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AGRICULTURAL RESEARCH IN INDONESIA

A Report to  
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## AGRICULTURAL RESEARCH PRODUCTIVITY IN INDONESIA

### INTRODUCTION

This report has two purposes. An immediate objective is to present our impressions of some of the challenges that face the Indonesian agricultural research system as it continues to develop. These impressions are based on discussions held in Bogor and at several field locations during the period August 25 - September 9. Most of our time was spent with the Central Research Institute for Field Crops, both in Bogor and at several other locations. Considerably less attention was devoted to the programs of the Central Research Institute for Estate Crops and with the affiliated estate crop institutes.

A longer term objective is to outline the framework for possible collaboration between the AARD and the University of Minnesota in a series of studies on the impact of the Indonesian agricultural research system on agricultural production and on the distribution of the benefits from research.

Our observations and suggestions are presented under four headings:

1. Research Capacity
2. Research Management
3. Questions About Agricultural Research
4. Research Productivity Analysis

## RESEARCH CAPACITY

The observed strengths and weaknesses of the research capacity of AARD are presented under the following categories:

- The manpower available to plan and conduct research.
- The facilities, equipment and budget available to support research.
- The objectives, goals and priorities set for research.
- The quality and quantity of research conducted.
- › The utilization of research information.

### Manpower

The survey team and the staff of AARD readily recognize that availability of trained staff is the most serious problem limiting future research productivity. Among the current AARD staff there are some very capable researchers and a few able research administrators. But the ranks are very thin. There are typically only one or two Ph.D. level staff in any one subject matter or discipline area. This thin corps of highly trained personnel at any given research institute or station will continue to be thin beyond the next five years due to the number of new research facilities being built or being planned.

The staff at most of the locations visited appear very dedicated to their work and to the task of solving the problems facing Indonesian agriculture. The staff at Sukimundi and Maros had an especially acute sense of "research priorities" and are strongly motivated to get the job done. With the development of a highly trained senior staff it is important to continue the upgrading of the junior staff and technicians to provide strong support in field and laboratory research and to permit moving more responsibility to lower levels. Total staff development is

important in maintaining and improving the spirit and morale of the staff. One method that would help accomplish this goal is to make greater use of the expatriate technical experts as trainers of the junior staff and technicians.

The staffing in rice research appears to have reached a critical mass where there are enough technically competent people to begin generating research excitement and enthusiasm. This is encouraging new Ph.D.'s and M.S. graduates to want to work on rice and to be part of the program at Sukimundi. In contrast there are relatively few technically trained people in the palawija crops and cropping systems. The comment was made that it was difficult to attract new people into these areas. There is also a lack of trained people for the estate crops and difficulty in hiring new staff although salaries offered are much higher than the food crop institutes offer.

In the development of a strong research staff, efforts should be made to keep the most productive researchers in research and not make administrators out of staff who have no aptitude for administration. The effective administrator should also seek methods to insure that researchers develop and maintain an inquiring attitude, a willingness to challenge, and the ability to be analytical and unbiased in their research. With the complexity of production problems cooperative research should be emphasized.

#### Facilities, Equipment and Budget

A strong research program must be built around well trained and highly motivated personnel. The support good personnel receive in facilities, equipment and operating budget can markedly influence research productivity. The physical facilities at Lembang, Sukamandi and Maros are,

or will be upon completion, outstanding. With the exception of Bogor, there seems to be sufficient land area available at each location to meet research needs. In general, the laboratories at the sites visited were not fully equipped. A common complaint was the lengthy delays in service, repair and/or replacement of older equipment or the unduly long delays in delivery of authorized equipment items. All of these problems seriously reduce research productivity and researcher morale. Research productivity at the institute and stations can be facilitated by developing good research station management, i.e. research farm managers who can deal with the day to day problems of operations such as land preparation, weeding and general pest control. There may also be some benefit in utilizing more equipment designed to improve the uniformity of data obtained and to evaluate alternative ways of increasing researcher productivity. The research stations at Sukamardi and Maros appear to have adequate irrigation, while the irrigation at Lembang is inadequate. In addition to the established stations, careful consideration should be given to test sites which adequately represent the diverse agroecological regions. This can also be a useful educational and public relations tool.

All of the sites visited indicated they had adequate operating funds. There were problems in budgeting and allocation of funds to areas where needs were greater than anticipated. Accounting procedures restrict the reallocation of funds once the budget is approved.

#### Research Planning and Objectives

The staff of AARD are to be complimented for the detailed list of objectives they have developed which, in the case of the food crops, properly place emphasis upon increased food production and improving

farmer income. The staff of AARD appear to have identified major production constraints and have set research priorities by crops and for problems within a crop. It was not evident to the team members how the research priorities were arrived at and whether all members of a research team participate in the decision making. It is important that all research team members are fully informed of the goals, objectives and research priorities so they see their role in the research activity. To facilitate the diffusion of responsibility, detailed project work plans need to be developed stating who will do what, when, where and how. There should also be some criteria for evaluating the success of the research and how the information will be utilized. We did not see detailed research plans. At the Institute at Medan (BPPM), we did see a list of project titles with brief descriptions and the project leader identification.

In planning research there appears to be a tendency to conduct a large number of small experiments because of the manner of research funding rather than planning fewer but more thorough studies which would result in publishable data or in new technology.

#### Quality and Quantity of Research

The quality of research is directly related to the quality of the staff. The quantity of research is a reflection of the training, the management skill, the motivation and the resources at the disposal of the researchers. It was obvious to the team members that the rice research program is acquiring technical strength and is developing into a quality program, especially in the breeding and pest management programs. This is documented by the release of superior varieties and the development of a very successful brown plant hopper monitoring system. A second area of

research strength appears to be emerging in the cropping systems group. These areas of strength are offset by the relatively small trained staff in palawija crops. There is less technical support from international centers and other national tropical research programs for these crops than is available for rice and cropping systems. Complicating the research on palawija crops is frequently the lack of seed for the different crops or varieties of a given crop. Strong interest in more seed production and seed storage research was expressed and is viewed as a valid research need. Lack of access to international technical publications and limited English reading ability act as a constraint on research quality.

#### Utilization of Research

Our discussions have indicated that an effective mechanism has been developed for transferring research information to rice farmers through the BIMAS/IMAS programs. The current practice of conducting trials on farmer fields also provide farmers and extension personnel access to new technology and should be expanded.

The lack of formal linkages with extension at the provincial and lower levels for the palawija crops, vegetable crops, cropping systems, and rubber, presents a difficulty in technology transfer for these programs. The apparent lack of extension personnel trained in palawija, vegetable and cropping systems limits the potential benefits of technology.

Effort should be made to strengthen the cooperation and interaction between AARD and the Agricultural Universities. This is necessary to facilitate sharing of information and to permit AARD to utilize the professional competency of the university staff as well as permitting the universities access to the expertise within AARD.

## MANAGEMENT OF THE RESEARCH SYSTEM

A study of the returns to research investment should include evaluation of the management of the research establishment and its component parts. In our survey, management appears to be a major constraint on research productivity.

Research institutions need skilled managers at least as much as they need qualified scientists. In addition, research has special problems in that it deals with ideas and the stimulation of innovation by the best minds with long and expensive training. Leadership of this elite group adds a dimension to the usual management problems of the efficient use of men, money and materials. Agricultural research must produce new materials, new methods and techniques and new integrated systems with potential for practical application and profitable adoption by farmers.

For convenience, research management is discussed in three phases of planning, implementation and reporting.

### Planning

Good research is carefully planned well in advance of implementation. Planning meetings are held in most AARD Institutes, but few of the stations we visited appeared to be doing an adequate job. Some research stations have regular meetings with the staff to discuss administrative problems and current results or financial developments. Many administrators appear to be reluctant to share available information fully with the staff. The result is often a "closed" style of administration with financial and staffing information receiving very limited distribution. Information on broad research goals and opportunities often is poorly communicated.

More productive research groups will result from finding ways to "open" the system so that information available to the Director is fully shared with staff even at mid and lower levels. Staff productivity, interest and inspiration is generated by their being included in planning and projecting research activities and in formulating budget requests.

The team observed a good example of staff participation in program development and review at the Maros station in Sulawesi.

### Implementation

Research output is varied and complex but can be studied to reveal reasons for low or high productivity. The implementation of well-planned research is the crux of the problem of research management. A good system will assist the swift regular flow of needed people, funds and materials to their assigned (or chosen) tasks. The Indonesian system encounters great difficulty in this area. The management of time is a key problem.

Scientists' salaries are low by nearly any standard. Many staff members must rely on multiple sources of income or employment, some of which may be competitive with their research responsibilities. Often too little time remains for the research activity. Scientists' work patterns and the working habits of support staff are said to have improved in recent years, but they are still below standard. The time devoted to research is closely related to their salary levels and much could be gained by raising pay standards to permit full-time employment at research.

We are concerned that promotion system also appears to be weighted in favor of academic rather than technology oriented research. The system should be carefully reviewed to make sure that it transmits appropriate incentives for technology oriented research.

The flow of supplies and equipment to researchers is unacceptably slow and requires more administrative time and skill than are available at some institutions. Long delays result between requests, which are quite within budget limits, and delivery. The solution would appear to require either simplification of the paper work and/or greater administrative staff capacity.

### Reporting

We have observed evidence of a heavy load of administrative and financial reporting within the research system. This burden needs to be made more efficient by shifting the task to lower administrative levels rather than taking a large fraction of the time of a research director.

The financial system requires monthly reporting of expenditures. Many routine signatures are required to keep funds and materials flowing into the work even after full approval. While there appears to be excessive concern about accountability for expenditures, research productivity does not appear to be monitored effectively. Methods should be devised to improve the quality, timeliness and amount of research reporting which would be of greater credit to the system. There is clearly over-reporting and regulation of financial matters and under-reporting of research activity and progress. Ways should be sought to separate fiscal accountability from the technical responsibility of working scientists.

### QUESTIONS ABOUT AGRICULTURAL RESEARCH IN INDONESIA

There are a number of questions that emerged in the process of our discussion with research scientists and administrators of the several research locations that we visited. These include the following:

1. Where will the future sources of production growth in food crops be found? Rice production has apparently doubled in the last 12-15 years. In some areas on Java, substantial numbers of farmers are achieving yields in the 8.0 metric tons per hectare range. In other areas yields in this range are not achievable even under experiment station conditions because of soil or other environmental constraints. Questions are being asked whether yield ceilings are being approached? Questions are also raised as to whether yield ceilings imply income ceilings? One answer that is frequently given to both questions, particularly on Java, is the need for further intensification through the design of crop varieties and cropping systems that can make more intensive use of land and labor.

For the outer islands reference is frequently made to the possibilities of expansion in area cultivated as a source of increase in production. Yet many of the projected increases must occur in rather fragile environments. We are concerned about the destruction of soil resources resulting from the methods used to open up some of the new transmigration areas. Relevant research will be needed on the soil conservation and development practices needed to sustain productivity in these areas.

2. What are the implications of potential rice self-sufficiency for the support of the agricultural research and extension system and related agricultural development activities? In spite of concern about future sources of production growth it is entirely possible, if present rates of growth in production continue, that Indonesia will become self-sufficient in rice production during the next decade. Much of the impetus for the rapid growth in the support for agricultural research and extension and for support of agricultural production, in the form of irrigation

development and fertilizer subsidies, is based on the drive for self-sufficiency in rice production. As self-sufficiency is approached, it may become more difficult to maintain the momentum required to staff and maintain the network of research institutions that are being developed.

3. What are the constraints on expanded production of food crops other than rice (the palawija crops, fruits and vegetables)? It seems quite clear that the lag in the increase in rice prices relative to most other items that enter into the cost of living, during the last decade has had the effect of transferring consumption from the less preferred sources of carbohydrates to rice. This is reflected in a substantial rise in the per capita consumption of rice and significant declines in this per capita consumption of some palawija crops. In some cases changes in relative prices appear to have been more serious than technological constraints in accounting for the stagnation in palawija crop production.

This problem is serious because, for large numbers of farmers on Java, further intensification of crop production, as well as higher incomes, will depend on opportunities for papawija crop and vegetable production. For many farmers on the outer islands, particularly in upland areas, palawija and industrial crops offer the primary possibilities for growth of production and income. Realization of rapid growth rates in palawija and industrial crops probably means that there will have to be a stronger export orientation in agricultural development planning and that the agricultural research system will be called on to generate and sustain technologies that will enable Indonesian maize, coconut and other palawija and industrial crop producers to be competitive in world markets. Failure to make this transition from an import substitution to an export oriented

agricultural development strategy could lead to the stagnation of incomes in rural areas.

4. What is the long range staff development program of the AARD? At present this AARD network of research institutes and stations is being expanded rapidly with very substantial support from both multilateral and bilateral assistance programs. Many of these new facilities will meet the best international standards in terms of physical resources. It will, however, be extremely difficult for staff capacity to develop as rapidly as facilities. Unless they are adequately staffed, questions will be raised about the returns from the very high costs that will be involved in maintaining the facilities. If inadequately staffed and managed they could become a burden on the effectiveness of the research system rather than a source of research productivity. Strong efforts are being made to upgrade the scientific staff at most stations through support for advanced study both in Indonesia and abroad. There is an impression that efforts to upgrade the technical staff and the junior scientific staff that will not qualify for advanced training is lagging. In our judgement, underutilization of the research facilities now being developed will remain a serious problem for at least the next decade.

5. Why is the capacity of expatriate staff located at Bogor and at a number of research centers and stations being inadequately exploited?

In some locations expatriate staff are being effectively utilized. At other locations their capacities are being seriously underutilized. One area in which they might be more effectively utilized is in the training of junior scientific and technical staff.

In spite of the efforts being made to increase the number of staff with advanced training, much of the research on which Indonesia must depend for improvement in its agricultural production capacity must come through the inservice training and skill enhancement of staff members who will receive little additional formal training. Each research institute or station should be engaged in inservice research and production training for its own staff. The expatriate staff could be much more effectively engaged in such activities than at present.

6. What will be the long run future of the Bogor facilities in the AARDS system. Research on most commodities at Bogor appears to be severely constrained by the availability of adequate land to conduct field research. The suggestion has been made that over time the research conducted at Bogor will be concentrated at the basic end of the technology - applied - basic research continuum. There are, however, serious questions as to whether the locational separation of basic research from technology oriented research will be conducive to effective articulation of knowledge generating and technology developing research.

7. How effective are the linkages between AARD and related research and production programs? A substantial percentage of professional capacity in agricultural science in Indonesia is located at Bogor Agricultural University. The headquarters location of a number of AARD research institutes at Bogor should facilitate collaboration between AARD and university scientists. We were unable to obtain a clear perception of the extent to which the AARD has been able to draw on University research capacity. At the provincial level effective collaboration is limited by the professional capacity of both AARD and University staff. We are

concerned that insufficient attention has been given, in AARD research facility decisions, to the potential complementarities between University and AARD research staff and activities.

We were impressed by reports of increasingly effective linkages between the AARD rice research program and the BIMAS/IMAS rice production program. AARD also appears to be making an effective input into solving some of the crop production problems faced by the transmigration program. We did not observe the same degree of effective interaction between research and extension or production programs in other areas. This may simply be a reflection of the greater capacity of the rice research and cropping systems research programs to contribute to production programs.

8. What is the appropriate role of centralization and decentralization in the research system of a large nation such as Indonesia? Studies of research productivity in Japan and the United States suggest that the combination of a centralized national system and a decentralized (prefectural or state) system has contributed to research productivity. The national systems has had the capacity to organize and coordinate major commodity oriented research programs. Those state or prefectural systems have been highly responsive to local and regional priorities.

It is possible that the advantages of a dual national-state system can be achieved through administrative decentralization within the framework of centralized national research system. This will, however, require the evaluation of decentralized planning and coordinating mechanisms to assure that the national system is responsive to regional and provincial priorities. We noted that the Maros station has begun to institutionalize such decentralized planning and coordinating procedures.

### RESEARCH PRODUCTIVITY ANALYSIS AND MONITORING

As a national research system matures and begins to command substantial financial and professional resources, questions about its effectiveness in generating technology that has an impact on agricultural production becomes increasingly important. Any large national research system should have the capacity to monitor the impact of research on production and on the benefits from research. This capacity should go beyond simple intuitive or impressionistic evaluation. It should become an effective input into research planning.

The University of Minnesota Department of Agricultural and Applied Economics has played an important role in the development of methodology for the evaluation of agricultural research productivity and has substantial capacity in the area of research policy analysis. The University of Minnesota is in a position, through an AID centrally funded project, to place a junior staff member (research assistant or associate) at an appropriate location within AARD for a period of approximately six months, to initiate a series of research productivity studies. The effort would be most productive, and the benefits to AARD would be greatest, if the AARD could also identify a junior staff member who it would like to assign responsibility for research productivity analysis, to work with the project.

The ability to carry out such analysis will depend on the availability of appropriate data on agricultural production; on the use of agricultural inputs; on the human and material resources devoted to agricultural research and extension, and on other factors contributing to the growth of agricultural production. The project would require cooperation between the AARD and the several agencies responsible for the

generation of statistical data. The project will also undoubtedly require modification in the methodology employed in similar studies that have been conducted in several developed and developing countries.

At this time we suggest that the initial study focus on the contributions of the agricultural research system to the growth of agricultural production at the national and regional levels. A set of productivity accounts will have to be constructed for the agricultural sector as part of the analysis. While the sector level study is proceeding, efforts could also be initiated to analyze this contribution of research to the production of one or two specific commodities. Rice, one crop where research has clearly been effective, is certainly a logical candidate for one of the commodity studies. It is possible that a second study should focus on an estate crop such as rubber.

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Jakarta, January 28 1981

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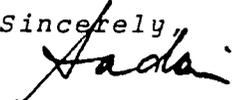
Dear Dr. Ruttan,

I am sorry that I could not meet with you as scheduled on January 16 but was called to an urgent meeting with the Minister of Agriculture. I have had a report of your meeting from Drs. Baharsyah, Manwan and Oyer and am pleased to learn of the thorough discussion of your report.

By this letter, I extend agreement for the forwarding of your report to the officials of USAID. I would reserve the opportunity to comment on the content of the report at a future date but do not wish to delay the completion of your responsibilities further. In general, I believe your report is a bit overly pessimistic in relation to research in estate crops and perhaps too accommodating to research in food crops, particularly at Sukamandi and Maros.

Finally, I would give you a positive signal to proceed with arrangements for the assignment of Mr. David C. Salmon to the AARD's Center for Statistics and Agro-Data Processing. Dr. Subijanto has just been appointed Director of that Center but because you have been in contact with Dr. Syarifuddin Baharsyah about the details of this arrangement, I would suggest that you continue to correspond with him in the development of the terms of reference. It is agreeable for Mr. Salmon to come under the technical assistance arrangement with the USAID planning project.

Again, my apologies for not being able to meet with you. I hope your visit to Indonesia was profitable and that we may see you here again soon.

Sincerely,  
  
 Sadikin S.W.

Director General for  
 Agricultural Research and  
 Development



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February 18, 1981

TO: Thomas M. Arndt  
Director  
Office of Technical Resources  
Bureau for Asia  
Agency for International Development  
Washington, D.C. 20523

FROM: Vernon W. Ruttan  
Professor

RE: Supplement to Progress Report: Asian Agricultural Research  
Review (ASIA-C-1456), February 11, 1981.

The purpose of this memorandum is to transmit to you the report "Agricultural Research Productivity in Indonesia: By Vernon W. Ruttan, James C. Moomaw, and Vernon B. Cardwell."

Director General Sadikin Sumintawirkarta has reviewed the memorandum and approved our forwarding it to the USAID. A copy of the memorandum and Director General Sadikin's letter to me is enclosed with this memorandum. You will note that Director General Sadikin feels that we may have been overly optimistic about the progress of research on food crops and a bit overly pessimistic about our comments on research and estate crops.

I am also including a copy of a letter dated January 29 from Dr. Robert E. Evenson suggesting that in the presentation I made to the AID Asia Bureau Agricultural-Rural Development Conference, "The Asia Bureau Agricultural Research Review" (January 13, 1981), my paper did not give adequate attention to the problem of investment in the training of the next generation of agricultural scientists.

VWR/mjb  
Encl. (3)

cc: Alan Hankins  
Robert Evenson  
Randolph Barker  
Carl Pray  
G. Edward Schuh  
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