

UNCLASSIFIED

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

INDONESIA

APPLIED AGRICULTURAL RESEARCH

PROJECT PAPER AMENDMENT NO. 1

(497-0302)

AUGUST 1985

USAID/INDONESIA

UNCLASSIFIED

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE

A = Add
 C = Change
 D = Delete

Amendment Number
One

DOCUMENT CODE
3

2. COUNTRY/ENTITY

INDONESIA

3. PROJECT NUMBER

497-0302

4. BUREAU/OFFICE

USAID/Jakarta

5. PROJECT TITLE (maximum 40 characters)

Applied Agricultural Research

6. PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY
09/30/92

7. ESTIMATED DATE OF OBLIGATION

(Under 'B.' below, enter 1, 2, 3, or 4)

A. Initial FY

B. Quarter

C. Final FY 92

8. COSTS (\$ 000 OR EQUIVALENT \$1 =)

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	()	()	()	(14,100)	(-)	(14,100)
(Loan)	()	()	()	(9,013)	(9,887)	(18,900)
Other U.S.	1.					
	2.					
Host Country					22,800	22,800
Other Donor(s)						
TOTALS				23,113	32,687	55,800

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1)				7,000	18,900	7,100		14,100	18,900
(2)									
(3)									
(4)									
TOTALS				7,000	18,900	7,100		14,100	18,900

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

11. SECONDARY PURPOSE CODE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code

B. Amount

13. PROJECT PURPOSE (maximum 480 characters)

To support the Agency for Agricultural Research and Development (AARD) in strengthening agricultural research administration and management, linkages among AARD, universities and the private sector, and research work in three selected food crop commodities.

14. SCHEDULED EVALUATIONS

Interim MM YY MM YY Final MM YY

15. SOURCE/ORIGIN OF GOODS AND SERVICES

000 941 Local Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a page PP Amendment.)

This amendment extends the life of project by seven years to September 30, 1992. The reasons for the amendment are: 1) to complete construction, commodity procurement, technical assistance and training activities under the original project, and 2) to support AARD's new policy directions in diversified crop research. The new project elements under the amendment also will support improved planning, administration and evaluation of national research programs in rice, maize and grain legumes.

17. APPROVED BY

Signature

William Fuller
 William Fuller

Title

Mission Director

Date Signed

MM DD YY
08/09/92

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY

PROJECT AUTHORIZATION AMENDMENT

INDONESIA

APPLIED AGRICULTURAL RESEARCH
PROJECT 497-0302

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961, the Applied Agricultural Research Project for the Republic of Indonesia was authorized on September 17, 1980. Pursuant to the ad hoc delegation of authority by the Administrator to me dated May 23, 1985, that authorization is hereby amended as follows:
 - a. The planned obligations are amended to not to exceed Eighteen Million Nine Hundred Thousand U.S. Dollars (\$18,900,000) in loan funds and Fourteen Million One Hundred Thousand (\$14,100,000) in grant funds. The additional funding provided herein is authorized for obligation over a five year period from date of this authorization amendment, subject to the availability of funds in accordance with the A.I.D./OYB allotment process to help in financing foreign exchange and local costs of the Project.
 - b. The anticipated life of the Project is extended to a total of twelve years.
 - c. The purpose of the Project is amended to include support for the Agency for Agricultural Research and Development (AARD) in strengthening agricultural research administration and management, linkages among AARD, universities and the private sector, and research work in selected food crop commodities. The original purpose is also amended to add East Timor to the islands where research capability will be expanded and improved.
 - d. Paragraph (b), Source and Origin of Goods and Services, is amended to permit financing of ocean shipping, in the case of loan funds, on flag vessels of the United States, Indonesia, or Code 941 countries.
 - e. Paragraph (d), Other, is amended by deleting the second paragraph pertaining to grant funding for technical assistance, and by adding the following paragraph: "The Project Agreement shall have a condition precedent to the effect that prior to the

disbursement of Loan Funds for special studies, the Government of Indonesia will furnish evidence that a research advisory committee has been formed and naming its member representatives.

2. The authorization cited above remains in force except as hereby amended.

Signature: William P. Fuller
William P. Fuller
Director

Date: 8/9/85
(August 9, 1985)

Clearances: ARD:NTumavick: (in draft)

PRO:SHadley: (in draft)

FIN:RALbores: (in draft)

DD:RClark: [Signature]

Drafted:LA:LChiles:08/05/85, mai

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- Annex C Technical Assistance under the Original and Amended TA Contract
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- Annex I Statutory Checklist (not included)
- Annex J Predominate Capability Waiver for ISNAR (not included)

I. Development Problem and Policy Issues

A. The Present

The agricultural sector remains the single most important component in the development of the Indonesian economy despite its declining importance over the past decade vis-à-vis other sectors. Growing at a 3.8 percent annual rate over the past decade agriculture now generates 30 percent of the nation's gross domestic product, employs 60 percent of its residents, and accounts for 70 percent of non-oil exports.

The Government of Indonesia's (GOI) past policies in the foodcrops sector have been heavily consumption oriented. Large input subsidies in fertilizer, irrigation, agricultural credit and agricultural chemicals have been used effectively to reduce producer cash costs, encourage the adoption of new technologies and maintain lower than normal consumer prices. Consumer price stability for major agricultural commodities has also been of paramount concern. The government's Logistic Supply Agency (BULOG) has focused its market intervention effort on stabilizing consumer and producer prices for rice, maize, soybeans, peanuts, sugar, vegetable oils and eggs. Even though effective, the GOI's programs have drawn heavily on government revenues.

The continuing downturn in oil prices and more recent problems created by large rice surpluses are encouraging GOI policy makers to redirect the nation's agricultural strategy. There is growing support for a strategy that focuses on cost effective production of staples important for food, agro-based processing, manufacturing and foreign exchange earnings. Consequently, the Ministry of Agriculture's research establishment, the Agency for Agricultural Research and Development (AARD), has diversified its attention beyond paddy rice to secondary and higher value export crops which have the potential for significant productivity and employment increases. AARD is also introducing more complex cropping and farming systems appropriate for Indonesia's diverse agro-climatic zones.

Beginning with the GOI's Fourth Five Year Plan (Repelita IV), implemented in 1984, the government is looking even more to the agricultural sector, including agro-industry processing, to provide increased export earnings and new employment opportunities for many of the country's rural unemployed and underemployed. Positive real growth of 3 to 4 percent per annum in this sector is considered feasible by most observers and necessary to support and stimulate non-farm rural economic activities. Repelita IV calls for a doubling in non-oil exports, with the bulk of these increases coming from the agricultural sector. It is anticipated that agricultural imports will decline as self-sufficiency in rice production becomes more secure and diversification of food crop production becomes more widespread. Based on recent and projected trends, the agricultural sector has important and positive implications for foreign exchange earnings and savings during the balance of the 1980s.

B. The Future

Although the Indonesian government is placing significant demands on agricultural production, this sector is in the midst of a major transition. Export earnings from oil, which have supported food grain, fertilizer and pesticide subsidies, have diminished. Consequently, subsidy levels are being reduced and farmers must face new cost and revenue constraints. At the same time, heavy investments in rice research during the 1970s are beginning to pay off. Rice production increases have averaged over 6 percent per year between 1978 and 1984, approximately 3 percent above annual increases in demand. Such increases in production have led to growing domestic stocks, as well as increased storage costs. As a result, there is a growing debate over the future of rice production. Three factors fuel this debate. First, rice exports are likely to be limited by quality and price differences. Second, there are questions about the long-term stability of recent production gains based largely in the lowlands of Java. Given available technologies, lowland rice yields are quickly approaching biological limits and new growth in production will have to be supported by yield increases in upland and tidal rice, crops for which there is currently very limited research and improved technology. Third, rice requirements to meet domestic consumption needs in future are uncertain. As prices decline, it is almost certain that consumption will rise, but the extent remains unknown.

The focus on rice over the past decade has left non-rice crops at a disadvantage. For example, maize production, while rapidly increasing, faces inelastic domestic demand. Production costs remain above world market prices, limiting non-subsidized exports and the use of corn as an animal feed. However, with the recent introduction of hybrid and other improved varieties, costs are beginning to decrease in important production areas. Similarly, production costs of cassava are high by international standards, and in recent years Indonesia has been unable to meet EEC export quotas because of price. Limited research on other crops such as soybeans and peanuts has not been sufficient to solve production constraints. For example, although the domestic production costs for soybeans are subsidized, they remain above \$11 per ton, almost double the world market price, and approximately half of the annual requirements for domestic human consumption must be imported. High prices place this excellent source of vegetable protein outside the purchasing ability of many of Indonesia's poorest consumers.

The emphasis on rice production has also meant that research on other crops, which constitute a major component of farming systems on the outer islands, has had less emphasis. While there is little doubt that rice will remain Indonesia's major staple, higher incomes are likely to result in increasing demand for more high-cost protein sources such as milk, meat, eggs, poultry and fish. To meet this demand, the production of animal feeds--based largely on domestically produced maize, cassava, soybean and fish meal--will be required at prices acceptable to both producers and consumers. As population densities increase on Java, regional shifts in production are predicted. It is anticipated that Java will specialize in the

production of rice, hybrid corn and sorghum in the east; horticultural crops and tea at higher elevations; and poultry, dairy, and possibly meat production under intensive feeding throughout the island. Inland fisheries will expand as well. The lower population densities of the outer islands will encourage less intensive production activities. Non-rice, industrial, and estate crops, as well as cattle production will likely concentrate in these areas. In western Indonesia oilpalm, rubber, corn, soybeans and peanuts will be produced; in eastern Indonesia, a much drier region, cloves, corn, marine products, sorghum, beef and cotton will become more important.

With increasing incomes on Java, economic stratification of the society also will continue. Wider distribution of development resources and equity will have to be considered in the future allocation of funds and programs. For agricultural research, this means broadening the agenda to include topics of economic importance in the less advantaged uplands and outer island areas.

II. The Agency for Agricultural Research and Development's Strategy and AID's Role

A. Introduction

Past successes in Indonesia and elsewhere attest to the importance of a dynamic research system to support growth in agricultural production and overall development. A base for strengthening and expanding the country's agricultural research network has already been established by the Ministry of Agriculture, and impressive progress has been achieved. By the end of this decade AARD will complete the development of its physical infrastructure, including 23 regional institutes conducting research at almost 200 stations, sub-stations, experimental sites and farmers' fields in 22 of the nation's 27 provinces. Over 100 Ph.D. and 300 M.Sc. holders are now in place and the professional staff is projected to grow to 1100 post-graduate research scientists by 1990.

Remarkable strides in biological research have been made in Indonesia in the past five years. For example, rice production has steadily increased, fueled by new varieties and improved agronomic technologies for overcoming outbreaks of tungro, brown planthopper and other major pests and diseases. A new rice rotation system that uses a mix of high yielding and improved domestic varieties to control brown planthopper and green leafhopper populations has been developed by research scientists at Maros and is now being tested by the International Rice Research Institute for worldwide application.

Research on other crops has been supported in only a limited way but is beginning to produce results. For example, seven new maize varieties with medium to high yield potential, short maturity and downy mildew resistance have been introduced. The control of downy mildew, a major constraint to higher yields, has led to a rapid increase in production. Over the last two years, maize production has averaged 5.3 million metric tons, 37 percent above levels achieved during the 1978 to 1982 period. Moisture conditions during

this period have been optimal, however, and gains in longer term production are yet unclear. The production of oil palm, a major import substitute and foreign exchange earner, has also benefited. The development of new varieties and pollination methods, using the Cameroon Weevil, has contributed to an annual growth in production of 12.9 percent since 1979. In addition, research work in Northern Sumatra has led to new soybean tillage methods. Previously constrained by the lack of viable seed supplies, farmers are now planting improved varieties on fallow ground during the rice growing season, harvesting the soybean for seed and then replanting their paddy areas using zero tillage techniques after the rice harvest. Seed germination rates have increased significantly, and Aceh, formerly a soybean deficit area, is becoming a major exporter to other parts of Sumatra.

To continue these impressive gains and to meet the increased research emphasis on secondary crops, AARD will have to overcome obstacles in three areas. First, this Agency will have to compete aggressively with a number of other government agencies for research support at a time when GOI financing will be under heavy pressure. In the short-term, declining oil revenues and slowdowns in government budget growth will limit GOI investment funds and support for research. In addition, the focus on industrial research proposed in Repelita IV to encourage import substitution has directed additional budget support to the Ministry of Science and Technology and Indonesia's university system. As a result, these organizations now compete with AARD for scarce research funds. And even though AARD has indicated its intent to reallocate existing budgets from rice to secondary crop research, the level of operational funding will likely not be sufficient because of AARD's heavy commitment to infrastructure development and salaries. Consequently, many of AARD's most qualified staff, many of whom will soon be returning from foreign training, may be left with inadequate support to finance active field research programs. In the medium- to long- term, this austere situation will likely change as non-oil exports increase, domestic resources are taxed more effectively, and the construction of new research facilities is completed, thus freeing AARD resources to support operational research costs. At least in the interim, however, AARD will have to find effective means of tapping funds from not only the GOI but also the private sector and universities to meet its research needs.

Second, while AARD's still evolving management structure has proved adequate to support intensive research on rice, new forms of organization will be required to manage, monitor and review the multi-crop, multi-ecosystem focus that the Agency is attempting to implement. Critical to this process will be a management system that effectively supports AARD senior policy decisions on the allocation of scarce human and financial resources between competing commodity research programs, facilitates and assists in the development of diversified commodity research agendas, provides timely feedback on progress and links commodity research outputs to the complex applied field testing efforts necessitated by Indonesia's diverse agro-ecological systems.

Third, to augment AARD's professional staff, effective mechanisms must be identified to tap the human resources in Indonesian universities and the private sector. Linkages with these groups exist, but they are now informal and often dissolve after a specific research effort has been completed.

Despite rapid expansion in professional staff, personnel shortages in key areas are likely to constrain the Agency's future research efforts. Until recently, training has focused on rice agronomy, breeding and entomology. Comparable skills in secondary crop sciences need to be broadened, particularly in plant pathology and breeding. Also, many of the professional staff now in the AARD system have limited knowledge of advanced research techniques such as tissue culture and genetic engineering, which could enhance the effectiveness of their varietal research. The new cadre of scientists now overseas for training will return with strong research credentials, but many will lack on-the-job research skills compatible with Indonesian conditions. Furthermore, the economic analysis skills essential for evaluating field tests and determining research priorities are in limited supply. Finally, the training of professional managers and administrators has not kept pace with the rapid expansion of physical facilities. Thus, trained managers are needed to improve the operation and maintenance of existing facilities, supervise the development of research farms associated with new station construction, and establish and implement operation and maintenance procedures on stations to assure the timely and efficient supply of support services to researchers.

To overcome these constraints, the Ministry of Agriculture through AARD has requested AID to extend its present agricultural research support and to consider new initiatives that will strengthen AARD's management structure and its support of diversified secondary crop research. In response, AID staff and Indonesian colleagues have reviewed recently published evaluations of AARD's secondary crops research program to identify potential areas for complementary AID support. In addition, a number of in-house and outside reviews were conducted to identify project components that need to be continued. These reviews have determined the commodities that would most benefit from increased AID support based on their future supply, demand and employment consequences; the commodities that would best utilize AID's comparative advantage and the programs that should be supported; the constraints that should be addressed within AARD's administrative structure and the alternative mechanisms for improving research efficiency; and the key problems associated with research station management and how they might be overcome.

These analyses have led to the formulation of a \$14 million, seven year amendment to AID's Applied Agricultural Research Project (AARP). This amended project proposes to:

- o Extend current AARP activities for approximately two years in order to complete:
 - the construction and farm development work at 17 research facilities;

- the ordering and installation of equipment to make the 17 institutions fully operational;
 - the work of selected consultants whose activities relate directly to accomplishing the objectives of AARP; and
 - short-term training abroad and selected in-country programs that are important to program monitoring and research station farm development.
- o Initiate new project components that build on the results of the original AARP efforts and focus on:
- technical assistance in the areas of research (particularly on grain legumes), administration, program analysis, facilities management, agricultural economics, agronomy, plant pathology, and seeds;
 - short- and long-term training in scientific specialities, research administration and station management;
 - establishing national commodity groups to focus and coordinate secondary crops research and developing a collaborative research mechanism between AARD and selected Indonesian universities; and
 - stimulating and supporting research on selected secondary crops.

To understand the strategic choices made by the AID Jakarta Mission in formulating this amendment, a brief description of AARD's present structure, functions and development strategy is presented below. This is followed in Section III by a discussion of AID's complementary strategy including the rationale for the development of an amendment, the choice of components proposed for support under the extension, the major thrusts within the new initiatives, and the activities necessary under each of these efforts.

B. The Structure of AARD

AARD was created by Presidential Decree in 1974 with the mandate to conduct research leading to new technologies that support the nation's agricultural development. Its responsibilities are to:

- o plan and prepare programs and coordinate policies for the administration of research and development within the Ministry of Agriculture;
- o organize, guide, and control programs and methods of personnel recruitment, financial administration and management, equipment supply and maintenance, scientific reporting, and research development according to the policies of the Ministry of Agriculture; and
- o manage agricultural research centers, institutes, stations, laboratories, experimental farms and libraries.

To accomplish these objectives, AARD has adopted a multi-tier management structure composed of a Secretariat with various supporting Centers, a system of five Research Coordinating Centers, and a network of Research Institutes. A schematic diagram illustrating the linkages between the Secretariat, Centers and Institutes appears in Figure 1. A brief explanation of the function of each unit follows.

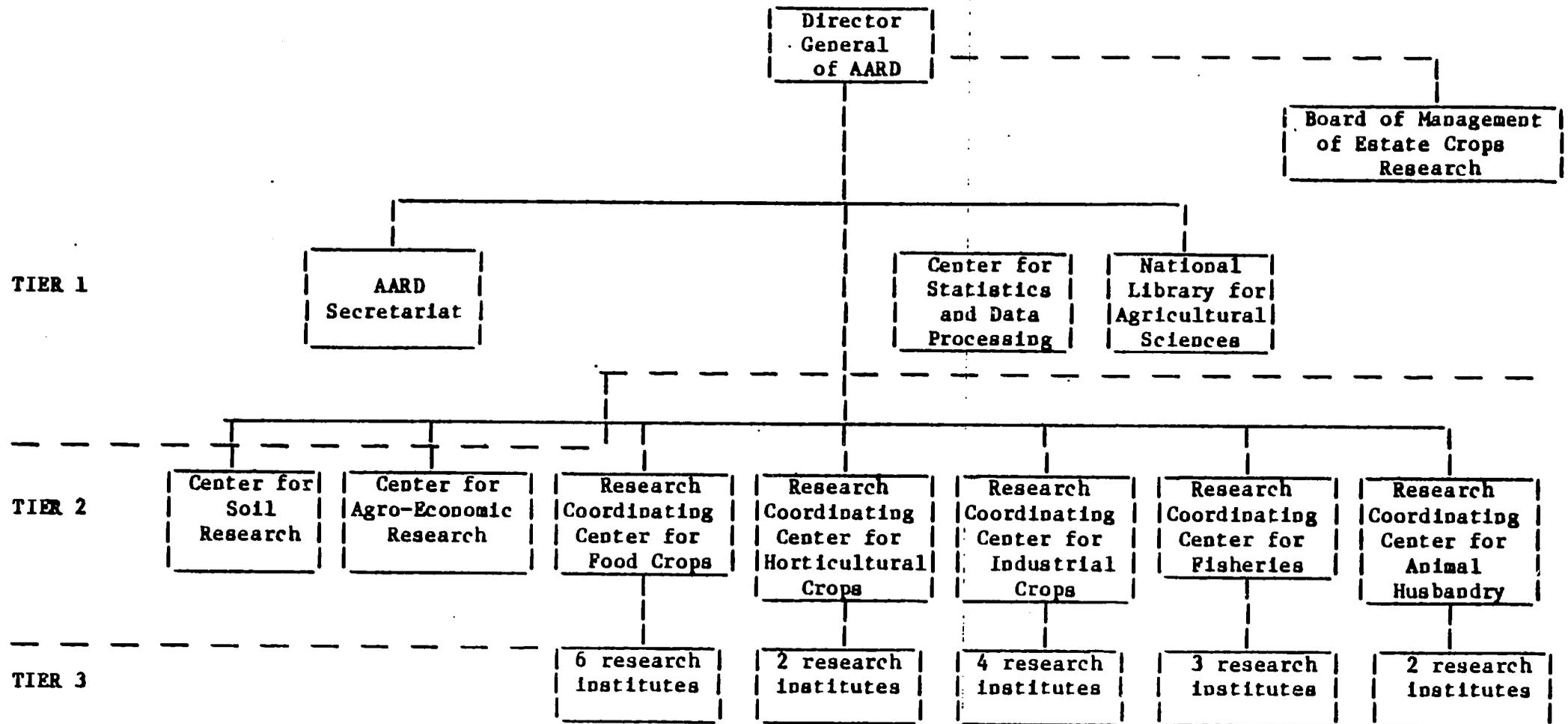
1. The Secretariat. AARD is managed by a Director General appointed by the President who serves under the Minister of Agriculture. As head of the Agency, the Director General has overall responsibility for planning, executing, supervising and coordinating the national agricultural research system. He is assisted by a Secretariat and two support centers.

The Secretariat provides overall staff assistance to the Director General, as well as technical and administrative services to all AARD organizational units. Composed of five Divisions--Program Formulation, Cooperative Research, Financial, Personnel, and General Administration, the Secretariat coordinates the formulation of research and development programs for the Agency; administers collaborative and cooperative agricultural research and development activities; coordinates the preparation of budgets for all Agency units and administers finances; manages personnel; and carries out general administration including the revision of the Agency's rules and regulations.

Two support centers within AARD assist the Secretariat in providing services to other units. The Center for Statistics and Data Processing, the Agency's main computer facility, is developing an administrative data base that will maintain Agency personnel, financial and inventory records; process salary payments; and monitor project implementation. The National Library for Agricultural Sciences serves as a central procurement, cataloging and clearing house for professional journals and publications.

Two other centers, the Center for Agro-Economic Research (CAER) and the Center for Soil Research (CSR), serve the Secretariat but also conduct their own research and provide support services to other research institutes in the system. For example, the CAER is developing a farm level data base for use in policy and planning functions relative to the agricultural sector. It has responsibility to provide leadership in agro-economic activities across the commodity-oriented research institutes. This large task carries with it a number of constraints. As an example, the manpower base in agricultural economics at both the Center and the Research Institutes remains weak. CAER could play a strategic role in effectively identifying priority research issues, designing specific research proposals in cooperation with other AARD units, and encouraging interaction between economists in the Center and other Research Institutes. These skills and functions are essential if AARD is to move from its present production/supply oriented focus to one

**FIGURE 1. ORGANIZATIONAL STRUCTURE OF THE
AGENCY FOR AGRICULTURAL RESEARCH AND DEVELOPMENT**



that examines demand oriented constraints to production. This latter view is critical when dealing with secondary crops, where many of the problems to be faced will be in the domain of post harvest processing, marketing and consumer preferences.

The CSR is responsible for matters related to land evaluation, standardization of soil analysis techniques and soil fertility testing, in addition to its own research program. As expertise in soils science has developed in each of the Research Coordinating Centers and institutes within the AARD system, the role of CSR has declined and emphasis has shifted to nationwide soil mapping activities and the provision of contract services to other government agencies, such as the Ministry of Transmigration.

2. The Research Coordinating Centers. The second tier of AARD's organizational structure is composed of five Research Coordinating Centers (RCCs)--Food Crops, Horticultural Crops, Industrial Crops, Fisheries and Animal Husbandry. All are located in Bogor. Each RCC is managed by a director who is responsible for administering the research programs conducted by the Research Institutes. Center Directors play a critical role in defining commodity research agendas, managing resource flows from the Secretariat in support of field research and administering personnel and facilities under their jurisdiction. They also have planning, coordination and budgetary authority over Directors of the Research Institutes. However, once funds are assigned to Research Institutes, there is little central control over expenditures or research implementation and few if any funds are available to meet emergency needs or opportunities.

The RCC Directors are accomplished scientists with some practical experience in administration. Few, however, have had professional training in research management, a critical skill for establishing and maintaining complex multi-commodity, multi-disciplinary national research programs. The absence of an efficient management information system to monitor research outputs within and among RCCs limits their effectiveness in defining new issues and strengthening coordinating links among their own and other commodity programs.

In an attempt to overcome some of these constraints, the Research Coordinating Center for Food Crops (RCCFC) has recently established national coordinators for specific commodities--rice, corn, soybeans, and rootcrops. It is intended that these commodity coordinators provide an effective conduit for information on national research results to the Director of the RCCFC, provide a focal point for better national coordination of the commodity research being done at the Research Institutes, and play a larger role in both the definition of research issues and the design of specific research proposals. As the authority of these coordinators is increased, they likely will become key actors in the improvement of research management and coordination.

3. The Research Institutes. The Research Institutes, which are basic to the entire research management system, conduct, evaluate, report and disseminate research results. The entire research system--from a management point of view--should be working to provide a stimulating environment in which individual researchers can work, learn, interact with colleagues, and develop a creative mission-oriented approach to seeking new knowledge and technology. While the broad research priorities and decisions on research issues are made at higher organizational levels, the detailing of specific research proposals and the work itself takes place at the Research Institutes.

At present there are 23 Research Institutes within the AARD system. The six Institutes under the control of the RCCFC, which is responsible for rice and secondary crops research, will continue to be the focal point of AID's agricultural research development strategy aimed at increased food production. Through the Applied Agricultural Research Project (AARP) and the Sumatra Agricultural Research Project (SAR), AID has supported facilities and/or staff development at the six food crops institutes and their satellite sub-stations and experimental farms. Three of these Institutes--Maros, Sukarami and Malang--will continue to play key roles in this proposed amendment. The location, as well as the relationship between these Institutes and the RCCFC at Bogor is provided in Figure 2.

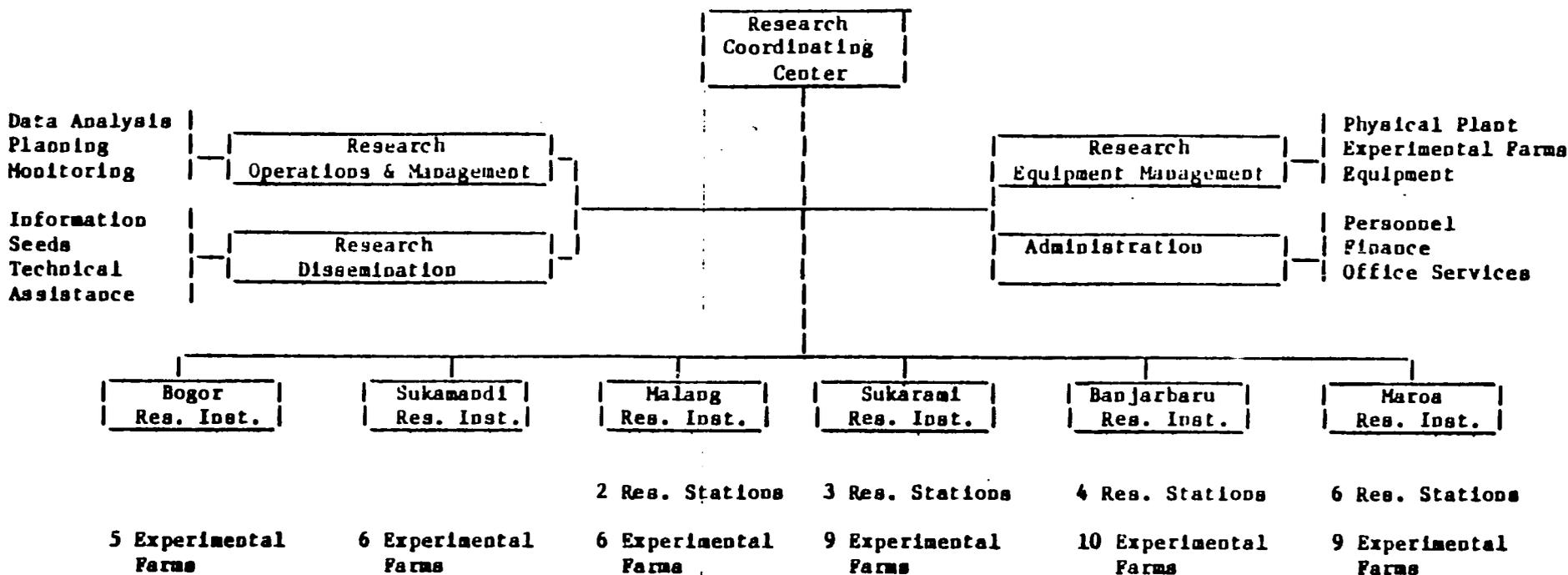
To improve research coordination and management, RCCFC has assigned a specific commodity or agro-climatic research mandate to each of the six Institutes (see Table 1). For example, the Research Institute for Food Crops at Bogor has the national mandate to conduct pioneering research on rice and secondary crops. It conducts fundamental research, including genetic characterization, evaluation, utilization and conservation. The Malang Research Institute, located in the drier region of East Java, has the national mandate to conduct varietal research on such secondary crops as corn, sorghum, soybeans, peanuts, mungbeans, cassava, wheat and sweet potatoes. Research Institutes at Maros, Sukamandi, Sukarami and Banjarbaru, by virtue of their locations, focus on adaptive research on rice and secondary food crops. These Institutes attempt to identify farming systems that will result in maximizing and sustaining productivity within their given ecological zones, while minimizing soil, pest and post-harvest problems.

C. The Development Strategy of AARD

Since its inception in 1974, AARD's development strategy has emphasized four major elements:

- the development of a sufficiently large and qualified manpower base required for quality research;
- the construction of adequate facilities to conduct research in Indonesia's diverse ecological settings;

**FIGURE 2. ORGANIZATIONAL STRUCTURE:
RESEARCH COORDINATING CENTER FOR FOOD CROPS**



**LOCATION OF
CRIFC RESEARCH INSTITUTES**



TABLE 1. COMMODITY AND AGRO-CLIMATIC MANDATES:
FOOD CROP RESEARCH INSTITUTES 1985

Institute	Geographical Area of Emphasis	Subject Matter and/or Commodity Emphasis
Bogor Research Institute (BORIF)	national	Fundamental research including genetic characterization, evaluation, utilization and conservation of rice and all secondary crops.
Malang Research Institute (MARIF)	national	Varietal research on secondary crops including corn, sorghum, soybeans, peanuts, mungbeans, cassava, wheat and sweet potatoes.
Sukarani Research Institute (SARIF)	upland wet climates	Adaptive research for upland and high elevation rice and secondary crops within the context of farming systems.
Maros Research Institute (MORIF)	dryland and dry climate areas	Adaptive research on rice, secondary foodcrops and sago palm with specific attention to rainfed farming systems.
Sukamandi Research Institute (SURIF)	irrigated lowlands	Adaptive research on rice and other irrigated secondary crops within the context of irrigated farming systems.
Banjarbaru Research Institute (BARIF)	tidal lands/swamp areas	Basic research on tidal and deep water rice and adaptive research on rice and secondary crops within the context of swamp and tidal cropping systems.

- the development of a sound research strategy that balances basic and applied research within a farming systems context; and
- the establishment of mechanisms to disseminate research results quickly and effectively to Indonesian farmers.

Based on the conviction that a strong staff and adequate facilities are essential to a productive research program, priority emphasis was given to these two elements from 1975 to 1983. Over \$500 million in government and donor funds were committed toward achieving these objectives. As Table 2 indicates, the results have been impressive. Overall staff and facilities have doubled, and scientific manpower increased five fold since 1974. Further strides are anticipated by 1990 when AARD will have a scientific staff of over 2600 college trained scientists and technicians and over 700,000 square meters of research and support facilities.

As manpower and facilities have improved to meet the Agency's long-term requirements, strategic emphasis has begun to shift toward research strategy and the dissemination of results. These shifts have been embodied in the functional roles AARD has ascribed to the present system--research planning, continued facilities and manpower development, the operation of facilities and support services to support research and reporting, and the dissemination of research outputs. As the shift in emphasis has occurred, however, problems and potential solutions have arisen. These are discussed below.

TABLE 2. AARD STAFF AND FACILITY DEVELOPMENT
1975 - 1990

<u>Degree (number)</u>	<u>1975</u>	<u>1984(June)</u>	<u>Estimated Need by 1990</u>
Phd	7	92 (+ 128)*	360
MSc	26	283 (+ 252)*	740
BSc	243	644	1,660
Others	<u>3,323</u>	<u>5,771</u>	<u>6,740</u>
Total	3,599	7,170	9,500
<u>Facilities (m²)</u>			
Office	51,002	82,201	111,887
Library	4,316	8,035	9,425
Laboratory	28,635	50,477	67,879
Green House	4,113	8,823	16,238
Screen House	2,545	3,545	5,854
Pond	60,201	130,564	131,936
Housing	58,815	91,230	168,849
Others	<u>81,022</u>	<u>111,999</u>	<u>216,960</u>
Total	290,694	486,874	729,038

* in training locally and overseas.

1. Research Planning. Although research planning is done at each tier within the AARD system, broad research priorities to support existing programs and provide guidance for future programs of the Directorates General are identified in the Secretariat with the assistance of the Research Coordinating Centers' directors and communicated to the Research Institutes. Researchers then prepare specific proposals in line with AARD research priorities. The proposals are submitted to the chairs of their disciplinary departments for review, compilation and transmittal to the director of the Institute. (While it is assumed that individual proposals receive scrutiny, in fact, this is not always the case. Because the review process conflicts with the preparation of annual budget submissions, Institute directors often are unable to devote sufficient time to careful review and often merely endorse proposals approved by department chairmen.) The proposals then become annual departmental and Institute research plans and are transmitted to the Research Coordinating Center Director in Bogor for review and approval. This process is extremely important because it establishes the Agency's annual research plan and ultimately affects resource allocation decisions. More needs to be known about how this planning system works so that constraints can be pinpointed, potential solutions identified and beneficial adjustments tested.

The results of the research planning process are embodied in the Agency's annual development budgets. An examination of resource allocations among commodity groups, within individual Centers, and among specific commodity programs is quite revealing. For example, resource allocations among commodity groups, when compared to the composition of agricultural gross domestic product, would suggest that research in animal and estate crops is favored over research in food crops (Table 3).

TABLE 3. AARD'S DEVELOPMENT BUDGET
BY COMMODITY GROUP 1984/85

<u>Commodity Group</u>	<u>Budget Allocation (Mil.Rp.)</u>	<u>Percent of Allocation</u>	<u>Composition of Agricultural GDP (Percent)</u>
Food Crops	3,577	37	98.4
Rice	(2,075)	(21)	(34.0)
Other Cereals	(556)	(6)	(5/0)
Grain Legumes	(691)	(7)	(4.4)
Root Crops	(255)	(2)	(4.0)
Horticulture Crops	749	8	11.6
Fisheries	1,431	15	8.0
Livestock	1,911	19	9.0
Estate Crops	2,293 *	23	24.0

* Includes US\$3.0 million in foreign assistance contributions.

This is not as disturbing as one would first imagine, given a) the expected growth in demand for livestock and fishery products and the infant state of research in these areas, and b) the strong research base already developed in rice. However, the increased importance placed on secondary crops as sources of improved human nutrition, animal feeds, export income and employment would strongly argue for some reapportionment of resources from livestock and fisheries, and more support for intensified secondary food crops initiatives.

Examining resource allocations within individual commodity programs also points up additional shortfalls. For example, the 1984/85 budget for RCCFC presented in Table 4 underlines the heavy commitment the Institute has to supporting salaries and capital investments. As a result, only 12 percent of its annual budget is available to support research, an amount that is inadequate to support RCCFC's multiple commodity research mandate. The need for operational research funds will become even more apparent as new professionals trained abroad return to resume their research duties. In addition, maintenance support, which is only 3 percent of RCCFC's current budget, will need to be increased significantly as new facilities and equipment come on line. A source of future budget flexibility lies in the Center's capital expenditure allocation, where declining expenditures are anticipated over the next five years as facilities expansion nears completion. The efficiency with which resources can be reallocated between commodity centers and within commodity programs will rely heavily on the quality of the Center's administrative and analytical skills, two areas of present concern within AARD.

Viewing resource allocation from the perspective of operational budgets within RCCFC also produces interesting insights. Within RCCFC, individual research projects are grouped into program areas called Rencana Penelitian Tempat Peneliti (RPTP). Within a specific program area, each experiment, including replications, is a component of the RPTP. Funding allocations to experiments are made on a standardized unit-cost formula for each commodity, with the unit based on land area

TABLE 4. ROUTINE AND DEVELOPMENT BUDGET
RESEARCH COORDINATING CENTER FOR FOOD CROPS
1984/85

<u>Budget Item</u>	<u>Amount</u> <u>(Mil. Rp.)</u>	<u>Percent</u>
Salaries	3,050	54
Maintenance	169	3
Research Operations	677	12
Capital Expansion	1,071	19
Other	677	12
Total	<u>5,644</u>	<u>100</u>

used. An analysis of these allocations (Table 5) shows that project support within RCCFC is still heavily committed to rice research. This funding mechanism underlines the difficulties RCCFC is experiencing in reallocating human and support facilities to secondary crops research and suggests that broad policy directives articulated within the Secretariat and the Research Centers may not yet be fully implemented at the project level.

TABLE 5. RESEARCH PROGRAM SUPPORT
RESEARCH COORDINATING CENTER FOR FOOD CROPS
1984/85

<u>Commodity/Discipline</u>	<u>No. RTP</u>	<u>No. Experiments</u>	<u>Percent</u>
Rice	58	746	41
Palawija (Secondary Crops)	64	669	37
Farming Systems	14	179	10
Socio-Economics	1	24	1
Post-Harvest	3	21	1
Other	15	167	9
Total	155	1806	100

In addition, the numbers mask the level of activity associated with secondary crops development. In the aggregate, the experiments associated with crops in this grouping constitute 37 percent of RCCFC's total experimental activity. This is significantly less than required, given the state of research and constraints associated with crops such as soybeans, maize and peanuts.

Finally, the data substantiate a significant under-emphasis of socio-economics and post-harvest technology, two areas critical to active secondary crops research programs. Limited work in these areas partially reflects the lack of trained agricultural economists and post-harvest specialists within the RCCFC system.

2. Facilities and Manpower Development. As indicated in Table 2, AARD's efforts to improve the facilities available to researchers have been impressive. Developments within RCCFC are equally so: major construction activities at all major food crops facilities have already been completed or planned. For example, the Coordinating Center and Research Institute at Bogor, and the Institutes at Sukarani and Sukamandi are either well developed and equipped or in the process of achieving this goal. The Institutes at Maros and Banjarbaru are still developing and have major construction programs that will be completed by 1986. The Institute at Malang is just beginning its development program. About half of the research stations and a smaller fraction of the experimental farms within RCCFC have adequate facilities.

AARD has given little emphasis to the selection and training of research station managers and support services personnel.

Because the operation and management of research facilities requires specialized skills, these personnel need appropriate training, guidance and support to plan, organize and operate the facilities needed for producing valuable and reliable field and laboratory data.

There are, of course, good reasons for this relative neglect. AARD's leadership opted for a strategy that stressed academic and short-term scientific and technical training. Lack of English language capability limited the access of support staff to overseas training opportunities. And finally, even if qualified support staff could be identified for overseas training, relatively few short-term or academic programs in facility management are available. As a result of inadequate training opportunities and AARD's limited budget allocations for maintenance, untrained and inexperienced support personnel have not been able to contribute as they should to AARD's overall goals. Some stations do not even have a farm manager, an indispensable position.

This situation is beginning to change, and many Agency administrators, as they focus more on operational issues, are realizing that it will not be possible to improve the output of meaningful research without adequate operating budgets and the timely maintenance and repair of buildings, equipment and other facilities. Solutions to this constraint will require additional budget allocations and training of support personnel if the Agency is to benefit from its large investment in physical infrastructure.

As the pace of infrastructure development within RCCFC begins to decline, AARD's successful program for recruiting, training, and upgrading research scientists still continues at an impressive rate. However, problems in RCCFC's present staffing patterns and manpower policies are evident. For example, past procedures of training those qualified for graduate study without regard to discipline, region or commodity is providing a skewed distribution of expertise in some areas. Examples from the recent palawija crops review conducted by the International Service for National Agricultural Research (ISNAR) appear in Table 6, and illustrate this point.

This table demonstrates the relative popularity of agronomy and plant breeding, the moderate expertise in the supporting disciplines of physiology, entomology and pathology, and the absence of expertise in socio-economics or post harvest specialities. Many factors contribute to this situation: the heavy reliance placed on breeding early in the research program, the lack of research facilities at Institutes responsible for initiating an active on-farm research effort, and the absence of other disciplines such as economics and post harvest technology to complement breeding efforts. As a result, RCCFC has a limited ability to conduct the post harvest and marketing research needed to relieve existing constraints to secondary crop production.

TABLE 6. TOTAL SECONDARY CROPS RESEARCH STAFF, CURRENT AND IN TRAINING BY DEGREE AND DISCIPLINE RESEARCH COORDINATING CENTER FOR FOOD CROPS 1984

	<u>Current</u>		<u>In Training</u>		<u>Total</u>	
	<u>Ph.D.</u>	<u>M.Sc.</u>	<u>Ph.D.</u>	<u>M.Sc.</u>	<u>Ph.D.</u>	<u>M.Sc.</u>
Plant Breeding	7	5	4	8 (-4)*	11	9
Agronomy	1	7	3	19 (-3)	4	23
Physiology	0	5	1	5 (-1)	1	9
Entomology	1	6	1	4 (-1)	2	9
Pathology	1	1	0	6	1	7
Socio-Economics	0	2	0	0	0	2
Post Harvest	1	2	0	1	1	3
Farming Systems	3	1	0	4	3	5
	<u>14</u>	<u>29</u>	<u>9</u>	<u>38</u>	<u>23</u>	<u>67</u>

* () represents M.Sc. scientists in Ph.D. training.

Exacerbating this disciplinary bias, candidate selection also tends to be disproportional with respect to location. As Table 7 indicates, a disproportionate share of RCCFC's professional staff identified for training is selected from and will return to the Bogor Research Institute.

TABLE 7. AVAILABLE MANPOWER BY INSTITUTE RESEARCH COORDINATING CENTER FOR FOOD CROPS

<u>Research Institute</u>	<u>Current</u>		<u>In Training</u>		<u>Available by 87/88</u>	
	<u>Ph.D.</u>	<u>M.Sc.</u>	<u>Ph.D.</u>	<u>M.Sc.</u>	<u>Ph.D.</u>	<u>M.Sc.</u>
Bogor	7	15	7	11	14	26
Malang	2	2	1	6	3	8
Sukamandi	3	6	0	6	3	12
Sukarani	1	2	0	9	1	11
Maros	0	4	1	4	1	8
Banjarbaru	1	0	0	2	1	2
	<u>14</u>	<u>29</u>	<u>9</u>	<u>38</u>	<u>23</u>	<u>67</u>

This trend, if it continues, will result in significant professional staff shortages at the Research Institutes at Maros, Sukarani and Banjarbaru, the major centers of adaptive research.

RCCFC's ability to restructure its staffing patterns will be heavily dependent on its ability to use position descriptions, recruitment and promotion policies, salary adjustments, opportunities for training, and other incentives as tools in developing its personnel management system. Enhanced benefit packages will be required to: a) provide incentives for professional staff placed in remote locations, b) provide stable

terms of employment and promotion opportunities for the growing number of research service personnel (library staff, repair and maintenance personnel, laboratory technicians, and statistical, visual aids and publication staff), and c) enable AARD to compete effectively with the private sector for staff in high demand areas, such as economics and post harvest technology. Many of these issues are being addressed in a major manpower development plan now being formulated by AARD. The recommendations emanating from this plan will be constrained, however, unless well trained administrative professionals are in place to carry them out.

3. Research Implementation, Analysis and Reporting. The quality of AARD research is variable. In part this is due to the limited support services and facilities available to individual researchers and the absence of a dynamic peer group review and planning process. Also, AARD's relatively young, rapidly expanding staff lack simple on-the-job research skills which cannot be learned through academic training. At the same time, the older, more experienced senior researchers have not been able to keep abreast of technological breakthroughs in research methodology that have occurred over the past decade.

A number of mechanisms will be used to overcome this constraint. Young inexperienced researchers will learn how to plan and carry out experiments by working with experienced university professors or other senior AARD researchers. Workshops on conducting, analyzing and reporting experiments will be employed. Seminars in each Research Institute will provide a venue for much of the necessary in-service training and evaluation. Also, these seminars will serve as the first step in developing a peer review process for the internal evaluation of proposals and research programs.

National Commodity Coordinators could be used in this effort. With adequate support, they could visit relevant Research Institutes frequently and communicate directly with all research workers, from the youngest to the most experienced. The Coordinators could assist with in-service training by organizing seminars related to commodity research problems; reviewing research proposals, field and laboratory experiments; and by providing guidance on the reporting of research results. Statistical support services could be increased and made more readily available to researchers to assist in the analysis and presentation of results. Finally, individual researchers could be encouraged to prepare and give seminars/reports on research results at their respective Research Institutes or, if appropriate, at annual commodity meetings.

4. Transferring Technology to End Users. While it is reasonable to expect individuals to bear responsibility for reporting their research results, some additional professional assistance is required to support the appropriate dissemination of those results. The AARD has authorized each of its Research Institutes to assume greater responsibility in this area. To support this effort the Institute Pertanian Bogor, Indonesia's premier

agricultural university, initiated the country's first undergraduate program in agricultural communication in September 1984, and 20 AARD staff are now participating. In 1985 Masters level instruction in this field will be provided.

AARD's leadership is also working to strengthen and coordinate its role with agriculture extension as a means of demonstrating the tangible implications of a strong agricultural research program. Based on recommendations presented in the World Bank's 1983 Agriculture Research Project Appraisal, AARD has begun training research specialists and has secured approval to appoint them in career-track positions in the area of agricultural communications. In each Institute, these specialists have been given enhanced responsibilities for publishing research results and providing liaison with colleagues in the extension services. More can be done, however. Secondment of personnel from both services could be encouraged to strengthen the existing links between the two services. AARD has a long standing policy of encouraging the placement of extension personnel at Research Institutes, but reciprocal arrangements for AARD staff have not been worked out, partly because of career uncertainty and budget constraints. Similarly, AARD assistance to the extension services in establishing demonstration trials has been limited.

D. Relationship to Other AID Projects

The agricultural research project amendment described in Section III is directly related to AID's strategy for agriculture and rural development and fully complements other AID projects in the sector.

A primary strategic goal of AID in Indonesia is to help the Government with programs that increase the productivity of the small producer. To this end, AID's agricultural programs over the next several years will give attention to the diversification of food crop commodities. This goal responds directly to the present and future trends in rice and secondary food crop production and AARD's own strategy, as outlined above.

AID assistance to agricultural research clearly supports the objective of diversification toward secondary crops. In addressing this objective, the agricultural research activities supported under the amendment also will help strengthen other AID agriculture and rural development efforts. For example, through the Uplands Conservation and Agricultural Development Project and the Citanduy Project, AID is assisting the Government of Indonesia in developing upland areas of Java. The people in these upland areas subsist primarily on rainfed rice, peanuts and maize, crops which are the primary focus of agricultural research under this amendment. Because these crops have not received much attention, the standard of living of people in the uplands has been falling behind that of people in the lowlands. With increasing population in upland areas, over-exploitation of resources and soil erosion, many people in the uplands are experiencing absolute decreases in their standard of living from an already poor base. However, upland areas have the

basic agro-climatic conditions needed for increased productivity. Through agricultural research on improved farm management techniques and new secondary crops technologies, the productivity of the uplands can be substantially increased.

Similarly, AID will be supporting the GOI in its desire to diversify investments in irrigation toward more emphasis on secondary food crops. As an example, the Small-Scale Irrigation Management Project will assist in the development of surface diversion, reservoir and groundwater irrigation systems in three eastern island locations where secondary food crop systems now exist or have potential. Research on secondary crops in irrigated food production systems will be essential in order to maximize returns from investment in water development.

E. Other Donor Support for Agricultural Research

As indicated in Table 8, international donors have provided extensive support to AARD since the early 1970s. The bulk of the assistance has been for infrastructure development and training directed at the national system, with particular emphasis on facilities and manpower for livestock, estate crops and food crops research.

Since its inception in 1974, AARD has received almost \$200 million in support from nine external sources--IBRD, United States, Australia, Holland, Japan, FAO, United Kingdom, Belgium and Canada. For the most part, this has supplemented the generous GOI contribution of more than \$300 million to AARD over the past 10 years. Foreign support to AARD will continue into the next decade, with the largest contribution coming from IBRD under the third National Agricultural Research Project (NAR III), with smaller but substantive support under the Swamps II, Seeds II, Transmigration III and Nusa Tenggara Development Projects, as well as the proposed Fruit and Vegetable Production and Marketing Project jointly financed with the Asian Development Bank. These projects will continue to focus on constructing and equipping research facilities and providing academic training for scientific staff to meet manpower needs throughout the system.

Other donors have also provided technical assistance to AARD over the years. The principal Research Institutes supported under the new program components of the project amendment--Sukararni, Maros, Malang, and Bogor--all have long-term assistance at present. Sukararni and Maros have USAID-funded teams in place and will continue to receive technical assistance support under the amendment. No additional technical assistance support from donors is currently in place or planned for these two Institutes. The Dutch government has assisted Malang with a number of long-term specialists over the last few years. It is likely that two Dutch scientists will remain at Malang through 1987. However, this team will focus on mungbean and cassava, crops not covered under the amended project activities. They are also targeting their efforts on East Java, while the amended project's research activities will have a national focus. Bogor currently has eight Japanese experts

TABLE 8. EXTERNAL SUPPORT FOR AARD SINCE ITS FORMATION

<u>L O C A T I O N</u>	<u>P R O J E C T</u>	<u>D U R A T I O N</u>	<u>D O N O R</u>	<u>G R A N T / L O A N</u>	<u>U S \$ m</u>
AARD (General)	Applied Agricultural Research	80 - 85	U S A	G	6.5
	Applied Agricultural Research	80 - 85	U S A	L	18.9
	Agricultural Development Planning and Administration (Agro data processing)	78 - 83	U S A	L	1.3
	National Agricultural Research I	75 -	IBRD	L	16.7
	National Agricultural Research II	80 -	IBRD	L	65.0 (108.4)
SOILS	Benchmark Soils	77 - 83	U S A	G	0.4
	Fertilizer Use	82 - 85	Australia	G	1.6
	Soil Research	74 - 79	Holland	G	0.4
	Soil - Zoning	74 - 80	Belgium	G	0.8
	Land Resources	79 - 83	FAO/UNDP	G	2.1
	Land Capability	72 - 76	FAO/UNDP	G	1.2
	Tropsoils Project	82 - 86	U S A	G	5.4 (11.9)
FOOD CROPS	Sumatra Agricultural Research	78 - 83	U S A	G	2.5
	Sumatra Agricultural Research	78 - 84	U S A	L	7.0
	Agricultural Research	72 - 82	U S A	G	2.96
	Regional Rice Research	72 - 82	U S A	G	1.1
	Rice/Soybean/Corn	74 - 77	Holland	G	1.1
	Horticulture	74 - 78	Holland	G	0.9
	Secondary Crops (Malang)	81 - 86	Holland	G	5.2
	Seed Potato	80 - 81	U K	G	0.2
	Food Legumes	78 - 83	Japan	G	2.3
	Food Crops	71 - 78	Japan	G	1.5
	Grain Handling and Storage	77 - 79	Australia/ ASEAN	G	0.14
	Tropical Agronomy for Potato (SAPPRAD)	82 - 87	Australia	G	0.23
	Tissue Culture for Virus Free Potato	82 - 84	U S A	G	0.15
	Hybrid Rice Project	82 - 84	U S A	G	0.55 (25.43)

TABLE 8 (continued)
EXTERNAL SUPPORT FOR AARD SINCE ITS FORMATION

L O C A T I O N	PROJECT	DURATION	DONOR	GRANT/ LOAN	US\$ m
ANIMALS	Small Ruminant R & D	80 - 84	U S A	G	2.5
	Animal Disease Research	80 - 85	Australia	G	5.52
	Animal Production Center	74 - 89	Australia	G	33.0
	Pasture & Fodder Crops	82 - 87	Australia	G	6.3
	Animal Health	78	U K	G	0.3
	Epidemiology Laboratory	80 - 85	U K	G	1.1 (48.72)
ESTATE CROPS/ INDUSTRIAL CROPS	General	70 - 80	Australia	G	0.06
	Tea and Cinchona	78 - 81	Holland	G	1.8
	Pepper	81 - 86	Holland	G	0.3
	Cloves	75 - 83	U K	G	0.7
	Rubber and Oil Palm Research	72 - 77	FAO/UNDP	G	0.7
	Coconut Research	73 - 83	FAO/UNDP	G	2.4
	Rubber Research	79 - 83	Holland	G	0.25
	Rubber Technology	80 - 83	Japan/ASEAN	G	0.5 (6.21)
FISHERIES	Post Harvest	77 - 79	U K	G	0.2
	Mariculture	79 - 81	Japan	G	2.5
	Fish Parasites	76 - 79	Canada	G	0.2
	Inland Fisheries	81 - 84	IDRC/Canada	G	0.25
	Fish Parasites (Phase II)	83 - 86	IDRC/Canada	G	0.2 (3.35)
FORESTRY	Saw Use	80 - 83	FAO/UNDP	G	0.2 (0.2)
					204.21

working on rice, farming systems and entomology, while USAID assistance to Bogor will be on seeds research. In summary, activities proposed under this project amendment are complementary to and not duplicative of other donor efforts.

Three positions will be provided to the Secretariat under the amended project. This will mark the first time that long-term technical assistance has been provided to the Secretariat by any donor.

III. Project Amendment--Rationale and Components

A. Evolving AID Strategy for Agricultural Research

Since 1972, USAID's assistance to AARD and its predecessor organization in food crops, the Central Research Institute for Agriculture, has focused on providing support for facility and manpower development within the framework of the government's strategic rice production program. AID support has complemented larger donor commitments to infrastructure and research program development, which collectively have resulted in the major advances in rice technology mentioned earlier.

This amendment will mark an end to AID support for physical plant expansion, which other larger donors will continue to finance. New activities under this amendment will continue to strengthen scientific capacity in selected areas that support the major objectives of the new program components discussed below and where other donor support is lacking. In addition, new project components will consolidate AARD's past accomplishments through assistance to improve the administration and management of the research program. The amended project will also support AARD's attempts to diversify its research agenda in order to match anticipated shifts in food production from Java to the outer islands and the emphasis on secondary crops.

To accomplish these objectives, the project amendment will support technical assistance and training to improve AARD's research planning, implementation and monitoring system; improve facility management and support services; introduce flexible budgeting procedures to address emerging problems; and strengthen the performance of national commodity coordination. In addition, the project will assist crop diversification by funding research coordinated through national commodity groups in grain legumes (soybeans and peanuts), maize and rice (particularly upland rice). This amendment will also provide funds to continue support for project activities now underway.

The proposed amendment will be composed of two separate but integrated parts--the extension of selected activities begun under AARP and the initiation of new follow-on support. The major components in each of these areas are discussed below.

B. Current AARP Activities

The AARP, signed in September 1980 with a five year life-of-project, has assisted in developing seventeen research stations primarily in Indonesia's outer islands. The project has provided financing for the construction and renovation of buildings, development of experimental plots, provision of equipment and vehicles, short-term overseas training for station researchers, collaborative research, and technical assistance.

The original purposes of the AARP were to expand and improve agricultural research capability by strengthening AARD's institutional network and its capacity to develop technologies to increase both agricultural production and farmers' incomes. Those objectives remain valid. In fact, completion of the following specific project components is necessary to achieve the purposes of the AARP:

1. Construction. The original AARP was designed to improve or establish nineteen research facilities. During implementation this target was reduced to seventeen stations consisting of twenty-seven separate construction sub-projects. When completed, these seventeen sites will form part of a strategic core of research facilities throughout Indonesia. Earlier delays in construction start-up have been overcome, and the target dates for completion can be met. The status of AARD construction activities is summarized in Annex A.

In addition to the construction of buildings (laboratories, workshops, storage and office facilities), farm development at each site will be funded as part of the continuation of original AARP activities. Expenditures will be for land clearing and preparation, drainage and irrigation works, station roadways, and fencing.

There will be no additional construction financed under the new project components.

2. Commodity Procurement. Because of delays in making final the procurement services agent (PSA) contract, a major procurement totaling \$5.8 million still must be completed. The contract was finally signed on July 25, 1984, thus removing a major obstacle to initiating procurement actions. This procurement contract will be extended for 18 months beyond the current PACD at no additional cost.

The commodities to be procured include field, laboratory and seed handling equipment necessary to conduct research; electrical generators and pumping equipment for station operation; and communications, library and data processing equipment. Equipment arrival has been coordinated with construction schedules so that commodities will be adequately housed and immediately useful.

3. Training. Approximately 370 of the planned 560 person months of overseas training will be completed by the time the current

project assistance completion date (PACD) of 9/30/85 is reached. The additional 190 person months of overseas training, as well as some short-term in-country technical and management courses, will be undertaken over the next 18 months (to 3/31/87) in order to complete the training objectives of the original AARP. Annex B summarizes the fields of study, number of participants, and location of training programs under the AARP as of January 1, 1985, as well as the training planned through March 1987.

4. Technical Assistance. The existing technical assistance contract with Resources Management International (RMI) will be extended for 18 months beyond the current PACD of 9/30/85. Under the extension, an additional 102 person months of technical assistance, above that contained in the existing contract will be provided to assure that construction, farm development, training and other objectives under the original project can be met. This contract extension will require no additional funds above the amount already provided in the existing contract.

A list of consultants and justification for those who will be extended after the PACD date under the amended project is provided in Annex C. In addition, detailed work plans setting forth specific annual performance targets have been prepared. These work plans will be included in the RMI contract extension and reviewed on an annual basis by USAID and AARD.

C. New Program Initiatives

As Indonesia's agricultural research establishment continues to evolve, a revised Mission strategy to support AARD is required. Based on an extensive review by Mission staff, consultants and other donor teams, the Mission has concluded that there is a definite, but difficult set of problems faced by AARD where AID investments could make a difference. These problems fall into two broad areas of concern: a) the need for AARD to strengthen its administrative and management structure to assure the efficient use of its enlarged facilities and manpower base, and b) the need to shift research focus from rice to secondary crops development. Thus, AID support under this amendment has two broad objectives:

- First, to improve research performance through a strengthening of AARD's planning, administrative and management functions, and
- Second, to increase the output of sound, applied technologies for increasing and diversifying the production of key secondary crops.

Each of these objectives and the components required to implement them is discussed below.

1. First Objective: Strengthening Research Management and Administration. The development of AARD's administrative system has lagged behind its rapid growth in physical and human infrastructure. In part this has been a conscious decision because it is difficult to develop programs without first having an adequate manpower and physical base to implement them.

However, AARD's facilities and trained scientific staff in most subjects are now reaching threshold levels. The proposed assistance consists of three components.

First, to overcome problems faced by AARD's management in improving the vertical and horizontal flow of information and decisions and in developing an articulated research management strategy, TA, training and support of limited special studies will be provided directly to the Secretariat.

Second, to improve facilities management and support services, assistance will be provided for the development of research station management training sites at two Research Institutes, Sukarani and Maros.

Third, to assist AARD in formulating secondary crops research objectives, setting research priorities, and in developing closer links with universities, other government institutions, the private sector and international agricultural research centers, project support will be provided for strengthening and expanding the role of national coordinated commodity programs in upland rice, maize and grain legumes.

Each of these components is discussed below and will include the TA, training, or other factors necessary for implementation.

- a. Support for Research Planning, Implementation and Monitoring in the Secretariat. The objective of this component is to improve AARD's management system so that it can respond more effectively to its expanding agenda and the country's research needs.

Technical Assistance

A four-person team will be located in the Secretariat to advise and interact with the Director General, Secretary, and AARD staff on agency-wide aspects of research management:

- An experienced research administration specialist, with knowledge of the International Agriculture Research Centers (IARC) and other sources of external research collaboration, will assist the Director General and Secretary in overall research planning and monitoring and in day-to-day research management. This individual will collaborate with the Program Formulation Unit of the Secretariat and the Research Program Analyst to plan, implement and monitor project-supported national commodity research groups. He or she will also provide leadership in organizing various training programs and will serve as chief of party.
- A research program analyst, an economist with knowledge of agriculture and experience in planning and agricultural research, will assist Secretariat staff in establishing national research priorities, and in evaluating and

monitoring research performance. This individual will interact with AARD's Center for Agro-Economic Research (CAER), Center for Agricultural Data Processing (CADP), and the Research Institutes in applying economic analysis skills and computer-assisted management techniques.

- A technical team coordinator/training specialist will administer the technical assistance team and coordinate their activities with regard to the national coordinated commodity groups. In addition he or she will work with Secretariat staff to develop in-country, in-service training that will use Indonesian and in-country expatriate expertise to organize and conduct training sessions, supplemented by a minimum of external technical assistance. He or she will be expected to assist in manpower development planning with a major objective of transferring these skills to appropriate counterparts in the Secretariat. This individual's responsibilities as technical team coordinator will include project administration duties, particularly with regard to the technical assistance team and research support.
- An Indonesian administrative assistant will support the technical team coordinator in his or her project administration duties. This individual will also collaborate with Secretariat staff in strengthening administration capabilities within the organization.

In addition, twelve person months of short-term assistance will be provided to the Secretariat to advise on specific administrative topics and assist in specialized training.

Training

As shown in the manpower development plan in Table 9, there is an absence of trained support specialists in the Secretariat. Thus, funds will be provided for:

- 5 Master's degrees at U.S. universities in personnel management, finance and accounting, general business administration, public administration and computer science;
- 10 Secretariat division or department heads to attend management short-courses at IARCs or U.S. research institutions on topics related to staff development and personnel administration, accounting, organizational procedures and program planning and evaluation; and
- 10 in-country training workshops for staff of the Secretariat and the RCCFC on such topics as procedures for establishing research objectives and priorities; research planning and monitoring; project proposal writing; computer-assisted management techniques to better schedule and track what is being done, where, by whom and on what;

financial and personnel management initiatives; staff development procedures to improve incentives, morale, and performance; research reporting and dissemination; and re-entry seminars for newly-trained scientists.

Special Studies

The amended project will provide a special studies fund to the Secretariat so that AARD can respond to emerging problems, such as unexpected pest or disease outbreaks. This fund can also help support the decisions of BAPPENAS and other policy-making bodies. Policy issues regarding research approaches to problems of upland rice and the potential role of the International Rice Research Institute (IRRI) is an example of how these funds may be used. Another example might be the expanded role of perennial crops in the transmigrating areas. Also an informed decision on a request to spread lime on several hundred thousand hectares should be backed up by information on where, how much lime, and what benefits might be expected. Such information is often available in scattered sources within Indonesia and abroad, but requires time, staff and money to assemble and evaluate. Under present government procedures, it is very difficult to budget for studies if they are not anticipated in advance. Under this project, discretionary money will be available in small grants to the staff of AARD, universities or other government agencies for special studies or unanticipated supplements to ongoing research.

Proposals for the special studies will follow a standard format which identifies the problem to be examined, indicates why it is important, and explains how the research will be conducted, who will be involved, and what resources are required. Proposals will be reviewed by a special research advisory committee established by the Director General of AARD. All work will be carried out by researchers under contract to AARD.

Initially, \$500,000 of loan funds will be earmarked for these studies, an amount to be matched by AARD contributions. It is envisioned the AID contribution will be greater during the first years of the project with an increasing AARD contribution during the life of project. The objective will be to institutionalize this funding mechanism with the AARP annual budgeting cycle during the course of the project.

- b. Improving Facility Management and Support Services. Research station management has received less attention than required. While system-wide expansion of the physical plant has been dramatic, (Table 2 above), and the program for recruiting and training scientists to conduct research at these facilities has been successful, little emphasis has been given to the selection and training of either research station managers or support services personnel. As a consequence, although many AARD stations have sufficient numbers of dedicated staff,

TABLE 9. MANPOWER DEVELOPMENT PLAN
SECRETARIAT

Division	Currently in Secretariat			Now in Training			Total Requirement as of 1990			Shortage in 1990			
	PHD	MSC/MS	IR/BS	PHD	MSC/MS	IR/BS	PHD	MSC/MS	IR/BS	PHD	MSC/MS	IR/BS	Total
Director General	1	0	0	0	0	0	1	0	0	1	0	0	0
Secretary	1	0	0	0	0	0	1	0	0	1	0	0	0
Personnel Management	0	0	5	0	0	1	0	3	11	14	0	-3	-8
Finance	0	0	3	0	1	3	0	3	18	21	0	-2	-14
General Services	0	0	8	1	0	1	1	3	10	14	0	-3	-4
Collaborative Research	0	0	5	1	3	0	1	7	8	16	0	-4	-7
Program Formulation	1	0	7	0	4	1	3	4	15	22	-2	0	-9
Total	3	0	28	2	8	6	7	20	62	89	-2	-12	-42

sufficient equipment and adequate buildings, laboratories, offices and housing, most are lacking in important operational components including:

- lack of understanding of the importance, role and responsibilities of station managers and operations support personnel;
- lack of procedures and funds for timely maintenance and repair of buildings, equipment and other facilities;
- lack of long-range institutional planning for the phased replacement of equipment;
- absence of inventory control and spare parts management;
- poor choice of sites and land for research station sites;
- inadequate land development practices; and
- underutilization of equipment and building space.

To alleviate the current deficiencies in facility management enumerated above, the project will support technical assistance, funds for periodic in-country training programs and workshops, and limited training abroad.

Technical Assistance

Two station development specialists will be provided under the amended project. One will be located at Sukarami and the other at Maros. They will work to improve facilities and will train staff to operate them effectively so that these research stations can serve as training centers for research station management and support services personnel. They will then plan and implement a series of workshops and training modules.

In addition, up to ten person months of short-term technical assistance would be available to help overcome the type of station management problems noted above. Also, volunteer farm mechanics/agricultural engineers will be funded under the amended project to assist the institutes in maintenance and operations at selected stations and laboratories, and provide on-the-job training to other staff within the AARD system.

Training

Because most of the training can be best accomplished through practical applications of lectures, demonstrations and training materials, fully-equipped and well-functioning stations are the most suitable places for in-service training courses. The project will provide funds for training and limited equipment at Sukarami and Maros. These two locations

are among the most developed AARD stations and have ample land, buildings, and living facilities for trainees. Also, these stations are representative of large land areas in Indonesia and are located to minimize transportation costs for trainees.

Funds for per diem, travel and materials for ten training workshops of up to four weeks each in station will be provided. Course topics will include:

- field operations, use of equipment and machinery, land shaping, and field plot preparations;
- repair and maintenance of farm equipment and machinery;
- general station management and operations;
- motor vehicle operations and maintenance;
- building repair, maintenance and up-keep;
- warehousing, inventorying and record keeping for spare parts and supplies;
- irrigation and drainage procedures;
- research laboratory and greenhouse management and operations;
- laboratory equipment repair and maintenance;
- operation and maintenance of electrical generators and distribution systems;
- seed production, processing and storage; and
- applied research operations for technicians and field foremen.

In addition, it is anticipated that workshops for station managers will be held annually.

Because certain specialized training activities cannot be effectively undertaken in-country, funds will be made available for training and apprenticeships for ten AARD staff at IARCs, U.S. research institutions or other appropriate organizations. This training, targeted for senior level institute, station and analytical laboratory managers, will include:

- research station management;
- laboratory management, including operation and repair of more sophisticated equipment;

- management and maintenance of seed storage, drying and processing facilities; and
- machinery and equipment shop management.

c. Support for National Coordinated Commodity Research.

Developing countries are shifting from organizing their research by disciplines (plant breeding, soils, entomology, etc.) to nationwide, multidisciplinary, multi-institutional, coordinated research programs to accelerate the output of research results and gain a better focus on achieving their objectives. To this end Indonesia has established national commodity research groups, each led by a respected scientist who serves as national coordinator. RCCFC, the principal AARD research entity being supported under this project amendment, appointed a coordinator for all secondary crops in early 1985. Sub-coordinators will be appointed for maize, upland rice and grain legumes. For each commodity group, a technical committee will be formed and will be chaired by the commodity coordinator. The vice-chairman for each group will be a university researcher.

These commodity groups will plan and coordinate all research done in the specific commodity. Each year, scientists from AARD and the universities, and representatives from the Directorate General of Food Crops (DGFC), BAPPENAS and the private sector will meet to review the research and recommend changes or new research to be undertaken by scientists at their own institutes or universities. Research proposals and budgets will continue to be formulated and channeled through the Research Institutes and from there through the RCCFC in Bogor to the Secretariat. Under the direction of the national coordinator, the national commodity groups will review national research programs in each of the commodities. Such coordination and management of the research agenda on a national scale has not existed in Indonesia to date.

These groups will provide a means to: (a) focus scarce administrative skills and resources on priority agricultural production problems and programs of the DGFC, (b) promote and facilitate commodity specific research, (c) organize the range of scientific disciplines required to develop appropriate new technologies, (d) widen the range of researchers and resources engaged in research, and (e) successfully influence a better allocation of budget and manpower resources among AARD's full range of programs.

An important feature of this project component will be the formal involvement of Indonesian universities through the Director General for Higher Education. In the past, few continuing, formal institutional agreements for effective collaborative research have existed between AARD and the universities. Informal arrangements have been useful but have not provided continuity in research programs, strong focus on

priority research areas, joint inputs in planning, executing, and evaluating results, or a common denominator for translating research into practical recommendations.

There are certain basic requirements that must be met if such collaboration is to be successful. AARD has the national mandate to conduct agricultural research and must be assured that they have adequate authority for the results for which they will be held accountable. On the university side, research activities must be compatible with, indeed complementary to, the basic university function of teaching. AARD and the Directorate General of Higher Education (DGHE) have recently formalized an agreement that sets up a framework for research collaboration between the two organizations. The national commodity groups supported by the project will be used to make this agreement operational. During annual meetings, both university research and AARD activities will be reviewed. Commodity coordinators will produce annual reports showing their progress, justifying allocation strategies, and recommending priority research activities.

When the first annual workshop for each commodity group is convened, ongoing research will be reviewed, research objectives identified, and procedures for funding future project proposals discussed. Within the first year of the project amendment, the coordinator will visit researchers in the field, the technical committee will review research proposals and make recommendations to AARD and DGHE, respectively, and the AARD and DGHE will fund the recommended projects. At the second annual workshop and thereafter, ongoing research will be reviewed and future related research planned.

In addition to AARD and university researchers, the annual meetings of the commodity groups will include DGFC personnel and extension workers, BAPPENAS and other government representatives, regional planning officials and private sector interests. The annual meetings will provide opportunities for biological and social science researchers from various institutes and research consumers to interact, discuss and evaluate research results and to plan future research activities.

In support of the commodity groups, project funds will provide:

- per diem and travel of each of three national commodity coordinators, and
- per diem, travel, and support for meetings of the three technical committees, and annual national commodity workshops in each of the three commodity areas.

Also, the project will include operational funds for research carried out by AARD and the universities under the

collaborative mechanism. These funds will be channeled directly through AARD and selected universities under separate project agreements with AARD and DGHE.

2. Second Objective: Improving the Efficiency and Effectiveness of Diversified Research. In the context of the growing movement to reorient research toward secondary food crops, the GOI has a heavy obligation to provide counterpart funds for foreign assistance for infrastructure, equipment and training. The large numbers of scientists sent abroad for training are returning to take up research responsibilities. A sizable portion of RCCFC's budget is committed to capital and salaries, which squeezes funds for research, operations and maintenance. Even less research support is currently provided to scientists at the agricultural universities. This budget pressure will begin to ease toward the end of this decade as physical and human infrastructure investments achieve their targets. During this transition, USAID will: a) support operational research on rice, maize and grain legumes; b) provide technical assistance to strengthen specific areas of commodity research; and c) provide academic training opportunities for CRIFC scientists to help fill gaps in specific disciplines.
- a. Support for Operational Research. Since its inception in 1974, AARD has been well supported by both the GOI and foreign donors, with the former supplying about \$350 million and the latter \$175 million during the organization's first eleven years. In real terms, GOI expenditures on agricultural research grew by over 11.5 percent per year from 1975/76 through 1982/83. However, as illustrated in Table 10, there was a budget reduction of 21.2 percent in 1983/84 and 8.8 percent in 1984/85, in part a result of the general economic downturn and in part because of the removal of the forestry budget to a separate Ministry. Similarly, the 1985/86 GOI contribution is likely to drop, marking the third year of budget declines.

TABLE 10. AARD BUDGETS 1974-85
CONSTANT 1975 RUPIAH
(Million)

Year	GOI			Donor Assistance	Total
	Routine	Development	Plantation		
1974/75	1,146	2,361	1,413	1,646	6,936
1975/76	1,616	3,361	1,530	1,569	8,077
1976/77	1,696	6,550	-	2,860	11,108
1977/78	1,958	7,347	-	3,861	13,166
1978/79	1,850	6,650	-	2,905	11,405
1979/80	1,751	6,490	-	2,750	10,983
1980/81	2,273	6,816	1,554	4,125	14,769
1981/82	2,816	7,089	1,674	4,703	16,284
1982/83	2,561	6,730	2,363	4,292	12,774
1983/84	2,463	5,415	1,531	8,589	18,000
1984/85	1,947	4,880	1,545	8,847	17,221

Like all other GOI agencies, AARD's budgets are divided into "routine" and "development" appropriations. Routine budgets are for civil servant salaries and rice allowances, maintenance costs and some travel allowances. Development budgets are for construction, equipment and other capital costs, administration, training, publications, on-farm trials and research operations. In addition, AARD receives a cess from the state-run plantations that supports estate crop research.

The research operations budget, which includes line items for researcher transportation and per diem, supplies and materials, casual labor, survey costs, etc., has averaged only about 38 percent of the AARD development budget over the last five years (Table 11) and only 15 per cent of AARD's total budget.

TABLE 11. AARD DEVELOPMENT BUDGETS 1980-85 BY PERCENTAGE BREAKDOWN

Category	1980/81	1981/82	1982/83	1983/84	1984/85
Project Administration	30.2	23.9	29.9	16.6	13.8
Research Operations	31.3	34.2	36.5	49.2	39.9
Technology Transfer	3.8	4.1	4.8	8.3	5.4
Capital Development	34.7	37.8	29.2	25.9	40.9
Totals-Constant 1975 rupiah (millions)	6816	7089	6730	5415	4880

Under the third IBRD-financed research project, NAR III, the GOI must provide about \$36 million over the next six years, primarily to support civil works and incremental operating expenses. The \$6 million or so per year required to support this project will amount to 20-25 percent of AARD's total GOI budget.

The strain that this will put on the operational research account will be exacerbated by the return of a large number of scientific staff from academic training. As of February 1985, AARD had 110 Ph.D. and 245 M.Sc./M.S. scientists at duty posts along with 925 IR/B.Sc.s. Operational research budgets are channeled through these scientists. Over the next three years, an additional 160 Ph.D.s, 293 M.Sc.s and 46 IR/B.Sc.s will return. They will come home to excellent, well equipped facilities, but inadequate research budgets. Operational research budgets on a per researcher basis will be considerably reduced, resulting in low research output and scientist dissatisfaction. Compounding this, the recent increase in per diems authorized by the GOI, without attendant increases in the total travel line item, will mean that fewer scientists will be able to travel to monitor their research.

These imbalances will be redressed in five to six years as AARD's capital development program is completed and the Agency has greater budget flexibility. In the interim limited loan funds will be provided to augment GOI operational research budgets for the food crop commodities supported under the amendment. These funds would be available to AARD in decreasing yearly increments to be matched by increasing GOI yearly contributions (see the annual project budget in Section IV). A portion of this money will also be made available to the Directorate General of Higher Education to support the commodity group recommendations for funding university research. As well as providing additional resources to support the intensification of research efforts on palawija crops in the outer islands, this loan money will provide the necessary leverage to ensure the success of the national commodity group concept and contribute to research output.

Research support for the three strategic commodity groups--rice, maize, and grain legumes--will be focused on activities at four sites: Malang, Bogor, Maros and Sukararni. The Malang Institute has the national mandate for conducting research in the palawija commodities mentioned above, while Bogor provides additional "fundamental" research expertise. Research outputs from these Institutes are applied through the field testing programs at Sukararni and Maros. These latter two Institutes have mandates for identifying improved farming systems in two of Indonesia's most expansive agro-ecosystems, the humid uplands and semi-arid and arid areas. Improved agricultural technologies specifically tailored to the cropping patterns and problems in these climatic zones would significantly enhance productivity, reduce per unit production costs, and lead to direct increases in employment, income and nutrition among a large segment of Indonesia's poorest agricultural producers.

Funds will be allocated to finance research on:

- Rice, with emphasis on developing and testing rainfed, upland rice with pest and disease resistance (especially to blast) and with tolerance to acid soils, aluminum and iron toxicity. Limited testing of the potential of hybrid rice will also be supported.
- Maize, with emphasis on increasing yields of open pollinated varieties, and the post harvest problems associated with wet, humid conditions. Limited testing of sorghum for the dry areas will also be undertaken.
- Grain legumes, with emphasis on improved soybean varieties that are resistant to major pests, diseases and environmental stresses, have superior storage and innoculation characteristics, and are early maturing. For peanuts, emphasis will be on developing varieties with resistance to leaf spot and mottle virus and with superior storage characteristics.

Research will be conducted in the disciplines of breeding, agronomy, pests and diseases, economics, soil management, biotechnology, seeds, and harvest and post-harvest management related to the three commodity areas. Project funds will support field and laboratory research costs such as inputs, transportation and logistical support, area surveys and monitoring, and post-harvest processing, storage and seed production expenses.

In addition to supporting field research activities in the traditionally strong disciplines of breeding, agronomy and pest and disease control in the three commodity areas, support will also be provided to improve AARD skills in four important areas: biotechnology, seed production and storage, soil management and economics.

New biotechnology techniques are being developed to supplement, facilitate and speed traditional plant breeding methods. Plant cell and tissue culture is used to clean germplasm of diseases, transmit it disease-free and screen plants for tolerance to various forms of stress. The technique is already proving useful to accelerate vegetative propagation of tubers, to screen rice for salt tolerance and to screen secondary crops for acid soils and aluminum toxicity.

The Agriculture Institute at Bogor is currently developing its capabilities in modern biotechnology; Gadjah Mada, Padjadjaran, and Brawijaya Universities are other possibilities for support. An inter-university center for biotechnology being developed at Bogor with World Bank funding would be a major source of cooperative research for AARD. A biotechnology institute is also being considered for the Ministry of Research and Technology. To take advantage of these developments AARD staff, who have limited biotechnology capability, will need training and practical experience with these new technologies. Such skills would increase research output and provide access to the various programs being developed elsewhere in Indonesia.

Seeds are critically important to secondary foodcrop development. The rice seed model that has dominated Indonesian thinking to date is not transferable to these commodities, given rice's superior storage characteristics. Unlike rice, other secondary crop seeds are not well adapted for survival under humid conditions, and Indonesian farmers have less experience in seed-saving and give less attention to it. Even if a superior variety of soybeans were developed today, it would probably take at least five years to multiply and distribute seed to all interested farmers in Sumatra and Sulawesi. Thus, both immediate and long-term research attention is needed, focusing on two levels: large-scale seed production supply operations and on-farm seed-saving activities (which will account for at least 80-85 percent of the total seed requirements of self-pollinated cereal and legume crops, even into the mid-1990s). Soybeans, corn, and peanuts are logical crops to focus on initially.

Such a research program would involve several of the following institutions: RCCFC; other central research institutes; IPB, Gadjah Mada, Padjadjaran, and possibly Andalas universities; the Directorate General of Food Crops; and private seed producers. Also, the relevant IARCs and national programs in Thailand and the Philippines could join in periodic regional network meetings to review comparative research.

Soil management is an important research topic on Java and the outer islands. On Java, intensively farmed upland soils will increasingly exhibit minor element deficiencies. In the outer islands, upland, largely red-yellow podzolic soils (oxisols and ultisols) are low in fertility, have low cation exchange capacity, fix phosphorus (make it unavailable to plants), and possess high levels of aluminum and other toxic elements. In newly cleared forested lands in the outer islands, organic matter content is quickly depleted and the nutrient reservoir is mainly in the shallow topsoil. These soils tend to erode easily unless a crop cover is maintained and organic matter content built up. This amendment will provide support to further investigate these problems.

Transmigration areas, located in previously forested upland areas outside Java, will be an important testing ground. The Center for Soil Research, in cooperation with other AARD research institutes, the universities, TropSoils CRSP and other international centers will play an important role in identifying practical solutions to soil-related problems in these areas.

Economics can contribute to research programs in two important ways. First, this discipline can help identify research issues and determine priorities to guide research activities. For example, in the absence of economic input, research objectives tend to focus on productivity and are set by breeders and agronomists. However, when farmers make their decisions, they consider a range of factors in addition to productivity, including input availabilities and costs, market convenience and price, and government policies. Without trained and experienced economists, research will tend to be production/supply oriented, only addressing constraints to yield in a limited context without considering the demand-oriented constraints to production. Second, economists can help researchers and farmers evaluate alternative technologies before making recommendations on varieties and practices. The researcher needs to identify major constraints to production, assign priorities to problem areas for further study, understand how the production will be used, and calculate benefits and costs of varieties and practices before making recommendations.

At the present time, economic skills are weak in AARD, as evidenced by the relatively limited number of economists at the institutes where research is being carried out (see Tables

12, 13 and 14). The amendment will support research within AARD and with selected universities to determine the socio-economic constraints Indonesia faces with respect to secondary crops production and marketing. The focus will be on the adaptive research being conducted at Maros and Sukararni, with secondary interest at Malang and Bogor.

- b. Technical Assistance. To assist the efforts outlined above, the project will provide technical assistance for Sukararni, Maros, Malang and Bogor to accelerate diversified secondary crops research. The technical assistance requirements (Table 15) are based on the staffing needs for each institute, as presented in Tables 12, 13, and 14. Draft scopes of work for each position are presented in Annex D.

The project will support:

- Three-person technical collaboration teams posted at SARIF (Sukararni) and MORIF (Maros). Each team will be composed of an agronomist or pathologist, an agricultural production economist and a station development specialist to help SARIF and MORIF scientists adapt and evaluate commodity and seed research on maize, soybeans, peanuts and upland rice for farming systems in two important ecological environments, the wet upland areas and the dry upland areas.
- Two scientists--a grain legumes breeder (peanuts) and a grain legumes pathologist (peanuts), both to be located in MARIF (Malang). These scientists will support the national grain legume coordinator in planning and implementing the national grain legumes research group, undertake research and link it with the research of grain legume scientists throughout the country. Technical assistance personnel will complement the limited breeding and pathology staff expertise at Malang. The grain legume specialists should be thoroughly familiar with activities of relevant IARCs, Collaborative Research Support Projects (CRSPs), S&T/AGR centrally-funded projects, neighboring country research programs, and other external sources of collaborative research.
- A seed specialist located at Bogor to work with Indonesian seed researchers, especially on farmer producing/saving methods for maize, soybean, and peanut seeds. The individual will help link public and private sector research with pertinent international efforts and assist in obtaining appropriate and timely short-term collaborative assistance.
- Short-term technical collaboration (twenty man months, approximately four man months/year primarily from IARCs, CRSPs, S&T/AGR centrally-funded projects, and regional countries would be provided to support programs in the three national commodity areas. Illustrative sources of short-term technical collaboration could include the following:

TABLE 12. MANPOWER DEVELOPMENT PLAN
SUKARAMI RESEARCH INSTITUTE

Scientific Discipline	Currently at Duty Post				Currently in Training				Short-Term Requirement(1990)			
	PHD/DR	MSC/MS	IR/BS	Total	PHD/DR	MSC/MS	IR/BS	Total	PHD	MSC/MS	IR/BS	Total
Crop Science/Agronomy	2	5	18	25	3	11	0	14	6	16	18	40
Breeding	1	3	9	13	3	1	0	4	5	10	8	23
Physiology	1	2	13	16	0	0	0	0	3	8	5	16
Pathology	0	0	8	8	0	2	0	2	3	8	5	16
Entomology	0	1	6	7	0	1	0	1	3	8	5	16
Ecology	0	0	0	0	1	2	0	3	1	2	0	3
Food Technology	0	2	4	6	0	2	0	2	1	4	4	9
Agricultural Economics	0	0	7	7	0	5	0	5	2	5	5	12
Weed Science	0	1	0	1	0	0	1	1	1	0	2	3
Microbiology/Biology	0	0	0	0	0	0	0	0	0	1	2	3
Agro Meteorology	0	0	0	0	0	1	0	1	0	1	1	2
Soil Science	0	1	0	1	1	1	0	2	1	2	3	6
Chemistry/Laboratory	0	0	1	1	0	0	0	0	1	2	5	8
Applied Statistics/ Computer	0	2	0	2	2	0	0	2	1	2	1	4
Communications	0	0	0	0	0	0	0	0	0	1	5	6
Research Management	0	0	1	1	0	0	0	0	0	1	12	13
T o t a l	4	17	67	88	10	26	1	37	28	71	81	180

TABLE 13. MANPOWER DEVELOPMENT PLAN
MAROS RESEARCH INSTITUTE

Scientific Discipline	Currently at Duty Post				Currently in Training				Short-Term Requirement(1990)			
	PHD/DR	MSC/MS	IR/BS	Total	PHD/DR	MSC/MS	IR/BS	Total	PHD	MSC/MS	IR/BS	Total
Crop Science/Agronomy	1	4	8	13	2	5	0	7	3	9	14	26
Breeding	1	0	0	1	0	0	0	0	2	2	4	8
Physiology	0	0	0	0	0	0	0	0	1	1	4	6
Pathology	0	0	1	1	1	0	0	1	1	1	4	6
Entomology	1	1	2	4	0	3	0	3	2	4	6	12
Food Science	0	0	8	8	0	0	0	0	1	1	6	8
Agricultural Economics	0	2	4	6	0	2	0	2	2	4	6	12
Weed Science	0	0	0	0	0	0	0	0	0	1	3	4
Agro Meteorology	0	0	0	0	0	0	0	0	0	1	2	3
Soil Science	1	1	8	10	0	5	0	5	2	5	8	15
Mechanization	1	0	0	1	1	0	0	1	2	0	4	6
Applied Statistics/ Computer	0	0	1	1	0	0	0	0	1	1	2	4
Communications/Library	0	1	1	2	0	0	0	0	0	2	4	6
Research Management	0	0	0	0	0	0	0	0	0	1	3	4
T o t a l	5	9	33	47	4	15	0	19	17	33	70	120

TABLE 14. MANPOWER DEVELOPMENT PLAN
MALANG RESEARCH INSTITUTE

Scientific Discipline	Currently at Duty Post				Currently in Training				Short-Term Requirement(1990)			
	PHD/DR	MSC/MS	IR/BS	Total	PHD/DR	MSC/MS	IR/BS	Total	PHD	MSC/MS	IR/BS	Total
Crop Science	0	4	8	12	2	1	0	3	3	4	10	17
Breeding	1	0	7	8	0	2	0	2	3	4	5	12
Physiology	1	1	0	2	0	1	0	1	2	2	1	5
Ecology	0	0	0	0	0	0	0	0	0	0	1	1
Pathology	0	0	2	2	0	1	0	1	0	2	5	7
Entomology	0	2	2	4	0	0	0	0	1	2	5	8
Food Technology	0	0	2	2	0	0	0	0	0	2	2	4
Agricultural Economics	0	1	2	3	0	0	0	0	1	2	2	5
Weed Science	0	0	0	0	0	0	0	0	0	0	1	1
Seed Technology	0	0	1	1	0	0	0	0	0	1	1	2
Tissue Culture	0	0	1	1	0	0	0	0	0	1	1	2
Soil Science	0	0	0	0	1	0	0	1	1	1	2	4
Agro Meteorology	0	1	1	2	0	0	0	0	0	1	1	2
Applied Statistics	0	0	0	0	0	0	0	0	0	1	1	2
Computer	0	0	0	0	0	0	0	0	0	0	1	1
Communications	0	0	0	0	0	0	0	0	0	0	1	1
Library	0	0	0	0	0	0	0	0	0	0	2	2
Research Management	0	0	1	1	0	0	0	0	0	0	4	4
T o t a l	2	9	27	38	3	5	0	8	11	23	46	80

TABLE 15. TECHNICAL ASSISTANCE FOR NEW
PROGRAM INITIATIVE IN SECONDARY CROPS RESEARCH

Institute	Position	Man-Months	Justification
Secretariat (Jakarta)	Research Administration Specialist/Chief of Party	60	Will work directly with the AARD Secretary, assisting him in strengthening system-wide research planning, monitoring and evaluation. Will also collaborate with the Program Formulation Unit of the Secretariat and the Research Program Analyst to help plan, implement and monitor project supported national commodity research groups. He or she will also provide leadership in organizing various training programs.
	Research Program Analyst	36	Will work with the Head of the Program Formulation Unit, AARD, and through him with the appropriate planning officers in the respective Centers, assisting them in identifying, formulating and communicating research objectives and priorities to the Institutes, monitoring and evaluating research programs, and preparing reports on program and project implementation.
	Technical Team Coordinator/ Training Specialist	60	Will have two main roles. First, will lead the technical and scientific group and provide it with administrative and research support. He will coordinate the research activities of team members in conjunction with the national coordinated commodity groups and assist in identifying and securing short-term technical assistance. Second, to prepare Indonesian staff for overseas training, this specialist will assist in planning and implementing in-country training workshops. In this capacity, he or she will work closely with the Head of the Collaborative Research Unit of the Secretariat.
	Administrative Assistant	36	Will provide administrative assistance to the Technical Coordinator with regard to supporting the scientific and technical group and in securing short-term technical assistance. He will also help administer the project training program, both in-country and abroad. In addition, he will work closely with administrative personnel in the Secretariat to improve staff capabilities.

**TABLE 15. TECHNICAL ASSISTANCE FOR NEW
PROGRAM INITIATIVE IN SECONDARY CROPS RESEARCH (Continued)**

Institute	Position	Man-Months	Justification
Sukarami Food Crops (SARIF) (West Sumatra)	Station Development Specialist	36	Will work with the Director of SARIF, assisting him and his staff in improving facilities and in training staff to operate them effectively. He or she will help develop the station so that it can serve as a training center for research station management and support services personnel. This individual will then plan and implement a series of workshop and training modules.
	Plant Pathologist	48	Will work with the Director of SARIF, assisting him and his staff on plant disease problems of farming systems in the wet, upland, rainfed agroclimatic areas of Indonesia. Much of his or her research effort will be devoted to working on blast disease of upland rice, the major constraint to increased production of that crop. The pathologist and his or her counterparts will be responsible for developing and maintaining a blast nursery carried out in both the field and greenhouse.
	Agricultural Economist	48	Will work with the Director of SARIF, assisting him and his staff on economic analysis of farming systems in the wet, upland, rainfed agroclimatic areas of Indonesia and on testing new combinations of commodities and practices adapted to these physical and socio-economic conditions. He or she will be expected to interact closely with scientists at SARIF, especially agronomists and economists, with economists at CAER, and with the project supported national commodity research groups.
Maros Food Crops (MORIF) (South Sulawesi)	Station Development Specialist	36	Will work with the Director of MORIF, assisting him and his staff in improving facilities and in training staff to operate them effectively. He or she will help develop the station so that it can serve as a training center for research station management and support services personnel. He or she will then plan and implement a series of workshop and training modules.

**TABLE 15. TECHNICAL ASSISTANCE FOR NEW
PROGRAM INITIATIVE IN SECONDARY CROPS RESEARCH (Continued)**

Institute	Position	Man-Months	Justification
	Production Agronomist	48	Will work with the Director of MORIF, assisting him and his staff on agronomic analysis of farming systems in the dry, upland, rainfed agroclimatic areas of Indonesia and on testing new combinations of commodities and practices adapted to these conditions, including varieties and practices developed at MARIF. He or she will support the national commodity research coordinators in rice, maize and grain legumes in organizing and implementing their respective groups.
	Agricultural Economist	48	Will work with the Director of MORIF, assisting him and his staff on economic analysis of farming systems in the dry, upland, rainfed agroclimatic areas of Indonesia and on testing new combinations of commodities and practices adapted to these physical and socioeconomic conditions. He or she will be expected to interact closely with scientists at MORIF, especially agronomists and economists, with economists at CAER, and with the project supported national commodity research groups.
Malang Food Crops (MARIF) (East Java)	Grain Legumes Breeder (Peanuts)	48	Will work with the Director of MARIF and the national coordinator for grain legume research, assisting in planning and implementing the national grain legumes research group, and in supporting cooperative research of AARD peanut and soybean scientists with reasearchers at Indonesian universities and abroad. He or she will also support breeding activities to obtain varieties tolerant to acidity and resistant to major insects and diseases.
	Grain Legumes Pathologist (Peanuts)	48	Will work with the Director of MARIF and the national coordinator for grain legume research, assisting in planning and implementing the national grain legumes research group. In particular, he or she will support pathology activities, including testing

**TABLE 15. TECHNICAL ASSISTANCE FOR NEW
PROGRAM INITIATIVE IN SECONDARY CROPS RESEARCH (Continued)**

Institute	Position	Man-Months	Justification
Bogor Food Crops (BORIF) (West Java)	Seeds Specialist	24	<p data-bbox="982 332 1875 492">promising lines at SARIF, MORIF and research facilities in other agroclimatic regions with emphasis on developing varieties resistant to bacterial wilt, rust, leaf spot, mottle virus, mosaic virus and mycoplasma.</p> <p data-bbox="982 527 1875 989">Will work with the Director of BORIF, the Seeds Program Director at IPB, and the private sector, assisting them in implementing programs of seed research, establishing linkages between public and private sector research and pertinent international efforts, and in obtaining appropriate and timely short-term collaborative assistance. He or she will also support the national commodity research coordinators in maize and grain legumes in organizing and implementing their respective groups, with particular reference to seeds research. In addition, this specialist will work with each Food Crop Research Institute Director to strengthen seed research and production programs.</p>

Total 576 (48MY)

Rice: IRRI, IITA.

Maize (and sorghum): CIMMYT, ICRISAT, Sorghum/Millet CRSP, and private sector.

Grain legumes: INTISOY, AVRDC, IITA, Peanut CRSP, and NIFTAL.

Economics: IRRI, ICRISAT, and CIMMYT.

Soil Management: IRRI, ICRISAT, IITA, TropSoils CRSP, IBSNAT, SMSS, and IBSRAM.

Biotechnology: IRRI and U.S. universities.

Seeds: Mississippi State University and private sector.

Harvest/post-harvest: Kansas State University.

c. Training. Training opportunities of three types will be provided.

First, funds will be provided for twenty AARD staff, approximately four per year, to attend IARCs, IARC workshops, and regional seminars on subjects related to the commodities and research topics being supported under this project.

Second, degree-level training will be provided for fifteen AARD staff. Although a large number of scientists have and will continue to be trained under AID and World Bank projects, shortages are still projected. In order to address these imbalances, Masters degree opportunities in technical fields will be provided to Maros, Sukarami, Malang and the Center for Soils Research to support the commodity research programs undertaken by this project. Based on the manpower development plans (Tables 12, 13, and 14), degrees in the following scientific disciplines will be funded:

- Sukarami - Breeding, Physiology, Pathology, Entomology, Microbiology, Agricultural Economics.
- Maros - Breeding, Physiology, Pathology, Food Technology, Agricultural Economics, Weed Science, Applied Statistics/Computer, Agro Meteorology.
- Malang - Breeding, Physiology, Pathology, Entomology, Food Technology, Agricultural Economics, Tissue Culture, Statistics.
- Center for Soil Research - Soil Fertility, Soil Physics, Soil Microbiology.

A portion of these participants will return immediately to join AARD after completing their training. The best M.Sc. graduates and those in critical fields, such as agricultural economics, physiology and entomology, will continue for Ph.D. training under IBRD funding (which covers spouses and other dependents and therefore is more attractive for the longer period required for a Ph.D. than AID funding). The AID funds also will be used to fund an additional year of post-graduate training in specialized areas, such as biotechnology.

Candidate selection will be biased toward those institutes and programs directly involved in activities supported under this amendment.

Third, senior scientists will be encouraged to undertake short "sabbatical" training at international centers and other prominent research institutions in the U.S. or neighboring countries.

IV. Financial Analysis

A. General Comments

The Applied Agricultural Research Project (AARP) will have a twelve-year duration continuing to September 30, 1992. The total cost will be \$55,800,000, of which \$18,900,000 will be an AID loan and \$14,100,000 an AID grant. \$22,800,000 of the total project costs will be contributed by the GOI.

Table 16 presents the total project budget broken down by the current project activities and new project components. Table 17 presents the new project components by Indonesian fiscal year. Table 18 reflects the USAID obligation schedule by fiscal year.

The GOI contribution of \$22.8 million represents 41% of the total project costs. This is entirely a cash outlay and includes no in-kind contribution. The large GOI financial commitment attests to the priority the project has been given by the Ministry of Agriculture and the GOI.

B. Specific Issues

1. Use of PL480 Proceeds. Footnote 1 on Table 16 indicates that about \$5 million from 1985 PL480 proceeds have been factored into the GOI contribution for current project activities. As of this writing, these funds have not been provided to the project as per the PL480 Loan Agreement.

The AARP requires this money for construction of the Lili Animal Husbandry and Mariri Food Crops Stations and to complete construction at the Bobonaro Food Crops, Bogor Food Crops, Selakau/Simpang Montrado Industrial Crops, Banjarbaru Food Crops, Banjarbaru Animal Disease, Lempake Food Crops, Unit Tatas Food Crops, Jeneponto Horticulture, Kalasey Food Crops, and Makariki Food Crops and Industrial Crops research facilities. These funds are also required for crucial station development work at Selakau/Simpang Montrado, Banjarbaru, Lempake, Unit Tatas, Maros Lanrang, Bontobili, Jeneponto, Makariki and Bobonaro. PL480 proceeds will also be used to procure required office furniture and data processing equipment for ten research facilities being constructed under AARP.

2. Support to Operational Research. USAID support for operational research in three strategic commodities marks a departure from our past investments, which were oriented toward physical and

TABLE 16. APPLIED AGRICULTURAL RESEARCH PROJECT
REVISED FINANCIAL PLAN
(\$'000)

		Grant FX	FX	Loan LC	Total	AID Total	GOI	All Costs
<u>I. Current Project Activities</u>	Technical Assistance	6500	-	-	-	6500	1800	8300
	Collaborative Research	350	-	-	-	350	-	350
	Construction	-	-	3063	3063	3063	9290	12353
	Commodities	-	5202	1000	6202	6202	1693	7895
	Vehicles	-	-	1017	1017	1017	81	1098
	Training	-	1881	429	2310	2310	141	2451
	Farm Development	-	-	-	-	-	3115	3115
	Administrative Support	-	-	-	-	-	1016	1016
	Sub Total	<u>\$6850</u>	<u>7083</u>	<u>5509</u>	<u>12592</u>	<u>19442</u>	<u>17136</u> ^{1/}	<u>36578</u>
<u>Ii. New Project Activities</u>	Technical Assistance	6970	-	615	615	7585	1664	9249
	Commodities	-	-	100	100	100	-	100
	Vehicles	-	-	150	150	150	-	150
	Training	280	1430	590	2020	2300	-	2300
	Commodity Research	-	-	1300	1300	1300 ^{2/}	2500 ^{3/}	3800
	Special Studies	-	-	500	500	500	500	1000
	Administrative Support	-	-	-	-	-	1000	1000
	Contingency/Inflation	-	500	1123	1623	1623	-	1623
	Sub Total	<u>7250</u>	<u>1930</u>	<u>4378</u>	<u>6308</u>	<u>13558</u>	<u>5664</u>	<u>19222</u>
	TOTAL	14100	9013	9887	18900	33000	22800	55800

^{1/} Includes an anticipated GOI contribution of \$5,000,000 from PL480 proceeds which will be used primarily to complete construction and farm development.

^{2/} Includes \$300,000 for the Directorate General Higher Education (DGHE)

^{3/} Includes \$300,000 DGHE contribution.

**TABLE 17. APPLIED AGRICULTURAL RESEARCH PROJECT BUDGET
BY INDONESIAN FISCAL YEAR
(\$'000)**

New Project Activities

<u>Element</u>	<u>'85/'86</u>		<u>'86/'87</u>			<u>'87/'88</u>			<u>'88/'89</u>			<u>'89/'90</u>			<u>'90/'91</u>			<u>'91/'92</u>			<u>Total</u>			
	<u>USAID</u>	<u>GOI</u>	<u>USAID</u>	<u>GOI</u>	<u>GOI</u>	<u>USAID</u>	<u>GOI</u>	<u>GOI</u>	<u>USAID</u>	<u>GOI</u>	<u>GOI</u>	<u>USAID</u>	<u>GOI</u>	<u>GOI</u>	<u>USAID</u>	<u>GOI</u>	<u>GOI</u>	<u>USAID</u>	<u>GOI</u>	<u>GOI</u>	<u>USAID</u>	<u>GOI</u>		
	<u>G</u>	<u>L</u>	<u>G</u>	<u>L</u>	<u>G</u>	<u>G</u>	<u>L</u>	<u>G</u>	<u>L</u>	<u>G</u>	<u>L</u>													
Technical Assistance	350	-	40	1280	75	250	1280	150	350	1280	150	350	1280	125	300	1200	90	300	300	25	74	6970	615	1664
Commodities	-	25	-	-	75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100	-
Vehicles	-	25	-	-	125	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	150	-
Training	15	75	-	50	350	-	50	350	-	50	350	-	50	350	-	50	350	-	15	195	-	280	2020	-
Commodity Research	-	-	-	-	150	50	-	250	225	-	375	400	-	250	450	-	175	650	-	100	725	-	1300	2500
Special Studies	-	-	-	-	100	-	-	175	25	-	125	75	-	100	100	-	0	150	-	0	150	-	500	500
Administrative Support	-	-	50	-	-	175	-	-	175	-	-	175	-	-	175	-	-	175	-	-	175	-	-	1000
Contingency/Inflation	-	-	-	-	175	-	-	250	-	-	350	-	-	375	-	-	400	-	-	73	-	-	1623	-
Total	\$365	125	90	1330	1050	475	1330	1175	775	1330	1350	1000	1330	1200	1025	1250	1015	1275	315	393	1024	7250	6308	5664

TABLE 18. APPLIED AGRICULTURAL RESEARCH PROJECT
USAID OBLIGATION SCHEDULE BY FISCAL YEAR
(\$000)

<u>US Fiscal Year</u>	<u>Required</u>		<u>Available</u>		<u>New Obligation</u>	
	<u>G</u>	<u>L</u>	<u>G</u>	<u>L</u>	<u>G</u>	<u>L</u>
1980-85	4450	6650	7000	18900	-	-
1986	2035	4611	2550	12250	-	-
1987	1330	1050	515	7639	815	-
1988	1330	1175	-	6589	1330	-
1989	1330	1350	-	5414	1330	-
1990	1330	1200	-	4064	1330	-
1991	1250	1015	-	2864	1250	-
1992	<u>1045</u>	<u>1849</u>	<u>-</u>	<u>1849</u>	<u>1045</u>	<u>-</u>
	14100	18900	7000	18900	7100	-

human infrastructure development. The rationale for such funding is presented in Section III.

The project will provide \$3.8 million (\$1.3 million in AID loan funds and \$2.5 million from GOI sources) over six years to support field and laboratory research costs, such as fertilizer and pesticide inputs, scientist transportation and per diem, field labor and crop processing costs.

This level of support is derived from discussions with AARD officials, an analysis of manpower and budget levels for palawija research and review of the ISNAR's palawija study published in August 1984. It is also based on preliminary targets for support to secondary crops research by the end of the amended project.

Table 19 presents the 1984/85 budget of the Research Coordinating Center for Food Crops. Operational support for research is channelled through the development budget. Over the past five years (1980-1985), annual support for operational research has averaged 38% of the development budget (See Table 11). Assuming this percentage, about Rp. 1.36 billion (out of Rp. 3.577 billion, as shown in Table 19 below) of AARD's development budget was committed in 1984/85 to food crop research. In August 1984, ISNAR estimated that 42 percent or Rp. 571 million of the Rp.1.36 billion supported the activities of 43 palawija scientists, approximately \$13,000 per scientist.

TABLE 19 : SUMMARY OF RESEARCH COORDINATING CENTER FOR FOOD CROPS (RCCFC) BUDGET 1984/85

<u>Unit</u>	<u>Million Rp.</u>			
	<u>Routine</u>	<u>Development</u>	<u>Foreign</u>	<u>Total</u>
Coordinating Center	279	250	-	529
BORIF	743	650	582	1975
MARIF	355	306	446	1107
SURIF	209	660	-	869
SARIF	111	857	2063	3031
MORIF	262	575	-	837
BARIF	108	279	-	387
	<hr/>	<hr/>	<hr/>	<hr/>
TOTAL	2067	3577	3091	8735
in US \$	\$2.0 m	\$3.5 m	\$3.0 m	\$8.5 m

Compared to other researchers within AARD and worldwide, scientists working in AARD's palawija research program are underfunded. For example, average research support for AARD scientists in all research programs is \$20,000 (ISNAR's estimate). However, as noted above, those in palawija research receive approximately \$13,000 each year. In addition, these

levels are well below those provided to scientists in other countries within and outside the region. The Asian average is \$39,000 per scientist, while Africa, Latin America, and North America/Oceanic countries provide \$53,000, \$54,000 and \$127,000, respectively, per scientist per year.

The project will provide operating funds for palawija research to enable AARD to place palawija scientists on a par with their AARD colleagues in other research areas. Achieving the \$20,000 per scientist level through GOI budget sources by the end of the project will indicate a significant shift of resources into palawija research, which will accomplish the diversification objective of this amended project.

Further, the project funds will be channeled through commodity groups for use in tightly focused priority research areas. This mechanism should help assure a more efficient use of the funds.

Two important points emerge from this discussion. First, with the rapid expansion of facilities and the return to Indonesia of a large number of trained scientists over the next five years, there is a great danger that funds for research operations will be seriously inadequate. The budget in Table 17 indicates that there is an increasing commitment by the GOI for research support as the USAID contribution decreases over the life of the project.

However, to maintain an adequate level of support to palawija research, the budget contribution from the GOI will have to be even greater than the level shown in the project budget. For example, as the number of palawija scientists increases to about 80 by 1989, regular GOI budget funds will have to double if the minimum expenditure level of \$20,000 per researcher is to be maintained.

Second, it is important that this situation be monitored during the life of the project. Thus, the technical assistance team working in the Secretariat will be asked to look at this issue in more detail and devise a system that can be used to measure and evaluate budget requirements and budget performance over time.

3. Funding Mechanisms. AID's contribution to commodity research will flow through normal GOI funding channels. \$1.0 million will go to AARD and \$.3 million to the Directorate General of Higher Education through an arrangement with AARD. These funds can only be accessed by researchers whose proposals have been approved by the technical committees of the National Coordinated Commodity Groups against the criteria established by each group.

Technical committee recommendations will be forwarded to AARD or DGHE for funding through established channels. Through the Project Implementation Letter (PIL) mechanism, AID will either advance funds for this purpose or GOI will prefinance and then be reimbursed.

AID funds will be allocated annually based on the technical recommendations of the commodity groups and a review of research performance and utilization of funds. Project personnel will also review GOI contributions to the commodity research element and ensure that both AID and GOI funds are flowing to researchers in a timely fashion.

V. Implementation Plan

This section describes the plans to implement an extension of existing activities under the AARP, the contracting procedures for new project components and an implementation schedule for the first 18 months of the project.

A. Follow-on Activities

1. Technical Assistance. To assure that the project's original objectives are met, an additional 102 person months of technical assistance services will be provided under an 18-month extension of the existing contract with Resources Management International (RMI). This extension, beyond the current PACD of 9/30/85 to 3/31/87, will enable the current team to oversee completion of construction, farm development, training and other activities of the original project and will serve as a bridging mechanism to continue the development of research facilities and staff which will be supported under the new project components.

The list of consultants and a justification for the extension and duration of services for each individual is presented in Annex C. There are sufficient funds now in the contract to provide the additional level of person months required to complete the project activities by March 1987.

In preparing this amendment, a comprehensive analysis of the current technical assistance team was conducted in February and March 1985 in collaboration with AARD management. The work of each AARP consultant was reviewed against the objectives of the project and the research program of each institute or substation. Based on this assessment of work performance and project requirements, a determination was made as to which consultants would be extended beyond the PACD date. In addition, detailed work plans setting forth annual performance targets have been prepared for each consultant. These work plans will provide the basis for the RMI contract extension and will be reviewed annually by USAID and AARD.

As pointed out in the December 1983 evaluation, there have been a number of problems related to the RMI contract--delays in recruitment, absence of annual work plans, inadequacies in required progress reports and lack of administrative support from RMI headquarters in Jakarta. However, over the past eighteen months, these problems have been largely overcome, an excellent team is now in place, and there is sufficient evidence that RMI will perform satisfactorily in completing project activities under the contract extension.

2. Commodity Procurement. Following approval of this amendment the procurement agreement with Connell Brothers will be extended to March 31, 1987, to assure that field, laboratory and seed handling equipment, electrical generators, data processing materials and other equipment have arrived and are in place. Procedures have been established to prepare and review the commodity lists before an order is submitted. For example, there is a technical review of specifications by RMI consultants involved in station development. After this review, AID project management will examine the request; if it is acceptable, they will issue a Project Implementation Letter giving written concurrence and authorization for procurement.
3. Training. Approximately 370 of the planned 560 person months of training will be completed by the time the current PACD of 9/30/85 is reached. The additional 190 person months of short-term overseas training, as well as some short-term, in-country technical and management courses, will be supported in order to complete the training objectives of the original AARP. Annex C summarizes the fields of study, number of participants and locations of training programs to be provided. All overseas training will be included under the RMI contract extension, while in-country courses will be coordinated by the project with the help of both long- and short-term technical assistance.

B. New Project Components

1. Technical Assistance. The scope of activities described in the amended project paper requires 576 and 42 person months of new long- and short-term technical assistance, respectively. Two contracting modes will be utilized. Two of the consultants will provide the following person-months of training services:

- Research Administration Specialist for the Secretariat	60 p.m.
- Research Program Analyst for the Secretariat	36 p.m.
Sub-total	96 p.m.
- Short-term consultants	12 p.m.
Total	108 p.m.

Thus, a total of 96 person months of long-term services (see draft scopes of work in Annex D) will be provided under host country contract with the International Service for National Agricultural Research (ISNAR) located at the Hague, Netherlands. ISNAR is a member of the Consultative Group for International Agriculture Research and has the world-wide mandate to support development of national agricultural research systems. ISNAR has predominant capability in providing the expertise listed above and is the GOI contractor of choice for the administration, planning and management aspects of the project. A waiver request has been prepared and is included in the authorization package.

A second host country contract will be competitively bid to provide the scientific and technical team, which is comprised of:

- Technical Team Coordinator/Training Specialist for the Secretariat	60 p.m.
- Administration Specialist for the Secretariat	36 p.m.
- Station Development Specialist for Maros	36 p.m.
- Station Development Specialist for Sukararni	36 p.m.
- Plant Pathologist for Sukararni	48 p.m.
- Agricultural Economist for Sukararni	48 p.m.
- Production Agronomist for Maros	48 p.m.
- Agricultural Economist for Maros	48 p.m.
- Grain Legume Breeder for Malang	48 p.m.
- Grain Legume Pathologist for Malang	48 p.m.
- Seed Specialist for Bogor	24 p.m.
Sub-Total	480 p.m.
- Short-term	30 p.m.
Total	510 p.m.

Draft scopes of work for each of these positions are presented in Annex D.

- Equipment and Vehicle Procurement. \$100,000 is being provided for procuring equipment under the new project elements; this will be handled by the GOI project leader in accordance with local competitive procedures and AID regulations. The funds will be used to purchase computers and miscellaneous equipment for use in local training programs. In addition, vehicles will be procured for each of the long-term specialists.
- Training. In-country and overseas training is summarized in Annex E. All training will be coordinated through the Secretariat with the assistance of the Technical Team Coordinator/Training Specialist. In-country programs will be implemented by both long- and short-term technical assistants and in-house local and expatriate expertise. Training abroad will be at appropriate IARCs and U.S. and regional public and private institutions. All training would be funded under the ISNAR contract.
- Commodity Groups. The sequence by which the National Coordinated Commodity Groups are to be made operational will be as follows. First, the Head of AARD will formally designate the three commodity group coordinators. Then, in consultation with these coordinators and other relevant persons, such as the Director General of Higher Education and the Director General of Food Crops, he will appoint the three technical committees. The commodity group coordinators will then inventory research by all parties throughout the country that might be relevant to the commodity and initiate technical committee meetings to identify criteria by which future research support would be allocated.

The first annual workshop for each commodity group will be convened in December 1985. At this workshop, ongoing research will be reviewed, research objectives identified, procedures for future project proposals discussed and budget levels determined. During the subsequent year, the coordinator would attempt to visit all researchers in the field. The technical committees

will review research proposals and make recommendations to AARD and DGHE, respectively, after which AARP and DGHE would fund the recommended projects.

At the second annual workshop, and thereafter, ongoing research would be reviewed, future research planned, and the GOI's performance in meeting budget commitments assessed.

More specific details for this mechanism will be outlined in a Project Implementation Letter (PIL) following approval of this amendment.

C. Implementation Methods, Financing and Schedule for the First 18 Months

Methods of Implementation and Financing
(new activities)

Method of Implementation	Method of Financing	Approximate Amount	
		Grant	Loan
		(U.S. 000)	
Technical Assistance-HCC	Direct Payment to Suppliers	6,970	615
Commodities-GOI-PILs	Direct Reimbursement to GOI		100
Training-HCC	Direct Payment to Suppliers	280	2,020
Vehicles-PIO/C's	Direct Payment to Suppliers		150
Commodity Research-GOI-PILs	Direct Reimbursement to GOI		1,300
Special Studies-GOI-PILs	Direct Reimbursement to GOI		500
Contingency/Inflation	Direct Payment/Reimbursement to GOI		1,623
T O T A L		<u>7,250</u>	<u>6,308</u>

The amount to be prefinanced by the GOI through the DUP/DIP process has not yet been determined. AID contributions will be made available through regular GOI channels, and will be disbursed in accordance with annual project plans following AID standard procedures.

Technical assistance, long and short term, as well as in-country and overseas training, will be implemented by long and short-term consultants funded under Host Country Contracts. Terms of the contracts will be reviewed, approved and committed by Project Implementation Letters, and direct payment to suppliers will be made by the USAID. It is anticipated that issuance of Letters of Commitment will not be required.

Computer and training equipment, per diem and travel, and other goods and services procured locally will be approved and committed by PILs and reimbursed directly to the GOI. Advances of funds, based on projected cash needs, will be made to the GOI to allow for

more timely and efficient procurement. /Vehicles for the use of long-term consultants will be procured by AID by means of PIO/Cs, and local suppliers paid directly.

Because of the large amount to be procured through the Host Country contracting mechanism, funds from the contingency line item are available for audit services, following guidelines from AID/IG. Audits will likely be performed by local representatives of US CPA firms selected by AID/W, with assistance from RIG/A/Manila. These services, procured by AID direct contracts, will be paid directly by the USAID. In order to minimize vulnerability, the Mission Controller, as part of its voucher verification program, will conduct periodic examinations of records and review GOI accounting procedures and documentation in support of their direct procurement.

Schedule

- | | | |
|----------------|---|--|
| July 1985 | - | Project amendment grant and loan agreements signed by the GOI. |
| August 1985 | - | RMI contract extension signed. |
| August 1985 | - | Connell Brothers procurement contract amendment signed. |
| September 1985 | - | Package for technical assistance services from ISNAR completed. |
| September 1985 | - | Package for competitively bid contract services completed. |
| November 1985 | - | RFP for competitive contract announced in CBD. |
| December 1985 | - | First annual workshop for commodity groups. |
| January 1986 | - | Proposals received for competitive contracts. |
| March 1986 | - | Selection of ISNAR consultants and contract firm completed. |
| March 1986 | - | First order of commodities arrives. |
| June 1986 | - | Second order of commodities arrives. |
| July 1986 | - | ISNAR consultants in place. |
| September 1986 | - | Scope of work drafted for comprehensive evaluation of original project activities. |
| October 1986 | - | First annual review of GOI budget contribution for operational support. |

- November 1985 - Entire technical assistance team in place.
- November 1986 - Comprehensive evaluation of original project activities undertaken.
- December 1986 - Third order of commodities arrives.
- December 1986 - Scope of work drafted for impact evaluation of agricultural research in Indonesia.
- March 1987 - Current project activities completed.

D. Indicative Benchmarks of Project Performance

Following are the types of indicative benchmarks to be used for measuring the project's performance.

By the end of 1986

1. Secretariat

- ISNAR team in place.
- Individual work plans prepared.
- Plans completed for review of the Secretariat's administrative processes and constraints.
- Commodity coordinators appointed.
- Technical committees appointed by AARD (and DGHE) and meeting to review national priorities and work that is underway.
- Coordinators have office and travel budgets adequate to allow them to function, meet with researchers in the field, and provide leadership to technical committees.
- First annual commodity workshops held, during which national research objectives are established and recommendations made for continuing or making changes in the current programs.

2. Research Institutes

- Construction of facilities at Sukarami and Maros completed.
- Farm development finished at Maros.
- Plans drafted for utilization of Sukarami and Maros as sites for management training.

By the end of 1988

1. Secretariat

- Second annual commodity workshops held and reports issued.
- National commodity research objectives reviewed and revised as needed.
- Future commodity research planned, based on priorities and intended objectives.
- Mechanism devised for monitoring GOI budget performance in supporting agricultural research.
- Research support funds increased over previous year and moving to researchers through AARD and DGHE based on commodity coordinator recommendations.

- Review of Secretariat administration completed, and plans developed to streamline operations.

2. Research Institutes

- Sukarami and Maros stations serving as sites for management workshops and training.
- Research relevant to national priorities underway at Maros, Sukarami and Malang, based on recommendations from commodity groups.
- Procedures developed for estimating the economic returns to secondary food crop technologies disseminating from research at Maros, Sukarami and Malang.

By the end of 1990

1. Secretariat

- Coordinated commodity groups in three commodity areas operating smoothly.
- Additional commodity areas being organized and coordinated through commodity groups.
- Identifiable changes in administrative procedures are being introduced in the Secretariat.
- GOI contribution to research costs increased over previous two years.
- Research programs and budgets are being reviewed and approved against priorities established by commodity groups.

2. Research Institutes

- Improvements made in operation and maintenance of station and support services at Maros and Sukarami.
- Secondary crops research being done in compliance with priorities identified by commodity groups, and relevant AARD and university researchers fully involved in the process.
- Research management training programs institutionalized at Maros and Sukarami, and management training offered to AARD personnel throughout the system.

By the end of the project--1992

1. Secretariat

- GOI support to agricultural research adequate and regular.
- The Secretariat effectively administering, planning and evaluating the national research program.
- Commodity groups meeting annually to review commodity research against national priorities and making changes based on evolving circumstances, performance and current and projected research needs.

2. Research Institutes

- Research results clearly contributing to increased productivity, production and farmer incomes in upland rice, maize and grain legumes, especially in wet rainfed and dry rainfed areas.

- Management of Sukarami and Maros facilities, including fields, laboratories and machinery, improved to optimize conditions for research.

During the first year following the arrival of the ISNAR team, specific benchmarks for the Secretariat and each institute, as well as for commodity groups and project outputs, will be developed and used in annual reviews of project performance.

VI. Evaluation and Monitoring Plan

Evaluations in this project will be of three major types: original AARP outputs, the National Research Program and new activities under the project amendment.

A. Comprehensive Evaluation of Original AARP Outputs

Prior to December 1986, as construction and commodity procurement and the work of technical assistance consultants come to a close under the original AARP project, a comprehensive evaluation will review the status of activities and the contribution of technical assistance and training in meeting the project's original objectives. The evaluation will assess AARD's utilization of the infrastructure developed and manpower trained under AARP. This evaluation will be carried out by one or two outside consultants with the assistance of Mission staff.

B. Evaluation of the National Research Program

As part of the new activities proposed in the amendment, two types of program evaluations will be undertaken.

1. The research program analyst assigned to the Secretariat will help coordinate an annual review of the Agency's food crops research programs in terms of their effectiveness and relationship to overall AARD research priorities. Included will be such issues as whether or not current national food crop commodity mandates are addressing the needs of the country, and whether or not the budget allocations are sufficient, particularly in the area of food crops. How well international research institutes, Indonesian universities and the private sector are conducting and disseminating agricultural research will also be assessed. Recommendations will be made regarding changes in the national agenda and the resources required to carry out the research program. To assist with this annual review, the project will provide special studies funds for travel and per diem of an eminent agricultural research specialist to visit Indonesia and assist the government in analyzing the direction and performance of the research program.
2. An impact evaluation of the past 10-15 years of agricultural research in Indonesia will be undertaken in mid-1987. This evaluation will attempt to measure the role of agricultural research in increasing food crop production in Indonesia. It also will seek to determine to what degree there have been

changes in income, nutrition and employment among the nation's farmers as result of investments in agricultural research. This evaluation will identify major trends occurring in the agricultural sector with regard to supply and demand of food crops and suggest future directions for agriculture research investments in the the country, particularly AID's role beyond 1990. Outside assistance will be required for this evaluation which will be funded under the Special Studies project element.

C. Monitoring Specific New Activities under the Amendment

The agricultural economists assigned to Maros and Sukarni will have the responsibility of helping the Institute staff evaluate the economic viability, production costs and benefits of technologies developed by research. Adoption rates and income changes also will be part of this monitoring.

In addition, the special studies and collaborative research done by universities and AARD will be reviewed each year by commodity groups, in terms of their relevance to local problems and regional research priorities. The quality of the work will be assessed and the status of various research proposals reviewed as a basis for planning the studies and activities in the following year. The criteria for selecting special studies and collaborative research activities, as well as the method of annual review, will be outlined in a project implementation letter.

In addition to these two specific monitoring aspects, a comprehensive evaluation of the amended project will take place about every two years, with the first assessment to be completed by December 1986, in conjunction with the evaluation of outputs under the original project. Indicative major benchmarks of project performance are presented in Section D of the implementation plan (Section V).

VII. Covenants

The GOI agrees to:

1. Provide PL 480 proceeds in the amount of \$5 million to AARD in order to complete construction and farm development work.
2. Provide adequate funds for maintenance and repair of research facilities, equipment and farms.
3. Establish Commodity Coordinating Groups for maize, grain legumes and rice and name members from AARD and DGHE.



REPUBLIC OF INDONESIA
NATIONAL DEVELOPMENT PLANNING AGENCY
JAKARTA, INDONESIA

No. : 2267 /D.I/8/1985

Jakarta, August 8 ,1985

Mr. William P. Fuller
Director
USAID Mission
c/o American Embassy
Jakarta

Dear Mr. Fuller,

On behalf of the Government of Indonesia, we herewith request an additional grant of 7.1 million United States Dollars (US\$ 7.1 million) under the ongoing Applied Agricultural Research Project (AARP) and an extension for 7 years of the Project Assistance Completion Date to allow for the following activities :

- A. To achieve the original purposes of the AARP - to expand and improve agricultural research capability by strengthening the institutional network of the Agency for Agricultural Research and Development (AARD) and its capacity to develop technologies to increase both agricultural production and farmers' incomes through completion of the construction, commodity procurement, training and technical assistance project components;
- B. To improve research performance through a strengthening of AARD's planning, administrative and management functions;
- C. To increase the output of sound, applied technologies for increasing and diversifying the production of key secondary crops through the strengthening of national commodity groups and the linkages among the Agency for Agricultural Research and Development, the Directorates General, universities and the private sector.

These additional grant funds would increase the project amount to \$ 14.1 million grant and \$ 18.9 million loan over the 12 year life of the project. The Government of Indonesia will provide an additional Rupiah equivalent of \$ 5.455 million in cash or a total contribution of Rupiah equivalent of \$ 22.8 million in cash in support of this project.

The project will be implemented by the Ministry of Agriculture.

We look forward to your favourable consideration.

Sincerely yours,



[Handwritten signature]

Moch. Sudin Siregar
Deputy Chairman

Cc. : Sec.Gen. Ministry of
Agriculture