throughout the nation. Major projects were the BIMAS/IRMAS project, which extended credit to farmers for purchasing fertilizers, and the

IPEDA, IMPRESS and SUBSIDI DESA projects which provided funds regionally for building primary schools, health clinics and bridges and for repairing roads and irrigation channels. Transmigration projects, initiated in the late 1950's under the Sukarno regime, are now better organized for preparing the previously uninhabited areas of the Outer Islands for migrants arriving from Java and Bali. By transplanting excess labor from these economically depressed areas to newly opened and agriculturally promising Outer Islands, the transmigration projects seem to function not only as a means of relieving the population pressure on Java but as an instrument of regional development in hitherto neglected islands. New irrigation projects in fertile areas such as Luwu and Dumoga, Sulawesi, are already underway with the assistance provided by World Bank and USAID. Both the local farmers and new migrants will surely benefit from such projects.

In cooperation with the central government's projects to develop regional economies and to raise the local standard of living, the current AARD's plans to establish regional agricultural research stations in Outer Islands are based on the awareness that agricultural problems in these islands differ agro-climatically and economically from those on Java. New rice varieties specifically developed for lowland alluvial plains, for example, are not readily adaptable to swampy areas in southern Kalimantan, or to fertile upland areas of Sulawesi. Regional research and development stations can experiment and perfect new technology to fit the specific requirements of local farm land. The present government's

drive to achieve regional self-sufficiency with rice is understandable, particularly given the fact that although the majority of Indonesian farmers cultivate rice, Indonesia is still dependent on foreign sources to meet the nation's demand for this staple.

The idea of diffusing the knowledge and the agricultural research techniques necessary to meet the local agricultural problems and decentralizing the research center, currently located in Bogor, seems to be both necessary and prudent for increasing the nation's agricultural productivity, raising the regional standard of living, and securing the nation's politics - maintaining economic stability even after timber and oil (currently the two most important foreign currency-earning export commodities) are exhausted.

The integrated approach to agricultural research and development (combining several agricultural research topics such as livestock and forestry with food crops under one roof), which this particular project calls for, is an idea almost revolutionary to the Indonesian political and administrative system. It is a sound one, however, not only from the viewpoint of financing the project but also in view of the particularly diversified nature of economic activities in the Outer Islands. Unlike the Javanese farmers whose economic activities tend to be specialized, the outer island populations are not nearly as dependent upon land for income as are wet-rice farmers. Fishing, lumbering, rubber tapping, raising industrial crops (coconuts, cloves) and secondary crops (e.g. sava, beans, nuts, maize) and maritime activities are important additional sources of income.

Regionalization of research and development centers will be particularly beneficial to the local farmers, the majority of them still being subsistence farmers and unaware of the advances of modern technology. Having little capital and few resources to begin with, these traditional farmers are not likely to readily adopt new techniques unless it is shown and proven that the new methods are economically feasible. The presence of experimental/demonstration farms nearby may perhaps help alter the traditional farmers' attitudes towards modern technology. Having research stations in the islands will also speed up the communication processes between research centers and local extension services which may need immediate answers to agricultural problems. Management of forest and aquatic resources can be integrated into the whole agricultural research spectrum for the same reasons. In this respect, not only scientific research but socio-economic and cultural studies of the local farmers by social scientists need to be stressed. They could serve as a liaison between research scientists and extension services in helping the scientists identify research needs from the viewpoint of the agro-economic make-up of individual localities. Reducing cost and labor inputs is often a more important concern than increasing the productivity of the land, particularly for the part-time farmer. Because wet-rice agriculture is labor-intensive, many farmers in these islands owning more than a hectare of land cannot fully utilize the entire land, particularly when it is economically more feasible to engage in other activities for cash income. The productivity per unit of land can be expected to increase when these research stations develop new varieties and methods that require less cost and labor inputs, and hopefully, when the farmers

are provided with proper incentives such as reasonable selling prices. The latter problem involves improvements in the area of marketing and shipping as well as a change in the national policy for establishing more realistic floor prices for major commodities based on the cost of production in each region.

The following social and economic analysis of the proposed research locations will be discussed by province. Due to decisions reached by AARD and USAID prior to the Team's departure, however, not all provinces of Kalimantan and the East Indonesian islands will be covered. Provinces left out of this project will be either covered by research institutes located in the neighboring provinces or will receive attention at a later date.

#### A. South Kalimantan

South Kalimantan comprises only 7% of the area of Indonesian Kalimantan, but is the most densely populated of four provinces (36% of the total population of Indonesian Kalimantan). Nonetheless, one of the factors hampering an increase in agricultural productivity of this already rice-surplus area is a labor shortage. According to the 1976 census, less than two million people live in the area as large as Central Java, which amounts to only 8% of the central Java's total population. About 27% of the total province's population reside in urban areas, of which 62% are in Banjarmasin, the center of trade for both South and Central Kalimantan provinces. The majority of South Kalimantan residents are Banjar (coastal)

Malays, the first ethnic group to populate South Kalimantan. Their culture grew out of an amalgam of northern Javanese, Malayan, Makassarese, Indian and Arabic influences between the 14th and 18th centuries and spread along coastal Sumatra and Kalimantan via the spice trade. They are all Moslems, and their ecological adaptation and socio-economic organization are unspecialized, combining wet-rice cultivation with fishing and itinerant peddling. They play an important part in inter-island trade. Another migrant ethnic group is the Buginese from South Sulawesi. Most Buginese are found in the southeastern part of the province, deriving their livelihood mostly from fishing along the coasts. The indigenous minority groups, referred to as the Dayak, live along the western foot of the Meratus mountains near the Amandit and Batang Alai Rivers. The number of aliens amounts to only 0.3% of the population, and includes Chinese, Indians and Arabs, mostly engaged in trade.

#### 1. Rice

Although the province has a rice surplus of about 70,000 - 80,000 year for export to Central and Eastern Kalimantan, the price of rice has been considerably unstable. During the 1969-1975 period there was a decrease in the role of agriculture in the region's economy, although the agricultural sector still produced the highest amount (36.14%) of gross regional domestic product. Per capita income from the agricultural sector during the same period showed a 4.72% annual growth in contrast to 12.8% in industrial sectors. Background information is as follows:

- (1) Out of the province's total area (3,698.530 hectares), 48% is covered by forest, 16% by swamps and lakes, and 15% by alang - alang (grass). The total cultivated land area for rice fields, dry fields and plantations is only 13.42% of the total land area, most of which is found along the densely populated alluvial plains and valleys at the western foot of the Meratus Mountains.
- (2) According to the 1971 census, two-thirds of the province's total labor force engage in agriculture, out of which two-thirds farm on less than 1 hectare of land. Approximately 81% cultivate their own land.
- (3) The BIMAS/INMAS intensification program in South Kalimantan did not begin until 1974. The majority of farmers still practice traditional farming, lack capital to adopt new technology, and have limited access to irrigation.
- (4) The high rainfall, well distributed throughout the year, is very striking in the delta area near Banjarmasin. This limits the choice of crops to be grown in this area totaling + 600,000 hectares. As the soil is almost always wet, or even flooded periodically, being influenced by tidal movements, the choice of crops is mostly limited to rice. Special soil management is required to enable farmers to grow crops other than rice. A careful study in this context is needed.

## 2. Secondary Crops

The region only began producing secondary crops in 1976 and still has to import these commodities and vegetables such as cabbage, carrots, tomatoes, shallots and garlic from Malang, East Java, via Surabaya. During the westward monsoon (December - March), prices of these commodities increase considerably due to the difficulties involved in shipping on sail boats from Surabaya.

## 3. Plantation Crops

The principal plantation crops in South Kalimantan are rubber and coconuts. Rubber is the second largest foreign currency - earning export item (after timber) for South Kalimantan, but the area of rubber plantation continues to shrink.

<u>Year</u>	<u>Area</u>	<u>Production</u>
1942	100,475 hectares	(figures not available)
1969	86,860 hectares	46,379 tons
1976	62,051 hectares	22,997 tons

An estimated 66% of the small-holder rubber trees are older than 30 years. Between 1955 and 1976, rubber exports from South Kalimantan decreased 50% from 64 thousand tons to 32 thousand tons.

The coconut and clove plantation areas, on the other hand, have increased since 1969.

	1969	1976
Clove	131 hectares	2,425 hectares
Coconut	7,370 hectares	26,385 hectares

#### 4. Animal Husbandry

Animal husbandry has become increasingly important in the province, which has cattle, buffalo, goat, sheep, horse, chicken and duck breeding. In Kabupaten Tanah Laut, near Tambang Ulang where a new experimental research station is proposed under this project, an extensive traditional cattle enterprise exists. In the Tambang Ulang area in 1976 there were 16,242 cattle, and 7,610 buffalos. A grass and fodder green plot was built in 1969 to support the industry. Since 1970, livestock breeding has been carried out by importing 229 cattle from East Java and Lombok. At present, the province still imports beef cattle from Madura, East Java, Eastern Lesser Sundas, and South Sulawesi totalling from three to five thousand animals annually. South Kalimantan, however, sells breeding Alabio ducks and duck eggs to Central and Eastern Kalimantan. Feed supply, particularly for the fowl breeders, is the major problem in expanding the industry. Most components of the feed are imported from outside the region. There is a great need for research in this area.

## 5. Forestry

The export of logs in 1976 (total US\$43 million) increased sharply in terms of both volume and value due to the favorable timber price increase in the international market. Some logs are exported to Java, Sulawesi and Bali through interinsular trading, but most go to Japan, Korea and Taiwan.

## 6. Industry

Industry is extremely underdeveloped due to marketing and transportation shortages. Mineral deposits (iron, manganese, coal, nickel, gold, chrome, and diamonds) are estimated to be high, particularly in Tanah Laut and Banjar districts. To date they have not been systematically exploited. Only 4% of the province's total labor force is engaged in the processing industry.

## Summary and Conclusion

The standard of living in South Kalimantan appears extremely low, largely because there are few cash-earning opportunities outside agriculture. The logging industry is only seasonal, rubber export is declining, and only coconut and clove plantations are currently promising. Improving agricultural production techniques and expanding the area of cultivation seem essential to improving such conditions and raising the standard of living. At the present, the vast monotone swamp areas need to develop a new drainage system

to control the fertility of the soils, tidal swamp areas need to be developed for "deep water" rice and new agricultural areas need to be opened to relieve the population pressure along the narrow alluvial plains belt between the swamps and the mountains. Handil Manarap, located in the tidal swamp area, will serve as an experimental farm as it is proposed in this project. Another food crop experimental farm is proposed at Unit Tatas in the district of Kuala Kapuas (Central Kalimantan). Located upstream on the Pulau-petak River about 30 km north of the city of Kuala Kapuas, the farm will serve as an out-reach station of the Banjarbaru food research institute.

Since secondary crops and vegetables are new to the area, much research is needed to test the adaptability of newly introduced food crops to the region. Sungai Ulin, the proposed site for the research institute near the city of Banjarbaru, is located at 28km southeast of Banjarmasin. The population density drops from 3,912/km<sup>2</sup> in Banjarmasin to 46/km<sup>2</sup> in Banjarbaru. The site appears suitable for the proposed research aims of the Kalimantan food crops research institute, currently located in Banjarmasin. The site is located in an area where the alluvial lowland and the upland meet, and it can experiment with lowland and upland rice, secondary crops and vegetables. The local farmers, already self-sufficient in rice, will benefit greatly from the results of experimental research concerning these cash earning food crops.

Estate crop research aimed at saving rubber plantations in the area and industrial crop research with coconuts and cloves, which have

become increasingly important to smallholder farmers, should increase the total cash income for the growers. Establishing a combined research station in Tambang Ulang (population density 10-25/km<sup>2</sup>) should be encouraged, particularly because the area, being not so fertile, has been the center of a newly developing livestock industry (cattle + buffalo) since 1969.

#### Additional Recommendations

According to the local extension service, the Banjarese farmers are not as receptive to new methods and technology as are the transmigrants who receive new varieties of seeds and fertilizers free of charge. Transportation difficulties along the rivers and swamp areas and the pattern of sparse population in the vastly scattered areas make the task of disseminating information by the extension service extremely difficult. It may be necessary to set up a number of small experimental/demonstration farms along the major rivers and canals in order to bring the technology closer to the people.

#### B. East Kalimantan

East Kalimantan, the richest province in the nation in terms of per capita regional income, is a province settled by outsiders, except for the Dayak and the Kutai. Half of the province's one million inhabitants live in three major towns - Samarinda, Balikpapan, and Tarakan - and the two largest ethnic groups, the Banjarese from South Kalimantan and the Buginese from South Sulawesi, make up from one-third to one-half of the cities' residents. A small number of

Javanese are found among the transmigrants and public servants, while the Malays and Chinese are engaged in trade. The majority of the remaining half of the population live in clusters near the main towns and in settlements along the main river. The vast areas of the mountainous interior are sparsely populated.

## 1. Food Crops

According to the 1976 census only 46% of the province's residents are farmers (other provinces in Kalimantan have an average of 69%, and in all Indonesia, 61.3%). The contribution of agriculture to regional income has fallen behind that of most other industrial sources. In food crops, there was 3.8% annual growth between 1971 and 1976. During the same period, the population growth was 5.9%.

While agricultural production has not kept pace with population growth, largely due to a lack of effective irrigation and to negligible fertilizer imports, food crops now account for less than 0.5% of the total land area, and East Kalimantan still imports nearly half her rice needs as well as almost all of her other foods. It is the industrial sector that has brought a change to the province's economic structure in the last decade.

## 2. Forestry

With less than one percent of the nation's population, East Kalimantan in 1978 accounted for nearly one-quarter of total

Indonesian export earnings, mostly from timber and oil. Since 1968, the value of timber exports in absolute terms has quadrupled, and over the past decade the province produced nearly half of the nation's exports of timber. Between 1967 and 1976, 15 million hectares of concessions were granted, covering virtually the entire area of East Kalimantan's productive forests.

Though these figures indicate a new trend in the economy of the province, they disguise the fact that most of the real value from timber escapes from the province. A total of 82 logging firms are of foreign origin, including the 6 largest enterprises (over 200,000 hectares of concessions are held by persons or firms resident in East Kalimantan). Many domestic concessions are contracted out to East Malaysians, and they are anxious to process their logs in other parts of the country near the important markets, despite the government's regulation that at least 40% must be processed locally.

Nonetheless, the timber boom has brought a significant source of income to both the resident population and the local government. In 1977, for example, 24,000 persons were employed in logging in East Kalimantan, and by 1979, most contractors were recruiting all but the most highly skilled personnel from the province, though the labor jobs are limited to dry seasons. As a consequence, average wages in the province are the highest in the nation, but so is the increase in the cost of living in the

urban centers. Since much of East Kalimantan's industry (i.e. sawmills) is located in the enclaves outside the main towns, it has also increased the industrial employment in rural areas. The total industrial employment, except for forest logging and the oil industry, was approximately 10,000 in 1977.

About 80% of the funds for development in East Kalimantan are derived from the timber industry. The provincial government claims 50% of the royalties paid on the harvested timber, while the district governments get 23%. A number of other duties are levied on exported logs as well.

In East Kalimantan, IPEDA (tax collected by the central government on agricultural, forestry and mining land, and channeled to the districts for development purposes) is an important source of the district governments' revenue, derived almost entirely from forestry.

#### Conclusion and Summary

The need for research on forest management and reforestation is evident, given the significant role the timber industry plays in the local economy and development programs. A forestry experiment station is proposed in Balikpapan under this project, and it is intended to serve as a research and information center (particularly with regards to forestry products) for the entire Kalimantan.

Given the new "industrial development" on the horizon, one almost wonders whether agricultural development is necessary, but the answer is strongly yes. Increase in agricultural productivity has been sluggish, and despite the fact that about one-half of the population, at least in part, depend on agriculture for subsistence, the BIMAS program in the province is not functioning. It has been reported that even with the added inputs, productivity is increased by only 0.1 ton. If the province continues to import food, its earnings from timber and oil will be exhausted before long. The German Federal Ministry of Technical Cooperation project on integrated regional development has been underway since 1977 in the middle Mahakam river region. The ambitious project, aimed at absorbing some 200,000 households through official transmigration programs, includes, among others, wet-rice, secondary crops and plantation crops, and development and equipment for research and training in fisheries and veterinary science.

Under our current project, AARD proposes a simple experimental farm in Lempake, located 11 km from the center of Samarinda. It is also a transmigration project site, operating since the early 1970's (total of 1,000 families). Given the peculiar pattern of the transmigration projects in East Kalimantan in which more than half the official transmigration since 1955 has been to the major urban areas, it makes sense to establish an experimental farm so close to the city.

Many local farmers, engaged in logging during the dry season, also return to the farm during the lay-off period in the rainy season.

Samarinda also has a large number of "rural" extension workers but no experimental farm. It will be particularly timely because all these transmigration projects around the city, including the one in Lempake, will be transferred from the central government to the provincial government starting in the next fiscal year. Dissemination of research results through the local extension service will become more efficient, and an increase in the yield on the experimental farm may convince the provincial government to channel the surplus budget towards constructing much-needed irrigation systems in the area. At present, the local farmer can expect only about 2 tons of rice per hectare. They could increase the yield, if the farm could be utilized during the dry season. All the cash income from other activities could then be used to raise their standard of living rather than to purchase food.

### C. South Sulawesi

South Sulawesi province, the Western "leg" (peninsula) of the island of Sulawesi, has been the homeland for a number of highly stratified ethnic groups along the coast as well as tribal groups in the interior. The Buginese, the largest among them, are historically known as sailors (often "pirates") and traders. The majority of the members who have not adopted the mobile life-style practice wet-rice farming in the north central coast of the peninsula. Their traditional counterpart, the Makassarese, on the other hand, occupy the southern half. Having participated in the interinsular trade and in the spice trade first with the Indian and Arab traders, the

Buginese, Makassarese, and Mandarese (northwest coast of the Peninsula) are all devout Moslems. Before and during the colonial period, they formed separate feudal states (sultanates), competing for control of the narrow belt of alluvial lands along the coast and for the trade with the Europeans. Makasar, presently called Ujung Pandang, has for centuries served as the center for all Eastern Indonesia. As a result of their more recent feudal past, social stratification remains pronounced and social status, accompanied by wealth, tends to follow traditional descent principles.

In the hilly north are a number of Sadang groups, and the Toraja groups are found in the mountainous northern interiors. As a result of contact with Protestant missionaries, many Toraja people have been converted to Christianity. Internal migration, however, is not uncommon in the province. Malaria, the primary disease, has pushed the population to more open and wider areas such as Luwu on the north-eastern coast of the peninsula, further lowering the status of low-class laborers. The fifteen-year political and military instability after independence along the hilly outskirts of the mountains was another cause of internal migration between the regions.

#### 1. Rice

The major means of subsistence for the majority (66%) of the province's population is rice farming. Though only twelve to seventeen percent of the province's total land area is suited for cultivation (1,352,000 hectares), it amounts to as much as

52% of Sulawesi's total arable land. The farm land is concentrated along the coast: 1) Pinrang and Sinderang areas in Wajo plains, 2) Watanpone plains on the east coast, and 3) Takalar plains on the southwest coast. However, only twenty percent of the entire lowland can be cultivated twice a year due to shortage of water during the dry season (May - October on the west coast, and November - April on the east coast). The largest lowland area, the eastern Wajo plains in the district of Bone and Wajo on the east coast, for example, has 28.3% of South Sulawesi's arable land (142,444 hectares), but production (273,489 tons) from the area amounts to only 8.9% of the province's total land area (45,915 hectares) because 60.7% of the district (20,000 hectares) is irrigated by Sadang Dam. The experimental farm, already in existence in Lanrang, is located in Sidrap. In the Luwu district where Bone-Bone (Mariri) experimental farm is proposed under this project, only 2.2% is currently irrigated, but with the completion of Luwu irrigation project, the total irrigated area could be increased by 15,000 hectares. In rainfed plus irrigated agricultural areas, research into cropping rotation systems with dry-land food crops is badly needed to enable the farmers to utilize the land more efficiently. The rainfed area is vulnerable to drought and disease, and lack of water limits the ability of some farmers to achieve desired results from intensification programs. Only 10 to 30 percent of the wet-rice farmers participate in BIMAS/INMAS programs. In the long-run, expanding the irrigation systems seems essential to increasing rice production in the area.

Nonetheless, South Sulawesi is a rice surplus area. In 1976, the total lowland and upland rice amounted to 1,821,791 tons, of which 787,185 tons were surplus. Between 1974 and 1976 rice production increased by 520,007 tons (40% increase) with the introduction of the intensification programs and the expansion of twice-a-year wet rice plantings. South Sulawesi exports 50,000 - 90,000 tons of rice annually. The present low productivity of wet-rice farming (attributed to the acid soils) could be improved through research. At present only 1.9 ton is harvested per hectare.

There is a strong need to increase yields in South Sulawesi because the land ownership in the province is distributed extremely unevenly among the farmers. According to the 1973 agricultural census, 55.7% of the farmers cultivate less than one hectare of land, whereas 6% of the farmers own about one quarter of all the cultivated land in the province. As a consequence, tenant share-cropping (landlord: tenant = 1:1 share of harvest and input excepting labor) is common, and as much as 40% of cultivated land is estimated to be operated under this system. Another handicap for the farmers in the area is a "shortage of labor", particularly in the irrigated areas where twice-a-year cropping is possible. This shortage, however, is partly caused by a cultural tradition. Except among the lower-classes like those in the arid Jeneponto areas of the southern tip of the peninsula, the women usually do not work in the fields. Out of the province's total population

(5,604,120 - 1976 census) only 40.8% are economically active, of which 66.3% are in agricultural sectors. A considerable outward migration, particularly among the landless Buginese, adds to the labor shortage. Some land reform measures may be needed to correct the uneven distribution of land and labor.

## 2. Plantation and Secondary Crops

The labor shortage is also attributed to the diversified mode of economic activities among the region's farmers. Secondary crops, small-holder coconut plantation crops, and livestock contribute additional income to the peasants' livelihood, but may serve to compete with labor necessary for rice-growing, particularly during the rainy season. Coconuts are the most important industrial crops but most trees are now more than 40 years old. Coffee, kemiri nuts, kapok and cloves are also planted, earning (including coconuts) about 30% of the province's income from export. No small-holder rubber plantations are found in the province.

In recent years, cassava, peanuts, and mungbeans, grown in the upland areas or in depressed lowlands through rotation with rice, have become more important than the province's traditional export commodity, corn, whose production has shrunk considerably due to the unfavorable market price. As for fruits, oranges in Selayar and Jeneponto appear promising. The Jeneponto citrus experimental farm could explore further possibilities with the crop. Vegetables such as cabbage, carrot, and potato are exported to East Kalimantan.

### 3. Animal Husbandry

South Sulawesi has the largest livestock population on the island and ranks third among provinces of Indonesia. According to the 1976 agricultural census, 438,000 cattle, 365,000 buffalos and 141,000 horses are raised in the province. Seventy percent of the cattle and buffalos are used as draft animals. Virtually all livestock, including goats and pigs (in the Christian Toraja and Catholic "Kolonialisasi" areas in the north) are consumed domestically, due to lack of marketing and transportation facilities for export. So far there is no positive development program. Animal diseases are also a major constraint to the livestock industry. The new research venture with the Australian government may solve some of these problems.

### 4. Forestry

Since the end of the Outer Island Rebellion, logging has been reactivated. The species composition of the forests is quite different from that of Kalimantan. A forestry research experimental farm is proposed in Maros to address problems of the entire island. South Sulawesi, however, has the smallest land area covered by forests (41%) in the island. Steep topography limits the areas of commercial logging. The largest production area is found in Central and Southeast Sulawesi contributing, in total, only 6% to the total forest production in Indonesia.

Central and South Sulawesi have the largest area of permanent forests and forest reserves. At the same time, South Sulawesi has the most bare lands. Reforestation of these bare lands which affect irrigated areas should rank high in both research and development programs. South Sulawesi also exports both inland and marine fish (85,000 tons) to Java.

### Summary and Conclusion

As stated earlier, research into both upland and lowland food crops is critically needed, even though the province for a long time has been a rice surplus area. Farms are small, the soils are not fertile and water supply is limited unless the land is situated near irrigation canals. The Maros research institute should address itself to these important issues. Lanrang experimental farm (180 km from Maros), located in the most productive (irrigated) part of Wajo plains, will address itself to the area's problems of labor shortages by achieving the goal of cultivating five crops in two years. Both stations already exist and need to be upgraded within the framework of the proposed research plans.

Pontobili experimental farm, however, may not need further expansion. 60 km from Maros (30 km from Ujung Pandang), it is amongst a lowland rainfed agricultural area, and may possibly be absorbed by the expansion of the nearby Gawa's recent manufacturing businesses. About 50% of the population is already landless, the majority working for the absentee landlords living in Ujung Pandang,

and 60% of all those farms in the area have adopted improved varieties, producing up to four tons per hectare. The local people also have immediate access to other jobs for cash income. Kertas Gowa, a paper factory using bamboos brought in from the Malino area, is located less than 5 km away, hiring a considerable number of skilled and unskilled wage laborers (Rp 25,000 - 40,000/month). Up to one hundred people are also hired for Rp 15,000/month by the nearby silk farm. In the neighboring subdistrict, there is also a Markisa fruit juice factory and plantation, established this year as a joint venture with Japan. The existing research projects at the experimental farm should be encouraged, but for the reasons stated above, it does not seem necessary to expand.

Jenepono horticultural experimental farm, on the other hand, should be supported, however, with some qualification. There is no doubt about the research need for such a station, specifically aiming at citrus fruit and vegetables. The citrus industry has declined during the past decade due to the "siam" disease, and there is no experimental farm elsewhere working on this problem. Jenepono is known as one of the poorest and most critical districts in the province. Due to a very short (less than three months) rainy season, farmers cannot grow rainfed upland rice. The major crop of the area grown by the poor peasants is corn, while the irrigated rice fields are mostly owned by a handful of local absentee landlords, who are descendants of traditional feudal "lords". The remainder of the area close to the coast has extremely poor soils; rocky or sandy in texture and low in N, P, and K. The recent drop

in corn prices has hurt the region's peasants. Considering the pattern of unevenly distributed land ownership, the depressed economy and poor soils, one is not surprised to hear that the whole area came under a strong communist influence before 1965.

Citrus plantations, which have only recently proven adaptable to the area, are very promising for improving the local economy. Many small-holder peasants have begun planting citrus trees in their gardens. They will produce oranges in five years. It is also the large land owners who have thousands of trees and are already harvesting, making millions of rupiahs each year. It is difficult to see that this project will narrow the gap between the rich and the poor.

Mariri at the northeastern corner of the province, on the other hand, is promising. It is located in the Luwu district, now active in opening the area for transmigration projects. The irrigation project, currently underway, will increase the total arable land for the area, and the district is a "melting pot" of rural Sulawesi. Presently a number of Javanese, Balinese and Sundanese are settled there, some having arrived there as early as the 1930's. Mariri is surrounded by these old and new Kampongs.

The project is also politically sound. Palopo, the capital of the district and the traditional seat of Luwu's court, has been repeatedly suppressed by Makassar, and during the 1950's, the district became the center of the Kahar Muzzakar Rebellion. The land is

still relatively inexpensive to purchase, and it is expected that many local and non-local people will move into the area. The experimental research farm will thus be of great benefit to the region. It is too far away from Maros to be served by Maros research institute.

D. North Sulawesi

North Sulawesi is currently one of the most prosperous provinces of Indonesia because of the large amount of cloves exported. The market price of cloves has skyrocketed in the past few years. The prosperity, however, is largely limited to the Minahasa district and the city of Manado from which 70% of clove and 53% of copra production comes.

In 1978, a little over two million people, belonging to fifteen different ethnic groups, were reported living in the province. The population is almost equally divided between Christians and Moslems. Having come under a direct Dutch influence during the Colonial period, the Minahasans and the Sanghir Taland are mostly Christians, while the Bolaang Mongondow and the Gorontalo are Moslems. Among the Christians, only ten percent are Catholic. Eighteen percent of the province's population live in urban centers, and about 45% of the total population are non-adult. The average population density is 77.62%/km<sup>2</sup>.

The size of average land holding among the farmers is very small, ranging from a quarter to one half a hectare for wet-farmland, and

from 0.75 hectare to 1.46 hectare for dryland. Twenty-five to fifty percent of the farmers engage in share-cropping (1:1 share), and 17 percent of the province's farmers are landless. Outside of the Minahasa areas, cash income is low. There is, however, a great potential for agricultural development in North Sulawesi. Around the Minahasa areas, where Intensifikasi Chusu projects (special intensification programs in irrigated farm areas, aimed at producing five crops in two years) are carried out by the extension service, the yield (rice) is as high as nine tons per hectare. In the Dumoga area where the largest single arable land area exists (31,000 hectares of unused and unopened land), irrigation constructions are currently underway and new farm lands (currently covered by primary forests) are being opened by the government, a great potential exists. These programs, however, need support such as floor prices. In rice surplus areas, for example, the price of unhulled rice is generally lower than the floor price, while export of vegetables and secondary crops are vulnerable to fluctuating prices in the free market. Unless new farm lands are opened, the size of land holdings will continue to shrink partly because of the bilateral inheritance practice common to the area.

#### 1. Rice

North Sulawesi is a rice-deficient province. Although 65% of the total labor force (606,042) is in the agricultural sector, only 1.67% of the province's total land is devoted to wet-rice farming (43,083 hectares), and 6.05% to dry land (156,068 hectares), of which the total irrigated area is less than 20%

(37,256 hectares). The vast mountainous and rolling hill areas are covered with forests (57.23%). Nonetheless, the province is one of the most promising agricultural territories currently open to transmigration programs. The average annual rainfall is high (2000 - 3000 mm), and in areas around Manado and Bolaang Mongondow (where Dumogo is located), there are 130 rainy days. The southern and eastern coasts, on the other hand, have only 1,500 mm of rainfall, spreading over 95 days of the year.

In 1978, the province produced 199,369 tons of rice and imported 78,869 tons from South Sulawesi. Four years previously, however, it produced 142,344 tons of rice and imported only 41,039 tons. In four years the total amount of rice consumption increased by 94,855 tons, which the local authorities attribute to an increase in cash income among the population and the consequent rise in the standard of living, particularly among the clove growers. The increased rice production is attributed to the increase per hectare resulting from intensification programs.

## 2. Secondary Crops

An increased use of fertilizers and insecticides has also increased secondary crop production. By the end of the second five-year program, surplus production was recorded with corn (since it is no longer exported, the production has since

declined), soybeans, peanuts (exported to Surabaya), which had increased by 983% (from 381 tons in 1974 to 4,194 tons in 1978), and greenpeas (increased from 140 tons to 773 tons). Vegetables, such as tomatoes, green onions, and cabbages totaling 54,596 tons were produced in 1978, but during the period between 1971 and 1977, only 100 to 300 tons were actually exported to West Irian and Maluku areas, due to the unstandardized quality control exercised by the middle-men.

### 3. Plantation Crops

The greatest farm income in North Sulawesi is derived from coconut production. Small-holder coconut plantations are found throughout the province (237,047 hectares in 1977). The farmers are familiar with the crop, and there is a relatively stable market. Clove, which currently sells for 10,000 rupiah per kilogram, is limited to the Minahasa and Sanghir Taland districts. The total industrial crop export of the province earns 70% of their total cash earnings.

### 4. Animal Husbandry and Other Economic Activities

Livestock (cattle and pigs for consumption, and eggs for export), and fish culture (carp) are other economic activities integrated into most farmer's subsistence activities. There are a number of wage laborers in the mining (copper, gold, nickel) and the processing industry (copra).

## Summary and Conclusion

As in East Kalimantan, the cost of living is rapidly rising in North Sulawesi because of a sudden influx of cash from export crops. Wages are high (i.e., 1,500 rupiah for a seven-hour day), and rice remains deficient. While the standard of living in Minahasa is high, the farmers outside clove-growing areas are poor. Between the lowland clove farmers and upland dryland farmers, there is a considerable gap in the standard of living, though the cost of living remains virtually the same for both. For this reason, Dumoga, where clove adaptation has not been too successful, is perhaps a better site to build an experimental farm than in Kalase where only 200 to 300 hectares of rice land exists.\* There are a number of other factors that favor Dumoga. They are:

- (1) The sub-district of Dumoga, located 200 km Southeast of Manado, is characterized by its tropical rain forest ecology, but unlike many tropical rainforests, the plains where Dumoga is situated are rich with volcanic soils. The river Onkag Dumoga runs through the Dumoga plains, and the area receives year-round, steady rainfall. In 1978, the district of Bolaang Mongandow produced 7,526 tons of rice.
- (2) Though between 1974 and 1978, the total cultivated land area increased from 837 hectares to 4,671 hectares, much of the area, however, is still covered by primary and secondary

\* It should be noted that the conclusions drawn by the Team's Anthropologist on the Dumoga site do not concur with the other members' findings (see Annex A-8).

forest. With the completion of the Dumoga irrigation project and the opening of new arable areas through transmigration and resettlement programs, the total farming area is expected to expand by 14,000 to 16,000 hectares. Currently, there are 14,231 families in Dumoga, out of which about 1,000 are transmigrants and another 700 are settlers from other areas of the province.

- (3) Currently both labor and land are in short supply. About 72% of the farmers own land, but the size of each farm is small; 45% own less than 0.5 hectare. Only 15% own more than one hectare of land, while as many as 27% of the farmers engage in share cropping.

These local farmers and newcomers hope to maximize productivity with the introduction of food crop varieties that are resistant to insects and tasty enough to sell in the urban market. The market is capable of absorbing a far greater amount than is currently being produced. Water, labor, and rich soils are already available.

Though Kalase is more convenient for the scientist because of the proximity to the university and other benefits of urban settings, Dumoga seems to have a greater need for an experimental/demonstration research farm.

#### E. Maluku

The province of Maluku, once known as the Spice Islands, consists of a number of island clusters stretching from north to southeast

between Sulawesi and East Irian. In the north is a group of volcanic islands, the largest one being Halmahera. Major islands in the central group are Sula, Buru and Ceram. The southeastern group is made up of small islands.

The total population in 1976 was 1,230,600 which amounts to less than one percent of the total people living in Indonesia. Most of the province's population live in Central Maluku. Amon, Ceram, and Buru have been the center of intensive trade contacts since the 14th century. Constant contact with a variety of trading cultures (Chinese, Arab, Indian, Portugese, Dutch) have produced a population that is racially heterogenerous. The population is divided into roughly equal proportions between Christians and Moslems. In both Christian and Moslem villages, patrilineal clan system is the basis of socio-economic and political organization. Land which is primarily committed to the swidden cultivation of sago, tuber, and vegetables for food and to spices for cash income, is apportioned on the basis of this clan system.

Communication is the major problem in these islands because of distance, poor transportation, and micro-insular geography. Like the Pacific Islands, wind directions determine the routes of trade and travel. As a consequence, the inhabitants of many small islands, particularly in the South, have remained outside the mainstream of Central Maluku.

Despite the fact that the province has a higher and better distributed rainfall than Sulawesi and that major islands such as

Halmahera, Banda, Buru and Ceram have rich soils, only six percent (191,000 hectares) of the potential food crop land in Maluku is being cultivated. Eighty percent of the total land area (3,152,400 hectares) is covered with forest. At the present, more area is planted in plantation crops than in food crops (124,143 hectares for coconut and 19,405 hectares for cloves in 1978).

#### 1. Rice and Food Crops

Most rice grown in the area is upland with a very low yield (0.9 ton per hectare). In 1978, the province produced only 1,940 tons of rice. Secondary food crops, in particular corn and cassava, are far more important. The province produced 18,298 tons of corn in 1978. As a consequence, although it has the potential to be self-sufficient in food, Maluku remains a food-deficient area.

Problems of the food crop agricultural sector can be attributed to a shortage of labor and the virtual non-existence of intensification programs. Both the local and national governments are involved in the improvement of infrastructures and the implementation of transmigration and resettlement projects to populate unused lands of the islands, in order to increase the available labor force. By the end of 1978, 15,000 transmigrant families and 5,000 resettlement families had moved to Halmahera and Ceram Islands. Another several thousand are expected to relocate to the island of Buru.

## 2. Plantation Crops and Other Economic Activities

Because of the high export cash crop production (coconut, nutmeg, clove, mace), the per capita income is relatively high. Sixty five percent of the province's gross domestic product is earned from food and plantation crops, to which 72% of the labor force is committed. Timber production (981,714 m<sup>3</sup>), fishery (7,685 tons), and the processing of plantation crops, forest products, fish products, and minerals have also become increasingly important parts of the economy.

### Summary and Conclusion

Since the population of the Maluku islands engage in diversified economic activities, an integrated approach to rural development is particularly stressed. The proposed outline of the experimental farm at Makariki is sound and congruent with the objectives of the policy makers and administrators.

Located at the southeastern coast of Ceram Island, the proposed site is near the resettlement program (three southern islands of Teun, Nila, and Serua). The land which was obtained by the government during the Japanese occupation for an abortive sugar project, belongs to the public, and the buildings are already under construction. An industrial crop experimental farm is near-by, and a live-stock breeding farm is also situated in the general area. The project has been blessed by the provincial government's enthusiastic support as well.

Recommendations:

General: Priority: First level

The team would not recommend, however, that a scientific team of 6 people be in residence. The staff should consist of a horticulturist in charge plus the necessary compliment of technical assistants (high school graduates). The other research could be supervised by visits from the staff at Maros. Only 9 staff houses are recommended: one @ 120 m<sup>2</sup> for horticulturist and 8 @ 50 m<sup>2</sup> for technical assistants. Office/laboratory should be 400 m<sup>2</sup> rather than 650 m<sup>2</sup>. More money should be allocated for an overhead irrigation system.

## ANNEX A-6

### MARIRI, NORTH LUWU, SOUTH SULAWESI, EXPERIMENT STATION

#### Description, Status and Recommendations

Purpose: North Luwu is a major transmigration agricultural development in South Sulawesi. Major irrigation works are currently being constructed and 135,000 hectares will be irrigated. A station is needed for research on irrigated rice, rainfed rice, horticultural crops plus legumes. Site would also serve as headquarters for experimental work on private farms.

Location: 4 km south of Bone-Bone.

Area: 50 hectares have been made available by the government.

Altitude: 6 m.

Topography: Flat.

Soil Types: Alluvial soils that are poorly drained. Some drainage work would be necessary.

Land utilization proposed: Research on irrigated and rainfed rice would concentrate on factors limiting production with emphasis in soils problem and pest control. Other work would include research on corn, legumes, and vegetable crops because of the market potential at the nearby nickel mines.

Fencing: None existent. Would be needed as provided for in the proposal.

Precipitation:

Mean annual: 3000 mm.

Pattern: Well distributed with less than 2 months (July and August) of less than 200 mm.

Water:

Irrigation: Irrigation canal runs through the site.

Potable water: Would need a cistern for water for drinking and laboratory purposes.

Communication: No telephone available.

Transportation: 4 km from a hard surface road but road by site appears to be all-weather. Hard surface road to be built by governor in support of transmigration project. Airport with limited service one hour away.

Power: None existent. Would need a generator with a standby generator so that power could be assured for homes and laboratory equipment. Budgeted items include power equipment for farming operations and transportation.

Buildings: None existent. Plans call for:

Office/Laboratory	550 m <sup>2</sup>
Service building	100 m <sup>2</sup>
Storage	200 m <sup>2</sup>

Green house 100 m<sup>2</sup>

Screen house 2000 m<sup>2</sup>

Staff housing:

Manager @ 120 m<sup>2</sup>

Guest house @ 120 m<sup>2</sup>

Scientific staff 6 @ 70 m<sup>2</sup>

Technical staff 10 @ 50 m<sup>2</sup>

Recommendations:

General: Priority: First level.

Comment: The rationale for location of an economist is discussed elsewhere, therefore staff housing could be reduced by one.

## ANNEX A7

### KALASE, NORTH SULAWESI, EXPERIMENT STATION

#### Description, Status and Recommendations

Purpose: The proposed station would serve the area now represented by thousands of hectares of coconuts covering the slopes of North Sulawesi. A location is needed for conducting research on perennial cropping systems, i.e., intercropping of tree crops and food crops. A portion of site could also be used for research on irrigated rice.

Location: 8 km southeast of Manado. Located close to agricultural high school being built by World Bank, the agricultural university, the extension offices and the capital of North Sulawesi

Area: 50 hectares of land available, now covered with a 70 year old stand of coconuts but the concession terminates this year.

Altitude: 5 to 20 m.

Topography: A portion is flat. It could be irrigated and a portion is relatively steep, typical of the topography of the coconut growing area.

Soil Types: Latosol.

Land utilization proposed: A three-fold purpose is proposed, namely, (a) work on irrigated rice; (b) cropping systems under rainfed conditions; and (c) a headquarters for cooperative trials with farmers.

Fencing: None. Fencing would be needed.

Precipitation:

Mean annual: 3000 mm.

Pattern: Evenly distributed.

Water:

Irrigation: Irrigation water would be available from the river.

Potable water: A well would be needed for drinking purposes and for laboratory.

Communications: No telephone but only one km from agricultural high school and 8 km from Menado.

Transportation: One km from road and 8 km from Menado, including a major airport.

Power: No electricity. A generator would be needed unless arrangements could be made to extend power line beyond the new high school.

Buildings: None on site. Following are proposed:

Manager's house	120 m <sup>2</sup>
Guest house	120 m <sup>2</sup>
6 Scientific staff @	70 m <sup>2</sup>
10 Technical staff @	50 m <sup>2</sup>
Office/Laboratory	740 m <sup>2</sup>
Service building	150 m <sup>2</sup>

Storage building	200 m <sup>2</sup>
Green house	100 m <sup>2</sup>
Screen house	260 m <sup>2</sup>
Drying floor	600 m <sup>2</sup>

Recommendations:

General: Priority: **First level.** This would be an ideal site for an integrated research station for food crops, industrial crops and livestock. Farming practices in the area include mixed cropping of coconuts-cloves and annual crops. Research on the replanting of coconut and clove plantation would logically involve cooperation between food crops and industrial crops specialists. Cattle raising on coconut plantings is successful in many parts of the world. An agronomist for industrial crops and an agronomist for pasture management could be housed under the present building plans. Additional land would probably be needed.

## ANNEX A8

### DUMOGA, NORTH SULAWESI, EXPERIMENT STATION

#### Description, Status and Recommendations

Purpose: The Dumoga valley is a fertile area receiving technical irrigation. Cropping intensity and crop yields are high. The station would serve for irrigated and rainfed rice as well as secondary crops, especially for work with soybeans.

Location: One and one-half hours from Kotamobagu, 10 km from the hard surfaced highway and 1 1/2 km from the secondary road.

Area: 50 hectares have been offered for experimental work.

Altitude: 227 m.

Topography: Flat.

Soil Type: Alluvial, covered with virgin forest.

Land utilization purposes: Experimental work would include rice, corn, soybeans and peanuts. These legumes are new to the valley but farmers are interested in growing them. Site will also serve as headquarters for trials on farmer's fields.

Fencing: None. Fencing would be needed.

Precipitation:

Mean annual: 2000 mm.

Pattern: June - September dry season.

Water:

Irrigation: Adjacent to an extensive irrigation system under construction.

Potable water: A well would be needed for drinking purposes and for laboratory.

Communications: No telephone service available but excellent communication between Kotamobagu and Manado.

Transportation: 10 km from highway and only 1½ hours away from airport at Kotamobagu.

Power: None on site. A generator would be needed.

Buildings: None on site. The following are proposed:

Office/laboratory	260 m <sup>2</sup>
Service building	60 m <sup>2</sup>
Storage	70 m <sup>2</sup>
Green house	100 m <sup>2</sup>
Screen house	100 m <sup>2</sup>
Staff housing:	
Manager	120 m <sup>2</sup>
Guest house	120 m <sup>2</sup>
5 Scientific staff @	70 m <sup>2</sup>
5 Technical assistants @	50 m <sup>2</sup>

Recommendations:

General: Priority: Third level.

The team was of the the opinion that the development of this station should come after the station at Kalase has been built and becomes functional. Furthermore it would be very difficult to convert this heavy, virgin forest into suitable land for experimental plot work. A more feasible alternative would be to continue cooperative trials with farmers.

Note: Although the anthropologist did not visit this site, she recommended that it be given a higher priority than the one located at Kalase. Other members of the team felt otherwise.

ANNEX A-9

MAKARIKI, CERAM, MALUKU, EXPERIMENT STATION

Description, Status and Recommendations

Purpose: The station will be located on the island of Ceram and will give special attention to upland rice, corn, cassava and crops of potential to the province. It is also a suitable site for irrigated rice.

Location: 6 km from Masohi on an all-weather but rough road.

Area: 50 hectares have been made available by the governor of Maluku.

Altitude: 3 m.

Topography: Flat with area becoming rolling topography toward the mountains. Poor drainage is a problem but can be overcome through proper development. Good natural slope towards the river.

Soil Type: Alluvial soils on the flat portion. Rolling land is Mediterranean.

Land utilization: To be used for variety trials, fertilizer rates and ratios and methods of weed control, diseases and insects of rice, corn, cassava and other secondary crops.

Fencing: 900 meters of fencing now being built. Would need more.

Precipitation:

Mean annual: 2800 mm.

Pattern: November - March very dry.

Water:

Irrigation: A potential for water but not yet available. Would need well.

Potable water: A well would be needed to provide water for the homes and laboratories.

Communications: No telephone would be available. Mail service in nearby town of Masohi. Also an airport there.

Transportation: Located on an all-weather but rough road. Team was assured by governor that road would be improved.

Power: None on site. A generator with standby facilities would be required.

Building: The following buildings are now under construction:

2 houses @	70 m <sup>2</sup>
1 gedung	100 m <sup>2</sup>
1 greenhouse	100 m <sup>2</sup>
1 screenhouse	100 m <sup>2</sup>
1 drying floor	200 m <sup>2</sup>
1 office/laboratory	400 m <sup>2</sup>

The following have been requested:

addition to office/laboratory	400 m <sup>2</sup>
storage building	150 m <sup>2</sup>
greenhouse	50 m <sup>2</sup>
screenhouse	50 m <sup>2</sup>
library	50 m <sup>2</sup>
staff housing:	
1@	150 m <sup>2</sup>
6 for scientists @	70 m <sup>2</sup>
10 for technicians @	50 m <sup>2</sup>

Recommendations:

General: Priority: First level with some modifications as follows: the equipment and vehicle request should be honored. Since some construction is already underway and since the industrial crops situation would be located at some spot there could be some reductions in building needs. Guest house, library and some laboratories could be jointly used.

## ANNEX A-10

### BANJARBARU, SOUTH KALIMANTAN, RESEARCH INSTITUTE

#### Description, Status and Recommendations

Purpose: The proposed Research Institute at Banjarbaru would be a replacement for the present facility at Banjarmasin which is very limited in land for experimental purposes. The Research Institute would be the center for agricultural research in Kalimantan. Much of the agriculture is on tidal swamp land and although the farm itself could be irrigated, the program would also include rainfed agriculture.

Location: 7 km from Banjarbaru on a hard surfaced road.

Area: 50 hectares will be made available by the government. Only a short distance from the river which can provide irrigation water.

Altitude: 20 m.

Topography: Mostly flat with a small portion with a slight rise for building site. Drainage may be a problem because it appeared that the stream running through the farm was higher than the surrounding land.

Soil Types: Red podzolic.

Land utilization proposed: To be used for both irrigated and upland rice combined with all types of secondary crops and cropping systems.

Fencing: None. Must be supplied.

Precipitation:

Mean annual: 2400 mm.

Pattern: December - March wet season.

April - September dry season.

Water:

Irrigation: Irrigation water to come from a nearby river plus a deepwater well that is to be dug.

Potable water: A well would be needed to provide water for the homes and the laboratories.

Communications: Telephone service could be made available. Mail in nearby town of Banjarbaru.

Transportation: Located on a paved highway and only a few km from University, airport and the extension office.

Power: Power line runs along the highway so electricity would be available.

Buildings: None on site. A complete plan has been submitted for office/laboratory building, service building, greenhouses and staff housing.

Recommendations:

General: Priority: First level with some modifications as follows:

Office and laboratory building	600 m <sup>2</sup>
Field Service Center	400 m <sup>2</sup>
Storage and processing	500 m <sup>2</sup>
Greenhouse	1000 m <sup>2</sup>
Screenhouse	1000 m <sup>2</sup>
Drying floor	1000 m <sup>2</sup>
Staff housing:	
Director	150 m <sup>2</sup>
Senior staff (including	
guest house) 10 @	120 m <sup>2</sup>
Junior staff 15 @	70 m <sup>2</sup>
Technical staff 25 @	50 m <sup>2</sup>

ANNEX A-11

HANDIL MANARAP, SOUTH KALIMANTAN, EXPERIMENTAL FARM

Description, Status and Recommendations

Purpose: The Handil Manarap experimental farm is a 20 hectare site of an indirect tidal swamp. It is devoted entirely to irrigated rice research. Four percent of South Kalimantan is classified as tidal swamp. The site represents 40,000 hectares in this area.

Location: This site is 12 km from the city of Banjarmasin but not on an all-weather road.

Area: 20 hectares located on a canal and on a road that is in need of repair.

Altitude: Sea level.

Topography: Flat.

Soil Type: Alluvial.

Land utilization proposed: To be used entirely for irrigated rice research.

Fencing: None existent. Will be needed.

Precipitation:

Mean annual: 2400 mm.

Pattern: December - March wet.

April - September dry.

Water:

Irrigation: To come from an irrigation canal. Pump is available and functioning.

Potable water: A deep well would probably not be feasible so water would be needed to be collected from roof and stored in a cistern for laboratory and household use.

Communications: None existent. Only means is by personal car on rough road or by canoe on the canal.

Transportation: Hopefully local government would grade and gravel the road and repair the bridges so site could be reached at all times.

Power: None in the area. A generator would be needed.

Buildings: One large housing being used for office, work room and living quarters. A new deep water screen house, a good storage house, an old seed storage building now being used for housing and also a pump house. Drying floor that needs resurfacing.

Recommendations:

General: Priority: First level for equipment and vehicles, and third level for site construction and buildings. The rationale for this recommendation is that the present building could be made very serviceable with some minor repairs.

## ANNEX A-12

### BARAMBAI (KUALA KAPUAS), CENTRAL KALIMANTAN, EXPERIMENTAL FARM

#### Description, Status and Recommendations

Purpose: Transmigration Ministry is moving people into undeveloped regions where there is little information about the soils or crop adaptation. The project at Barambai proposes to study the management of organic soils in terms of their agricultural potential.

Location: 50 km by canal from Banjarmasin (about 1½ hours).

Area: 16 hectares, representing 4.5 million hectares of land in Central Kalimantan.

Altitude: Only a few inches above sea level.

Topography: Flat.

Soil Types: Organic soils.

Land utilization proposed: Prior to this time the experimental work on evaluation of tropical fruits, rice and secondary crops on these low-lying organic soils has been done under contract with Gadjah Mada University but the Transmigration Ministry is now transferring property to the Department of Agriculture.

Fencing: None available but canals make them unnecessary.

Precipitation:

Mean annual: 2400 mm.

Water:

Irrigation: Mostly a matter of water control because of direct tidal action. Primary and secondary canals established.

Potable water: Currently using rainwater.

Communications: No telephone service available, but extension office is adjacent to site.

Transportation: Access to site only by boat on the river and canal.

Power: No electricity but a generator is available.

Buildings:

- One manager's residence
- Two duplex residences
- Two guest houses
- One mess house
- One large storage building
- Wooden drying floor 80 m<sup>2</sup>
- Screen house 50 m<sup>2</sup>
- Generator house
- Meteorological station

Recommendations:

General: Priority: First level. Would need equipment, vehicle and training funds as requested under Kuala Kapuas proposal. Would need no funds for buildings.

ANNEX A-13

LEMPAKE, EAST KALIMANTAN, EXPERIMENTAL FARM

Description, Status and Recommendations

Purpose: Transmigration Ministry has moved people into the Samarinda area where little information is available to guide them in their farming operations. The proposed site would provide land for experimental work with rice and secondary crops under both irrigation and rainfed conditions.

Location: 15 km from Samarinda on a rough road, 7 km from airport.

Area: Government has provided 10 hectares, but more could be made available. 200 m from river.

Altitude: Less than 10 m.

Topography: Flat.

Soil Types: Alluvial.

Land utilization proposed: Adaptation trials with rice, secondary crops and horticultural crops under varying soil treatments, time of planting and cropping systems.

Fencing: None. Fencing would be needed.

Precipitation:

Mean annual: 2000 mm.

Pattern: December - February wet season.

July - September dry season.

Water:

Irrigation: Irrigation available at river 200 m away.

Potable water: Would need a cistern.

Communications: Telephone at airport 7 km away.

Transportation: Government has indicated road would be built.

Power: No electric power available Generator would be needed.

Buildings: None on site. Proposal calls for office/laboratory of 200 m<sup>2</sup>, machine shed 120 m<sup>2</sup>, storage building 120 m<sup>2</sup>, and one dwelling 120 m<sup>2</sup>.

Recommendations:

General: Priority: First level, provided the structures could be reduced to one dwelling and one additional building of 200 m<sup>2</sup>. Total cost should be no more than half the \$648,500 requested.

## ANNEX B

### TAMBANG ULANG, SOUTH KALIMANTAN, EXPERIMENTAL FARM - ESTATE CROPS

#### Description, Status and Recommendations

Purpose: Vast areas of Kalimantan are infested with alang-alang grass that is producing very little income. Possible uses include rubber production and so a research farm is proposed at Tambang Ulang.

Location: 35 km from Banjarmasin and 23 km from Banjarbaru. 7 km from a hard surface road.

Area: Exact site has not been determined but 200 hectares are available in proximity to the proposed livestock station.

Altitude: Unknown.

Topography: Rolling to steep.

Soil Type: Organosol.

Land utilization proposed: The proposed site of 200 hectares would be used primarily for a rubber nursery, testing rubber clones and agronomic trials.

Precipitation:

Mean annual: Unknown.

Pattern: Unknown.

Water: Unknown.

Communications: The nearest telephone would be 23 km away. No knowledge of postal service.

Transportation: Hard surface road 7 km away and over rough terrain. Airport is 35 km away.

Power: No electricity in area.

Buildings: None. Plan calls for an office/laboratory of 375 m<sup>2</sup>, a storage building, drying floor and 8 staff houses, namely for manager, assistant manager, guest house and 5 houses for technical assistants.

Recommendations:

No one from the Research Institute for Estate Crops-Bogor was at the site at the time the team visited the vicinity, but upon returning to Bogor it was learned that an alternative site was being considered at Tanjung some 300 km north. Only 100 hectares are available but it is in the rubber producing area of South Kalimantan. The team did not see the site.

Options:

1. 200 hectare site near Tambang Ulang covered with alang-alang, near the sites of other research facilities but outside the rubber producing area.
2. 100 hectares near Tanjung, 300 kilometers from the research complex but more typical of the rubber producing area.

## Conclusions:

The Team is unable to make comparisons between what they saw and what they did not see. An on-site review would be necessary if serious consideration is to be given to expanding rubber research on Kalimantan.

## ANNEX C

### MAKARIKI, CERAM, MALUKU, EXPERIMENT STATION - INDUSTRIAL CROPS

#### Description, Status and Recommendations

Purpose: The proposed experiment station would concentrate on coconuts and cloves under the dry climate of eastern Indonesia. Coconut hybrids and dwarf varieties now available have not been evaluated under this dry climate. Clove production has been declining and although diseases are serious there may also be other factors limiting production.

Location: 6 km from Masohi on an all-weather but rough road.

Area: 200 hectares will be made available by governor of Maluku.

Altitude: 3 m.

Topography: Area near road is flat but becomes gently rolling toward the mountains.

Soil Type: Lower portion is alluvial while upper portion is mediterranean.

Land utilization proposed: To be used for experimental plantings of coconuts and cloves, primarily under rainfed conditions.

Fencing: None, must be supplied.

Precipitation:

Mean annual: 2800 mm.

Pattern: November - March very dry.

Water:

Irrigation: A potential for water, but not yet available. Would need deep well.

Potable water: A well would be needed to provide water for the homes and laboratories.

Communications: No telephone would be available. Mail service in nearby town of Masohi.

Transportation: Located on an all-weather but rough road. Team was assured by governor that road would be improved.

Power: None on site. A generator with standby facilities would be required.

Buildings: None on site. Plan calls for an office/laboratory 470 m<sup>2</sup>, green house 100 m<sup>2</sup>, storage building 1000 m<sup>2</sup> and 21 staff houses, namely:

Manager and assistant manager @	120 m <sup>2</sup>
6 Scientific staff @	70 m <sup>2</sup>
12 Technicians @	50 m <sup>2</sup>
1 Guest house @	300 m <sup>2</sup>

Recommendations:

General: Priority: First level with some modifications as follows: The station would be on same site as food crop station and many facilities including laboratories and guest house could be shared. Equipment and vehicle should be provided but site development and construction could be reduced by 50%.

ANNEX D-1

BILI-BILI, SOUTH SULAWESI, EXPERIMENT STATION - ANIMAL HUSBANDRY

Description, Status and Recommendations

Purpose: To establish a livestock research station in South Sulawesi to study factors affecting the establishment of a successful livestock industry, including reproduction, nutrition and breeding problems and to investigate factors affecting pasture establishment and management.

Location: 35 km from Ujung Pandang and 65 km from Maros.

Area: 50 hectares.

Altitude: Unknown.

Topography: Unknown.

Soil Type: Unknown.

Land utilization proposed: To be used for feed for livestock under breeding and nutrition trials and to conduct pasture management studies under livestock grazing conditions. The latter to include intensity of grazing, species introduction and fertilizer variables.

Fencing: Unknown.

Precipitation:

Mean annual: 3000 mm.

Pattern: November - March wet season.

April - October dry season.

Power: Unknown.

Buildings: Unknown.

Recommendations:

General: Priority: Third level.

The team did not see this site since there was no one present from the Animal Husbandry Research Institute. Upon returning to Bogor and discussions with them it was learned that they have a "Monitoring Cattle Productivity on Pastures Project" located in South Sulawesi in collaboration with the Australian Development Assistance Bureau. It would appear more logical for the expansion of livestock research to take place in South Kalimantan.

## ANNEX D-2

### TAMBANG ULANG, SOUTH KALIMANTAN, EXPERIMENT STATION - ANIMAL HUSBANDRY

#### Description, Status and Recommendations

Purpose: The Tambang Ulang station is proposed for research on non-irrigated land in South Kalimantan now infested with alang-alang grass, a relatively nonproductive grass.

Location: 35 km from Banjarmasin and 23 km from Banjarbaru. 7 km from a hard surfaced road.

Area: Exact site has not been determined but to be chosen from an area of 900 hectares owned by the government and covered with the weedy grass.

Altitude: Unknown.

Topography: Rolling to steep.

Soil Type: Organosol.

Land utilization proposed: The proposed site of 200 hectares would be a general livestock center with emphasis on pasture renovation from alang-alang grass to more productive species. The area represents 600,000 hectares of rolling topography now covered with this grass.

Fencing: None.

Precipitation:

Mean annual: Unknown.

Pattern: Unknown.

Water: Streams are available for water for livestock but ponds would need to be built and a deep well for household use.

Communications: Non-existent. Nearest telephone would be 23 km away. No knowledge on postal service.

Transportation: Hard surface road 7 km away, over rough terrain. Airport 35 km away.

Power: None in area. Generators would have to be installed.

Buildings: None.

Recommendations:

General: Priority: Second level.

The area is too isolated. It would be inaccessible for farmers and ranchers or for other visitors.

Since there are vast areas of land covered with along-alang grass there appears to be a real justification for studying its adaptation to livestock farming. Two alternatives are suggested:

1. Locate a more accessible site and combine function with that proposed at Banjarbaru by Animal Disease Research Institute.

2. Activate only the pasture renovation phase by placing one agronomist at the Food Crops Research Center at Banjarbaru where he would be associated with other research people and arrange for 2-5 hectares of alang-alang infested land that is more accessible. This arrangement would reduce the budget from \$4,280,000 to approximately \$200,000 to \$300,000.

Either alternative 1 or 2 above would be given priority of first level. Should alternative 1 be selected, the staffing pattern should consist of a manager, a livestock specialist and an agronomist and budget adjusted accordingly.

## ANNEX E

### BANJARBARU, SOUTH KALIMANTAN, EXPERIMENT STATION - ANIMAL DISEASES

#### Description, Status and Recommendations

Purpose: The station is proposed to establish a regional laboratory so that research work and identification of animal disease problems could be conducted for all of Kalimantan.

There are appreciable numbers of cattle, buffaloes, sheep, goats, chickens and ducks now in South Kalimantan. Plans are underway for the Asian Development Bank to finance a livestock development scheme nearby.

Location: On the edge of the city of Banjarbaru. The exact location has not been determined but the 12 hectares needed can be obtained from land owned by the government.

Area: Not currently defined but near the city because of accessibility. Animal disease people in Bogor place a high priority on being near the airport.

Altitude: Unknown.

Topography: Gently rolling.

Soil Types: Unknown.

Land utilization proposed: The laboratory's function would not be directly related to land use since only 12 hectares are contemplated and most of activity would be inside the building.

Fencing: None.

Precipitation:

Mean annual: Unknown.

Pattern: Unknown.

Water: Unknown.

Communication: Telephone and mail service could be made available since laboratory to be located at edge of city.

Transportation: Located on a paved highway. Very accessible to airport and nearby cities.

Power: Available.

Buildings: None. An elaborate building plan is proposed.

Recommendations:

General: Priority: Second level.

Much of the focus seems to be on disease identification and control. This would not seem to justify a staff of six veterinarians, specializing in bacteriology, virology, parasitology, mycology and pathology.

Alternative recommendations:

1. Build a research laboratory of 2-3 rooms for one well-trained veterinarian plus a couple of technicians. Maintain a strong liaison with the Central Research Institute at Bogor.
2. Locate as a wing either on the Animal Husbandry Station at Tambang Ulang or at the Food Crops Station at Banjarbaru, thus utilizing joint facilities and placing the officer-in-charge in proximity to other scientists. Note - the animal husbandry people at Bogor fear disease contamination but it seems proper precaution could prevent this. The budget of \$3,907,900 could probably be reduced to \$400,000.

General comment: Unfortunately no one from the Animal Disease Research Center-Bogor was present at the proposed site and so many of the team's questions could not be answered.

## ANNEX F-1

### MAROS, SOUTH SULAWESI, EXPERIMENTAL FARM - FISHERIES

#### Description, Status and Recommendations

Purpose: Provide brackishwater pond and laboratory facilities for adaptive research on the culture of milkfish (Chanos chanos) and Penaeid shrimp. Research results would be applicable to approximately 42,000 hectares of brackishwater ponds (tambak) in the Sulawesi region.

Location: 10 km north of Maros town proper, then ½ hour by boat from highway.

Area: 15 hectares of existing brackishwater ponds.

Altitude: Sea level.

Topography: Level, former mangrove forest.

#### Land utilization proposed:

Ponds: 6 existing ponds, varying in size from 1.5 - 2.5 + hectares, to be renovated and subdivided into research units, plus one existing water supply canal. Detailed plan of pond complex not available.

Buildings: No existing buildings. Construction of the following is planned:

- |                 |                    |
|-----------------|--------------------|
| 1. laboratories | 240 m <sup>2</sup> |
| 2. offices      | 100 m <sup>2</sup> |

3.	green houses	150 m <sup>2</sup>
4.	field service center	200 m <sup>2</sup>
5.	houses	2000 m <sup>2</sup>

Water: Water from tidal swamp channeled through a main supply canal.

Communications: Telephone and mail service available at Maros. Airport near Maros.

Transportation: Asphalt highway from Maros to tidal swamp area. Boat service required from highway to site.

Power: Electric power in Maros and surrounding area. Site would require a generator.

Recommendations:

General: Priority: First level.

Specific: The proposed brackishwater complex should be upgraded from an experimental farm to an experimental station. An alternative site should be looked for, as the current site is not easily accessible, has no available land for support buildings, and poses potential problems with water use rights and dike and canal maintenance. The site would also require extensive pond, dike, and gate renovations. A larger site near the highway with suitable land for pond development and building construction is recommended. Manpower training and technical assistance should receive priority attention. Proposed buildings should be reduced to a small office and laboratory/service center on site. Staff assigned to the station can be housed at the World Bank supported freshwater research center at Maros, with full use of the center's laboratory facilities.

Technical note: Brackishwater research stations have been proposed for World Bank support at Benoa and Gondol, Bali. These stations would conduct research on spawning/rearing techniques for marine aquatic species, with specific emphasis on brackishwater pond culture at Benoa and sabalo (Chanos chanos) spawning at Gondol. The potential support by these stations of brackishwater pond culture in Sulawesi was given as the primary reason for limiting the size and scope of the Maros station to be assisted by USAID. As there are few brackishwater ponds on Bali, and as research conducted on Bali would not be directly applicable in Sulawesi, it would seem more appropriate to expand the role of the proposed Maros station and limit the size and scope of the Benoa station. Research on spawning the sabalo (Gondol station) would also be a duplication of effort currently undertaken by SEAFDEC (Southeast Asian Fisheries Development Center), Philippines, and the University of Hawaii. With the limited manpower and capital resources of the Inland Fisheries Research Institute, it would appear more beneficial to channel these resources into developing a center of excellence for brackishwater research in Maros. Research applicable the Java/Bali area could be handled by rejuvenating the existing research complex at Jepara, Central Java.

## ANNEX F-2

### TENGGARONG, EAST KALIMANTAN, EXPERIMENT STATION - FISHERIES

#### Description, Status and Recommendations

Purpose: An experimental station is proposed at Tenggarong that would serve as research headquarters for fishery management and provide pond and laboratory facilities for aquaculture. Fishery management research would be directed toward management of fishery stocks in the lakes of western East Kalimantan. Approximately 14,000 fishermen land an estimated 3,000 MT of freshwater fish from 90,000 ha. of lake area in this region. Approximately 2,000 MT of this production are exported to Java as salted, dried fish. Water levels in the lakes fluctuate seasonally, with the lakes reducing considerably in size and depth during the dry season. Overfishing is reported to be a serious problem, but little has been done to impose gear, species, area, or seasonal restrictions on the fishery.

Aquaculture research would be directed toward developing pen and cage culture techniques suitable for the lakes region. Emphasis would be on fry production, nutrition and culture techniques for the snakehead (Ophiocephalus striatus) and the betutu (Oxyeleotris marmorata). A limited cage culture industry has been established in the lakes area already, using the entrails of salted fish as feed for the snakehead.

Location: Tenggarong, 45 km southwest of Samarinda on the east side of the Mahakam.

Area: 10 hectares of land for pond, laboratory and housing complex. A small fisheries service hatchery is adjacent to the site.

Altitude: Less than 5 m.

Topography: Flat, gradual sloping to river.

Land utilization proposed:

Ponds: 2.16 hectares allocated for pond and hatchery complex.  
Detailed plan of pond complex not available.

Buildings: No existing buildings. Construction of the following is planned:

1. laboratories	240 m <sup>2</sup>
2. offices	100 m <sup>2</sup>
3. green houses	150 m <sup>2</sup>
4. field service center	200 m <sup>2</sup>
5. houses	2000 m <sup>2</sup>

Water: Water for irrigating ponds is to be obtained from the Mahakam River and a small stream adjacent to the site.

Communications: Telephone and mail service available across river from site at Tenggarong.

Transportation: Asphalt highway from Tenggarong to ferry crossing at Samarinda. Airport at Samarinda. Boat service required to cross river to site.

Power: Electric power in Tenggarong. Experiment station would require a generator.

Recommendations:

General: Fishery management - Priority: First level.

Aquaculture - Priority: Third level.

Specific: Fishery management - High priority is given to management research for open water fishery stocks. In the provinces of South and East Kalimantan,  $\pm$ 90,000 hectares of freshwater swamp and lake areas respectively are fished by more than 30,000 full- and part-time fishermen. A wide variety of gear are used in this capture industry, with few or no management controls. Technical assistance, manpower training, equipment and vehicles should receive priority attention. Facilities could be minimal for the initial 2-3 years, requiring only housing and laboratory facilities at a headquarters site, plus limited field facilities in the lake and/or swamp regions. Headquarters for the project could be in either Samarinda, East Kalimantan, or Banjarbaru, South Kalimantan. This headquarters could be incorporated into an integrated research complex, such as the Research Institute for Food Crops planned for Banjarbaru. Additional facilities thereafter would be dependent on recommendations stemming from stock management research.

It is also recommended that post-harvest technology and marketing research be incorporated in the research scope. The large majority of fish landed in the capture industry are salted and dried for inter-insular export. Current salting and drying techniques result in a

poor quality product that could be greatly improved. It is recommended that the Fishery Technology Research Institute/Jakarta assist with respect to post-harvest technology and marketing research.

Aquaculture - Low priority is given to the construction of a freshwater aquaculture facility at Tenggarong to support cage and pen culture development in the lake region of East Kalimantan. Culture emphasis is being placed on the production of carnivorous species that are expensive to rear and cater to a minority market due to their high price. Pond culture of other fish species in the region is limited to less than 16 hectares of common carp production. Fresh fish is abundant in local markets from the capture industry and freshwater aquaculture in general is viewed by the local fisheries service as an economically non-competitive enterprise.

ANNEX G-1

FORESTRY RESEARCH CENTER PROPOSAL

SOUTH KALIMANTAN (RYANKANAN)

The team visited here 7-10 February, of which Van Eck used 8 February for discussions and tours to evaluate the forest research proposal.

The provincial Forest Service manages 2.1 million hectares with a staff of 220 foresters, of which 22 have the Ir degree and 4 the B.Sc. degree. There is a need to have 400+ foresters. Typically, the office has two administrative and three technical divisions. The latter are planning, management (includes security, reforestation and fire control) and utilization (includes production, marketing and grading). Most of the forested land is divided into logging concessions. One of the largest areas was retained by the government logging company Inhutani II covering all of the island of Pulau Laut. There are 60,000 hectares of land in forest plantations, mostly Pinus merkusii and some Eucalyptus deglupta, Acacia auriculiformis and Caliandra; with an ongoing program of afforestation and maintenance of the protection forest on the Meratus mountain range. No aerial photographs were used or available at this office for planning or reconnaissance purposes. The dean of the forestry faculty at Universitas Lambang Mangkurat (now training 110 students in a 5-year Ir degree program) offered similar comments.

We visited the Ryankanana area, proposed for the research station, in a combined car and boat tour. Observed were extensive alang-alang

fields surrounding the Ryankanan reservoir, apparently offering excellent soil conservation cover without apparent signs of destructive cultivation, fire or soil erosion. Small areas along the lake edge were planted to Pinus merkusii, Acacia auriculiformis and Peronema canescens in close 2 x 3 m grids. Elsewhere we saw less successful examples of "regreening" plantings with Pinus and Acacia in grassy fields. No large-scale plantings or nurseries were seen but we were told they were at some distance to the east.

The visit did not result in materialization of a designated location for a forest research station. It appeared likely that the Forest Service would have adequate land adjacent to or near its new building in Banjarbaru, or that a location could be found in the neighboring campus of the university. However, we met no local spokesman to make a strong plea or offer for such a station.

Local forest industry consists of two sawmills and plywood mills cutting timber from Central Kalimantan brought down the Barito River. A Martapura paper mill has been closed since 1976. The proposed location of the research station is adjacent to the vast region of rawa or swampland, sections of which could be profitably reforested to provide fuel and utility wood as well as edibles and shade for the planned transmigration settlements, but this aspect was never mentioned.

#### Recommendations:

**The Ryankanan proposal should not be funded because:**

1. The research objectives (originally written for Pulau Laut) do not clearly apply to the problems raised at Banjarbaru and Ryambanan;
2. the forest areas to which they could apply are quite inaccessible from Ryankanan or Banjarbaru;
3. most of the research objectives stated can be quite easily incorporated into the Balikpapan station;
4. there was no evidence of substantial local enthusiasm or support for a research station in South Kalimantan;
5. at this time the site was given low priority by FRI;
6. there are no especially critical local forest problems that require immediate attention;
7. the proposal does not address some specific local forestry problems that do exist and that will eventually require research attention; and
8. any research work on which FRI wishes to embark on at this time could be handled from office space that could be made available in the new provincial Forest Service office or shortly in the yet-to-be-built agricultural research center at Banjarbaru, and the latter agency could also provide greenhouse and/or land for demonstration or research trials

ANNEX G-2

FOREST RESEARCH CENTER PROPOSAL

EAST KALIMANTAN (BALIKPAPAN OR MERDIKA)

The team visited at Samarinda and Balikpapan 12-13 February, and again at Balikpapan and Kenangan 17-19 February.

East Kalimantan is the largest province of Indonesia after Irian Jaya, and certainly the one with the most forest land and the most active logging operations. With their 1000 staff (only 50% on fixed salary) it is still quite impossible for the Forest Service to monitor all aspects of forest activities. Substantial revenues are generated from forest production fees and a portion returns to the province and districts. Concession licenses were issued without adequate prior forest inventory and without adequate information on forest regeneration by natural or introduced species. Certain research problems were submitted to universities, e.g. GAMA for silviculture, IPB for wood technology and UNMUL for logging.

The forestry faculty at Mulawarman University in Samarinda (UNMUL) explained their new Center for Environmental Studies in Tropical Rainforests which covers a wide range of biological or socio-economic research problems, to be handled in part by the 50+ staff members in forestry. They expect to receive \$7,000,000 from West Germany for a charcoal research facility and a like amount from the Japanese for five broad forest ecological research areas and for graduate fellowships in Japan while Japanese counterpart experts are in Samarinda. New construction is rising at the new 100 ha campus of UNMUL. An overture had been made by the University Rector (himself a forester

with a Masters' degree from North Carolina State University) to locate a FRI branch at UNMUL. They also collaborate with the ITCI (Weyerhauser) researchers at Kenangan, and are proud to show the reports of some of their studies. Dr. Ed Sukoff of the University of Minnesota, with whom I visited the 300 hectare Lempakē research forest of UNMUL, told me that equipment and facilities for forestry training and research are still very inadequate; but it is partly compensated by the enthusiasm of the teaching staff.

FRI has prepared a master plan for an East Kalimantan branch station (see above) and the request should be judged in the context of that plan. Certain objectives and details of the master plan are inadequately reflected, if at all, in the fund request. On the other hand, in terms of staffing, the master plan does not provide for even one Ph.D. within the first 5-year period (1979-1984) but as many as 8 by the year 2000, in addition to 28 Ir. and 7 M.Sc. graduates. The FRI figures for staffing in the 1979-1984 period are as follows:

	<u>East Kalimantan</u> 1979-2000 Master Plan	<u>request for</u> Balikpapan (Merdika)	<u>South Kalimantan</u> <u>request for</u> Pyankanan
Ph.D.	0	1	0
M.Sc.	0	3	1
Ir.	6	6	2
B.Sc.	4	2	2

All available information from personal interviews and field observation indicate the very urgent need to establish a well-equipped, well-staffed, broadly conceived FRI-FPRI branch station in East

Kalimantan. The existing location of the 500 hectare research forest at Wanariset (Merdeka), 39 km north of Balikpapan and 77 km south of Samarinda, is a suitable site for certain facilities such as tree nursery, seed storage, arboretum, equipment storage and certain greenhouse studies. However, in order to attract and keep qualified staff to have reliable utility and mechanical services, a site closer to Balikpapan should be chosen for office and laboratory facilities. The FRI request compares with their East Kalimantan master plan as follows:

	Master Plan		USAID Request	
	<u>1979-84</u>	<u>by 2000</u>	<u>Balikpapan</u>	<u>Ryamkanaan</u>
Offices (m <sup>2</sup> )	1000	2000	300	150
library (m <sup>2</sup> )	100	200	-	-
laboratory (m <sup>2</sup> )	0	900	200	100
greenhouse (m <sup>2</sup> )	200	200	-	100
herbarium etc. (m <sup>2</sup> )	200	600	-	-
field shelter (m <sup>2</sup> )	60	240	(\$25,000)	(\$13,000)
expt garden (ha)	50	200	-	-
nursery (ha)	2	2	-	-
housing (m <sup>2</sup> )	1000	3020	550 + 120	360 + 200

Recommendations:

The Kalimantan (Balikpapan or Merdeka) Forest Research Center should be funded with the recommendation that:

1. The Merdeka field station be expanded to include a "head" house (H.Q.) or storage/office building adjacent to the existing greenhouse; and an additional house for the field station or research forest manager.

2. The requested facilities and funding be adjusted to include those originally asked for Ryamkanaan (South Kalimantan), in order to build an adequate office/laboratory block within or near the city limits of Balikpapan. The site and buildings should allow for incorporation of or expansion with a regional forest products and industrial technology laboratory.
3. The request for technical assistance be changed by deleting the agro-forester and by including a silviculturist who has specific experience with Dipterocarps in natural and/or plantation forestry, and a second one who should have experience in tropical forestry with a working knowledge of airphoto and remote sensing data interpretation. The soil scientist should have a pedology or soil conservation background and have acquaintance with forest hydrology, watershed management and/or microclimatology. The research planning expert should be experienced in the use of statistical analysis and/or computer programming.
4. The request for agro-forester be denied. Instead, FPKI should be urged to submit a request for a logging technologist and a sawmill engineer. The first would evaluate improved logging techniques to diminish damage to residual stands and soils during selective cutting. He would also study log handling and transport for greater efficiency and reduced defects. The second would evaluate improved sawmill design and maintenance, techniques for veneer peeling and slicing and for wood chipping, and help develop appropriate quality standards and laboratory test evaluation for sawn timber, plywood and particle board.

5. The FRI branch concentrate on the silvicultural techniques of the Dipterocarp forest regeneration and enrichment planting, and establish research plots or substations to collect information that represent all ecological zones of Kalimantan. These data should serve as guidance for modification of the TPI logging standards, and as a basis for establishing forest reserves of adequate size in which the rich flora and fauna of each zone can be protected and preserved for scientific study and as a germ-plasm reservoir.
6. The FRI branch gain expertise in establishing nurseries and plantings of those Shorea species which combine good timber quality with the production of "tengkawan" nuts which fetch consistently high prices for oil extraction, and which would allow for large acreages of agro-forestry in the buffer zones between farming areas and the production or protection forest zones. The species should include Shorea stenoptera (of which the Forest Service planted a 150 hectare stand near Bogor), S. pinanga, S. macrophyllus, S. maesisoptryx and S. gysbertiana.
7. The terms of technical assistance experts be extended to not less than 2 man-years each in order to obtain reasonable benefits from this expensive investment and provide reasonable overlap with Indonesian counterpart staffing.
8. The budget items for long-term training and for operating cost be dropped from the request, and that the item "building, housing \$350,000" be substantiated with detailed specifications and sketches to show compatibility with the FRI request. The "equipment \$260,000" item needs clarification in some detail.

9. The Center plan to become especially proficient and equipped to interpret airphotos and remote sensing imagery as a tool in forest engineering, ecology and forest management planning and control.

. ANNEX G-3

MAROS FOREST RESEARCH CENTER PROPOSAL  
SULAWESI (BILI-BILI OR MAROS)

The team visited the Ujung Pandang area 14-16 February and again 20-21 February.

The Forest Service for South Sulawesi has a staff of 250 full-time foresters of whom 20 are Ir graduates and 20 with SKMA, but they need 52 Ir graduates and 44 SKMA rangers. The service is faced with immense problems of afforestation of 300,000 hectares of open land, 100,000 hectares of which have been planted mostly with Pinus merkusii and even that with only a 30 percent success rate.

There is great interest in certain aspects of agro-forestry to discourage widespread shifting cultivation, watershed destruction and uncontrolled grazing. The already widespread planting of Aleurites moluccana which combines utility timber and edible nut production could be even more encouraged under supervision. Sulawesi foresters are keenly interested in minor species and secondary forest products. The Gowa papermill runs largely on local mangrove and bamboo as a fiber source. The largely uncontrolled selective logging of the valuable Diospyros celebica (ebony) can be counteracted by encouraging collection of its seed and plantations on farms, or even underplanting in existing pine stands. There are some critical watershed management as well as mineland reclamation problems that should be studied by appropriate local research workers in order to simplify the work of the Forest Service.

The forestry staff at the Faculty of Agricultural Science of Hasan-nuddin University is keenly motivated to apply their talents to local or regional problems. While the staff of 18 (2 Ph.D.) looks after 200 students, they find time to do contract research for the Forest Service or for transmigration projects. They would prefer to do contract research for FRI instead of seeing funds applied to a local research facility that might operate in parallel but separate projects. They have just acquired a 1300 hectare research forest at Camba and have access to a large natural forest reserve (Karaenta) adjacent to the research forest. The latter has extensive plantings of Pinus merkusii, Swietenia and Acacia auriculiformis.

We did not visit Bili-Bili but found a potential site for a FRI branch stations 17 km north of Ujung Pandang on the Maros road, adjacent to the Agricultural Information Center, (Balai Informasi Pertanian), on land already used by the Forest Service for training. There is good expansion potential on level well-drained land adjacent, now still owned by the local SPMA (Agricultural training school) which recently moved to a new location. The new 100 hectare campus of UNHAS is a few miles to the south while the Maros Agricultural Research Center is 10 km to the north.

### Recommendations

The Sulawesi (Maros) Forest Research Center should be funded with the recommendation that:

1. The proposed location be located at the 2 hectare site made available by the Forest Service adjacent to the Maros agricultural information center.
2. The Center addresses problems uniquely appropriate to Sulawesi and Maluku: watershed management; species evaluation for abandoned and overgrazed lands; silviculture of such valuable endemic species as Intsia byuza, Pterocarpus indicus, Pericopsis sp., Cinnamomum cullilawan, Melaleuca leucadendron; erosion control and revegetation of mined lands; agro-forestry systems using Aleurites mollucana and A. chinensis, Acacia decurrens, Anthocephalus chinensis, Diospyros celebica; plantation trials of Agathis and Eucalyptus species; wildlife management in nature reserves and protection forests.
3. The technical assistance expert request be expanded to add a second silviculturist with experience in tree breeding and/or tree phenotype selection. The forest soils expert should be experienced in forest hydrology and watershed management experimentation and research design.
4. The staffing pattern include one vacancy for a Ph.D. preferably in silviculture, who would be qualified to be the center director.
5. The research program acknowledges the great interest of the forestry staff in adjacent Hasanuddin University by developing cooperative research programs, especially through its newly established Center of Natural Resource Management and Environmental Studies.

6. The building of laboratory facilities be restricted so as to take maximum advantage of the existing or planned laboratories (soils, entomology, pathology) at the Maros agricultural research center.
7. Efforts be made to acquire additional land for the nursery and arboretum at the proposed branch station site.
8. The station endeavor to become a knowledge and documentation center in the expansion and utilization of minor or secondary forest products (copal resins, rattan, edibles, drugs) in Eastern Indonesia.
9. The terms of the technical assistance expert be extended to not less than 2 man-years each in order to obtain reasonable benefits from the investment and provide overlap with Indonesian counterpart staffing.
10. The budget items for "buildings, housing, land clearing \$375,000" and "equipment \$270,000" be substantiated in some detail so as to show size and unit cost for each separate item.

ANNEX H  
SOURCES OF MATERIAL

As background information the team was given publications in Jakarta, Bogor and during its travels in Kalimantan, Sulawesi and Maluku. The material that was most useful is listed below. No attempt is made to list all of the material or to cite specific references.

1. "This is AARD," Agency for Agricultural Research and Development, Ministry of Agriculture, Indonesia.
2. "A Master Plan for the Lembaga Penelitian Pertanian Maros (Maros Research Institute for Agriculture) in the 1980's."
3. "The Agricultural Research System in Indonesia", paper by S.W. Sadikin to an International Conference on Potentials for Cooperation among National Agricultural Research Systems, Bellagio, Italy, 1977.
4. "Report of Joint Indonesian-American Team on Palawija Crops, October 1979."
5. "Appraisal of Agricultural Research and Extension Project World Bank, April 1975, Report #646 a."
6. "Terms of Reference Strengthening the Agricultural Research Institutions on Kalimantan, Sulawesi, Maluku, and at Bogor."

7. "Master Plan, Forest Research Institute Branch East Kalimantan 1979-2000"  
Forest Research Institute, 1979
8. "Introductions to the Forest Products Research  
Institute Bogor, Indonesia, 1977."
9. "Indonesia - Sumatra Agricultural Research, USAID Project Paper,  
1977.
10. "Review of the proposed Sumatra Agricultural Research Project,"  
AARD/USAID, 1977.
11. Project Digests for individual research station sites for food  
crops, estate crops, fisheries, forestry, animal husbandry, and  
animal diseases.
12. "Study ekologi wilayah Kalimantan Selatan dan Kalimantan Tengah,  
Laporan 1," by: Team Ekologi P4S Universitas Gadjah Mada pub-  
lished by: Departement Pekerjaan Umum & Tenaga Listrik  
Universitas Gadjah Mada 1975.
13. "Profile Propinsi Kalimantan Selatan"  
published by: Bappeda Propinsi Kal. Selatan.  
Banjarmasin May 1978.

14. "Report on soil investigations of the Delta Pulau Petak (South and Central Kalimantan) 1973", Soil Research Institute, Bogor No.5/1973  
Ministry of Agriculture, Directorate General of Agriculture.
15. Ibrahim Manwan  
"The Agricultural Research Systems in Indonesia" Paper presented at the International Seminar - Workshop on Agricultural Research Management, Nov. 28 - Dec. 2, 1977. Kuala Lumpur, Malaysia.
16. Mamun Ysuf and Dachlan Patong  
"The consequences of Mechanization study in South Sulawesi, Ind." Workshop on consequences of Small Farm Mecahnization in Asia, September 11-13, 1978. The International Rice Research Inst. Los Banos, Philippines.
17. "Sulawesi Regional Development Study."  
University of British Columbia in Canadian International Development Agency, 1979.
18. Josef Mailoa  
"Glance at Ne Moluccas"  
1977: Dharma Bhakit Denpasar
19. "Indonesia National Agricultural Research Project, Staff Appraisal Report, 1979." World Bank Projects Department, East Asia and Pacific Regional office.

6. Sherwood J. Shankland, Director/Bontoa Human Development Project.  
The Institute of Cultural Affairs (South Sulawesi)
7. A.P. Vayda, Anthropologist - cultural ecology, Samarinda

ANNEX I  
ITINERARY

Briefings began in Jakarta where Mr. Tappan outlined the needs of AID in making the feasibility study and continued in Bogor where all of the Central Research Institutes were visited, the latter for the purpose of learning more of their research programs and more specifically of their anticipated research in Kalimantan, Sulawesi and Maluku. The itinerary was as follows:

January 24        Conferences in USAID/Jarkarta

January 25 - 26        Reading

January 28        Conference with AID Director,  
Thomas C. Niblock

**Met with AARD Planning Committee of -**

Dr. Subijanto

Budi Haryanto, Staff member of

Animal Husbandry, Bogor

Ibrahim Manwan, Director of Maros

Research Institute for Agriculture

Budhoyo Sukotjo, Staff member of

Estate Crops Research Institute,

Bogor

Paransih Ibhagyo, Secretary of the

Team, CRIA, Bogor

Hans Anwarhan, Staff member of CRIA

January 29 Conferences with Dr. Rustandi and his staff of Animal Husbandry Research and Dr. Yan Nari and his staff of Animal Health Research.

January 30 Dr. Ed Oyer of the International Agricultural Development Service and advisor to AARD.

January 31 Ir. Hasman Azis, Director, Institute for Industrial Crops and his staff  
Mr. Sadikin, Head, AARD  
Dr. Rusli Hakim, Director of CRIA and his staff  
Dr. D. Muljadi, Director, Center for Soil Research

February 1 Mr. P. Angkapradipta, Central Research Institute for Estate Crops

February 1 Mr. Fuad Cholik, Assistant Director, Inland Fisheries Research Institute

February 2 Mr. Hom. Sunaryo Harjodarsono, Director of Forest Products Research Institute and Ir. Soerjono, Director, Forest Research Institute.  
Inland Fisheries  
Research facilities, West Java.

February 3 Surachmat K., Director, Horticultural Research Station, Lembang.

February 4 Kalidas Sengupta, World Bank

- February 5** Central Research Institute for Agriculture  
Fisheries Research Institute facilities, Pasar Minggu and Depok.
- February 6** Sofyan Ilyas, Director, Fisheries Technology Research Institute, Jakarta.
- February 7 - 10** South and Central Kalimantan.  
Visited the Governor of South Kalimantan, several Bupatis, and research sites at Banjarbaru, Banjarmasin, Handil Manarap, Kuala Kapuas, Tambang Ulang; an extension officer and other agricultural officials.
- February 11 - 13** East Kalimantan.  
Visited the Governor, extension officers at Lempake, Balikpapan and Tenggarong, forestry officials and university officials.
- February 14 - 18** South Sulawesi.  
Visited the Governor, university officials, Bupati, extension officers and research sites at Maros, Bontobili, Lanrang, Jenepono, Mariri, and Bili-Bili, as well as a Transmigration Center.
- February 19 - 21** North Sulawesi.  
Visited the Governor, Bupati, extension officers, university officials and research sites at Kalase and Dumoga.
- February 22 - 23** Maluku Province.  
Visited the Governor at Ambon, forestry, fisheries and extension officials and research site at Makani, Iki (Ceram).

February 25 - 29      Revisited research institutes in Bogor

March 1 - 8      Bogor - Jakarta

Preparation of report.

In addition to the above schedule the forester and fisheries specialist visited the research programs related to their assignments. The forester also interviewed a number of people engaged in activities related to the forestry industry. This included both public and private enterprises and expatriates as well as Indonesians. These visits are identified as a partial list of persons consulted. (See Annex J).

ANNEX J

PARTIAL LIST OF PERSONS CONSULTED

USAID/Indonesia

1. Thomas C. Niblock, Director
2. Walter C. Tappan, Chief, Agricultural Office (ADO)
3. Charles Larsen, Fisheries Program Manager (ADO)
4. David Quane, Regional Planning Advisor, Banjarmasin
5. Paul Lippold, Agr. Research/Extension Advisor, Banjarmasin

AARD-Bogor/Jakarta

1. Sadikin S.W., Head, AARD
2. Subijanto, Director, HRI
3. Rusli Hakim, Director, CRIA
4. Hasman Azis, Director, ICRI
5. Rustandi, Director, AHRI
6. P. Angkapradipta, Assistant Director/Crop Production, ECRI
7. Fuad Choli, Assistant Director, IFRI
8. Sofyan Ilyas, Director, FTRI
9. Jan Nari, Director, ADRI
10. Sukardi, ADRI
11. Moch Soeroso, ADRI
12. Hidajat Nataatmadja, Economist, CRIA
13. Suryatna Effendi, Agronomist, CRIA
14. Suharjan, Pest Control, CRIA
15. D. Muljadi, Director, Center for Soil Research
16. Ed Oyer, Advisor to AARD
17. Richard Bernstein, Advisor to Socio-Economic Division/CRIA/  
South Sulawesi Mechanization project

18. Ali Poernomo, Research Advisor, IFRI
19. Moh. Sunaryo Harjodarsono, Director, Forest Products Research  
Institute
20. Ir. R. Soerjono, Director  
Ir. Rusli Harahap, Forest Research Institute
21. R.G. Dixon, Project Leader  
Brian Kingston, Silviculturist  
UNDP/FAO Forestry & Forestry Products Development Project
22. Ir. Syafii Manan, Senior lecturer in silviculture  
Bogor Institute of Agriculture (IPB) Faculty of Forestry
23. Dr. Kuswata Kurtawinata, Forest Botanist  
National Biological Institute & Herbarium Bogoriense
24. Dr. Peter Burbridge, Environmental Planner  
Ford Foundation & Center for Natural Resource Management and  
Environmental Studies, Bogor Agric. Univ.
25. Dr. Ir. Herman Haeruman  
Assistant Minister of State for Environmental Affairs, Jakarta
26. Dr. Ir. Soedrajat Soeradji  
Manager of Planning, PT Inhutani I, Jakarta
27. Ir. Soediono, Ir., Markjuki  
Planning Division, Directorate General of Forestry

#### Universities

1. Mrs. S.S. Hartono, Dean of Agricultural Faculty, Hasanuddin  
University/South Sulawesi
2. Anwar Hafid, Director Rural Dynamics Study, Hasanuddin University

4. Ir. Lose, Forester  
Ir. Josef Siakaya, Manager  
PT Inhutani I., Balikpapan
5. Ir. Djauhari, Manager PT Inhutani II, Banjar Baru
6. Dr. A. Madjidhan, Asst. Chief Forest Service, East Kalimantan,  
Samarinda
7. Ir. Budiyo, Branch Chief Forest Service, East Kalimantan,  
Balikpapan
8. Dr. Alan Long, Chief of Research  
Thomas B. Miller, Planning Manager  
International Timber Cooperation of Indonesia, Kenangan

#### Foresters in Eastern Indonesia

1. Ir. Hadimartono, Chief  
Ir. Samuel Tiranda, Planner  
Forest Service, South Sulawesi, Ujung Pandang
2. Ir. Soehadi, Planning Chief  
Forest Planning Office for Region V (Sulawesi)
3. Dr. Ir. Masud Junus, Forest Management Lecturer  
Ir. Idris Mayo, Logging Engineering Lecturer  
Dr. Wirawan, Forest Botany Lecturer  
Ir. M. Baharuddin, Watershed Management Lecturer  
Ir. Mrs. Nora, Wildlife Management Lecturer  
Hasanuddin University
4. Dr. Ir. Muslimin Mustafa, Head of Central Research  
Institute for Natural Resource Management, Hasanuddin University

5. Ir. Armana Darsidi, Chief  
Subagyo Had. seputro, Planning  
D. Tahitu, Marketing  
Forest Service, Ambon
6. Fred Smiet, Ecologist, Directorate of Nature Conservation, Ambon

#### Provincial Governors

1. H. Subardjo, Governor, South Kalimantan
2. Eri Soepardjan, Governor, East Kalimantan
3. H.A. Odang, Governor, South Sulawesi
4. Des. J. Rosos, Secretary to Governor, North Sulawesi
5. Hasan Slamet, Governor, Maluku

#### Others

1. Jim Hooper, Agronomist, IRRI contract/Maros
2. H. Said, Provincial Development/S. Kalimantan
3. Iskandar, Bupati/Jeneponto, South Sulawesi
4. Abdullah Suara, Bupati/Lulu/Luwu/S. Sulawesi
5. William L. Collier, Associate/Agricultural Development Council,  
Inc.

### Extension Service

1. Burhanuddin Lubis, Director of Production, DGF/Jakarta
2. Arif Chasairi, Director, Fisheries Service/East Kalimantan
3. Rifat, Head, Fisheries Service/Tenggarong
4. Andisinka, Head, Fisheries Service/Maros
5. Darsono/TM, Extension Officer/Samarinda
6. Amiruddin Madjud, Extension Officer/Jenneponto
7. Moh. I. Ginting, Fisheries Service/Ambon

### AARD - Field Research Stations

1. H. Noorsyamsi, Director, CRIA/Banjarmasin
2. Hans Anwarhan, Agronomist, Cria/Banjarmasin
3. Ibrahim Manwan, Director, FCRI/Maros
4. Ali Hasanuddin, Plant Pathologist, FCRI/Maros
5. Supriono, Director, IFRI/Ujungpandang
6. Haniah, Director, IFRI sub-station/Pasar Minggu
7. Sawardo, Director, IFRI sub-station/Depok
8. Suaachamat k. Director, HRI, Lembang

### Foresters in Kalimantan

1. Ir. Djwa Hi Liang, Asst. Chief  
Ir. Soestrisnotardjo, Forester  
Forest Service, South Kalimantan, Banjar Baru
2. Ir. Norman Iking, Head  
Forestry Department, Universitas Lambung Mangkurat  
Banjar Baru
3. Ir. R. Sambas Wirakusumah, Rector  
Ir. Dwisutanto, Dean, Faculty of Forestry  
Universitas Mulawarman, Samarinda

ANNEX A-1

CENTRAL RESEARCH INSTITUTE FOR AGRICULTURE, BOGOR

Description, Status and Recommendations

Purpose: The Central Research Institute for Agriculture serves two functions. It is the national center for research on food crops and also the local research institute for food crops.

Location: Most of the buildings are in the city of Bogor although some are several km away.

Area: 10 hectares, including plot land and building sites.

Altitude: 300 m.

Topography: Less than 3 degree slope.

Soil Types: Latosol

Land utilization proposed: Currently in experimental plots for evaluating food and horticultural crops. Five buildings now being used.

Fencing: Not applicable.

Precipitation:

Mean annual: 3000 mm

Water:

Irrigation: Some irrigation water now available but inadequate during dry season. World Bank proposal includes a keep well.

Communications: Good telephone and postal service available.

Transportation: Excellent highway to Jakarta and paved highways to other locations on Java. Major airport in Jakarta with air service to major islands.

Power: Electricity available. Limited tractors available but more are needed as indicated in proposal.

Building: Five buildings now being occupied by CRIA. Many are old and obsolete. The request included 4050 m<sup>2</sup> for laboratories and 9300 m<sup>2</sup> for offices, 7000 m<sup>2</sup> for field service center, 1500 m<sup>2</sup> drying floors, 4200 m<sup>2</sup> for staff houses and 3760 m<sup>2</sup> for "other" buildings.

Recommendations:

General: Priority: First level. Several modifications are included in giving this a top level priority. The team recognizes that the requested budgets for all locations are approximately double the amount of money available. The budget for this specific proposal should therefore be in the neighborhood of \$7,000,000.

The following specific recommendations are made:

1. Reduce the space designed for offices. The 9300 m<sup>2</sup> would provide 400 offices of 24 m<sup>2</sup>. That seems to be more offices than will be needed.
2. Delete the staff housing in accord with government policy.
3. The equipment item of \$200,000 for economists seems far too high.
4. The other field and laboratory equipment needs seem justifiable.
5. The need for vehicles appears justified.
6. The budget for foreign consultants and shortterm training should be retained.
7. Since the present agronomy building is near the proposed site, it could be renovated and the new agronomy building eliminated.
8. The same reasoning applies to some of the service buildings adjacent to the present agronomy buildings.

ANNEX A-2

MAROS RESEARCH INSTITUTE FOR AGRICULTURE, SOUTH SULAWESI,  
RESEARCH INSTITUTE

Description, Status and Recommendations

Purpose: The Maros Research Institute for Agriculture is intended to be the headquarters for all of agricultural research in Eastern Indonesia. Currently it has, in addition to the main center at Maros, substations in Bontobili and Lanrang and cooperative trials with farmers in other locations. According to their five year plan research activities are ultimately scheduled to be established in animal husbandry, estate crops, forestry and fisheries.

Location: near the town of Maros and 32 km from Ujung Pandang on a paved highway.

Area: 150 hectares, all fully developed into plot land, seed increase blocks and building sites.

Altitude: 6 m.

Topography: flat.

Soil Type: lowland alluvial soils.

Land utilization proposed: All devoted to studies on rice production under irrigation.

Fencing: There is a fence along the highway that is in need of repair. Additional fencing is needed.

Precipitation:

Mean annual: 2200 mm.

Pattern: December - March wet season

Water:

Irrigation: Water available from river, even in dry season.

Communications: Telephone and postal service available locally as well as to headquarters in Jakarta and Bogor.

Transportation: Station is on a paved highway. Major airport only a few km away.

Power:

Office and laboratory: Electric power is available. A standby generator is needed in case of a power failure.

Field: Animal and land labor and limited tractors. Additional tractors are needed.

Building: The physical development of the institute during the period of 1971-1978 has been as follows:

Fiscal year	Physical development activities	Total cost
1971-1972	Roads, fence, staff houses, pump and irrigation water storage and screenhouse.	Rp. 13,934,350
1972-1973	Landscaping, irrigation and drainage, roads, shallow well and pump, water tower and tank, sanitary facilities, electrical and telephone installation, laboratory/office building and clearing of imported equipment and supplies.	Rp. 62,638,306
1973-1974	Landscaping and land reshaping at Maros, irrigation and drainage, shallow well and pump, road building and upgrading, service building, concrete drying floors at Maros and Lanrang, installation of sanitary, electrical and telephone facilities, greenhouse, four staff houses, fencing at Lanrang sub-station, storage building for equipment and supplies.	Rp. 58,382,593,6
1974-1975	Replotting the experimental fields in Maros and Lanrang, irrigation and drainage facilities at Maros, road upgrading, 3 staff houses, 1 guest house, laboratory/office building (Annex) and upgrading concrete drying floor.	Rp. 34,141,000
1975-1976	Three staff houses, screenhouse, network of roads at the experimental field, seed storehouse, and equipment storehouse.	Rp. 40,101,173,37
1976-1977	Three staff houses, laboratory/office building (Annex), screenhouse, greenhouse, replotting of experimental fields, irrigation and drainage facilities at Maros, roads at the experimental fields at Maros including culverts, bridge and dam.	Rp. 87,460,448

1977-1978	Sixteen staff houses, parking shed, greenhouse, two storage buildings at Maros and Bontobili sub-station, electrical installation in the staff houses and other new buildings, replotting of experimental fields, drainage system, upgrading of roads and culverts, concrete drying floor at Bontobili sub-station	Rp. 97,034,000
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TOTAL

Rp. 393,700,870,97

Additional buildings requested consist of the following:

Office/laboratory	4200 m <sup>2</sup>
Office/laboratory	120 m <sup>2</sup>
Storage building	100 m <sup>2</sup>
Service building	100 m <sup>2</sup>
Green house	1000 m <sup>2</sup>
Library	260 m <sup>2</sup>
Auditorium	400 m <sup>2</sup>
Dormitory and guest house	400 m <sup>2</sup>
153 Staff houses	8770 m <sup>2</sup>
Drying floor	100 m <sup>2</sup>

Recommendations:

General: Priority: First level. The first level priority is made with the suggested modification of the plan to reduce the 4200 m<sup>2</sup> office/laboratory by one half and reduce the staff houses from 153 to 43.

ANNEX A-3

BONTOBILI, SOUTH SULAWESI, EXPERIMENTAL FARM

Description, Status and Recommendations

Purpose: This is currently a general food crops research station with emphasis on rainfed agriculture including research on corn, cassava, peanuts, and rice.

Location: 35 km from Ujung Pandang and 65 km from Maros. Adjacent to an extension farm.

Area: 23 hectares, all being used for experiments except that for building sites.

Altitude: 45 m.

Topography: Gently rolling.

Soil types: Mediterranean.

Land utilization proposed: Being used for variety trials, fertilizer trials and pest control studies on rain-fed rice, cassava, corn and peanuts and on irrigated rice. Plan to add horticultural crops.

Fencing: Fenced along highway. River forms boundary on back side of farm. No fencing needed.

Precipitation:

Mean annual: 3000 mm

Pattern: November-March wet season.

Water:

Irrigation: a shallow well and river that is inadequate during dry season.

Potable: Adequate in wet season but need deeper well for household purposes.

Communications: No telephone.

Transportation: Located on a paved highway.

Power: None. In need of a generator.

Buildings:

Office/laboratory	300 m <sup>2</sup>
Storage building	100 m <sup>2</sup>
2 staff houses @	50 m <sup>2</sup>
Drying floor	800 m <sup>2</sup>

Roof on office/laboratory needs painting. Also need a larger pump than the 25 horsepower now available.

Recommendations:

General: Priority: Second level. With some minor additions such as larger pump and building repairs this station can continue to function.

ANNEX A-4

LANRANG, SOUTH SULAWESI, EXPERIMENT STATION

Description, Status and Recommendations

Purpose: This station represents a huge irrigated area and the most important rice producing section of South Sulawesi. All of farm is devoted to rice research under irrigation.

Location: 5 km Northeast of Rappang and 150 km from Ujung Pandang.

Altitude: 50 m.

Topography: Flat.

Soil types: Alluvial sandy clay loam.

Land utilization proposed: Entire area is devoted to irrigated rice research. They have extensive work on rice breeding, pest control and fertilizer trials.

Fencing: Completely fenced.

Precipitation:

Mean annual: 2200 mm.

Pattern: October - February, dry season.

Water:

Irrigation: large irrigation canal nearby. Also a deep well is being constructed.

Potable: Will soon be adequate for household and laboratory uses.

Communication: No telephone available.

Transportation: 5 km from a paved highway and on an all-weather road.

Power: Electricity promised next year. Now in nearby town. Currently have a small generator for guest house only. No electric power for threshing machines or other equipment.

Buildings:

Present buildings comprise:

Office/storage building	300 m <sup>2</sup>
Office building	75 m <sup>2</sup>
Seed storage building	300 m <sup>2</sup>
Fertilizer storage	60 m <sup>2</sup>
Drying floor	600 m <sup>2</sup>
Screen house	900 m <sup>2</sup>
Staff housing:	
Manager @	120 m <sup>2</sup>
Assistant Manager @	50 m <sup>2</sup>
Guest house	135 m <sup>2</sup>

Written plans call for a new service building (100 m<sup>2</sup>), a storage building (150 m<sup>2</sup>) and a greenhouse (100 m<sup>2</sup>). Verbal discussions indicated a need for four staff houses @ 60 m<sup>2</sup>.

Recommendations:

General: Priority: Second level.

They badly need electric power, threshing machines and additional machinery since this is a farm that would lend itself to mechanization.

## ANNEX A-5

### JENEPONTO, SOUTH SULAWESI EXPERIMENT STATION

#### Description, Status and Recommendations

Purpose: To establish a horticultural research station in one of the more economically depressed areas. Located in the extreme southern part of South Sulawesi and in a low rainfall area. The location seems suited as a major center for citrus research and development. The team observed considerable citrus fruits in the area. Land is being purchased by AARD.

Location: 110 km from Ujung Pandang, 142 km from Maros, 28 km from Jeneponto and 5 km from village of Tolo Kelara. Five km from a hard-surface road but located on an all-weather road.

Area: 30 hectares.

Altitude: 100 m.

Topography: Essentially flat to gently rolling.

Soil Type: Many small stones with some boulders that will interfere with field research. Soils very poor in their native state but do respond to fertilizers. Soils are porous and well drained.

Land utilization proposed: The major thrust will be introducing, evaluating and maintaining citrus germ plasma. Other horticultural crops will also be included in the research program.

Fencing: None exists. Will be needed although there is currently an old stone wall around part of the area.

Precipitation:

Mean annual: D type.

Pattern: December - March: wet season.

April - October: dry season.

Water:

Irrigation: Area is adjacent to irrigation canal and plenty of water is anticipated by 1981.

Potable: A cistern would be needed for drinking water and use in laboratory.

Communication: No telephone service would be available.

Transportation: Located on a rough but all-weather road and 5 km from hard surfaced road.

Power: None existent. A generator would be needed. Project calls for field and laboratory equipment, some of which would need electric power.

Buildings: Ten to twelve huts now inhabited but would be of no value in the anticipated research program. Plan calls for a guest house, 17 staff houses, an office/laboratory building, service building, storage building, green house and screen house, plus a drying floor.