Report to the Ministry
of Agriculture and Food,
the Republic of the Philippines

ISNAR R34

REVIEW OF THE RESEARCH SYSTEM OF THE MINISTRY OF AGRICULTURE AND FOOD IN THE PHILIPPINES: AN ISNAR ANALYSIS

ISNAR
International Service for National Agricultural Research

The International Service for National Agricultural Research (ISNAR) began operating at its headquarters in The Hague, Netherlands, on September 1, 1980. It was established by the Consultative Group on International Agricultural Research (CGIAR), on the basis of recommendations from an international task force, for the purpose of assisting governments of developing countries to strengthen their agricultural research. It is a non-profit autonomous agency, international in character, and non-political in management, staffing, and operations.

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December 1988

isnar
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Chapter 1
INTRODUCTION

This chapter refers to the recent review of the research system of the Ministry of Food and Agriculture (MAF) in the Philippines conducted by a national team of scientists. It describes the major recommendations made by the review team and the role of International Service for National Agricultural Research (ISNAR) in undertaking further analysis.

The agricultural research system of the Philippines has been the subject of a number of reviews in the last 15 years. The most important of these reviews was carried out in 1971 by a National Agricultural Research System Survey Technical Panel, and the recommendations it made led to a major reorganization of the research system in the country. The major changes included the establishment of the Philippine Council for Agricultural Research, which later became the Philippine Council for Agriculture and Resources Research and Development (PCARRD), and strengthening of the colleges of agriculture and the universities in providing technological support for the country's agriculture. PCARRD, in the last 10 years, has helped to establish a network of national and regional research centers and has provided a focus and sense of direction to agricultural research in the country.

The technical panel's recommendations also had an important impact on the research service of the MAF, which had the country's largest number of experimental stations. The ministry recently decided to commission a review of its own research organization in the wake of these changes and the earlier decision of the government to decentralize the research function in the Ministry. The review was conducted in August/October 1985 by an interagency team of Filipino scientists and resource persons, under the chairmanship of Mr. Sadikin S.W., who until recently, was the head of the Indonesian Agency for Agricultural Research and Development.

Terms of Reference

The Agricultural Research Review Team (ARRT) was asked to look into the relative role of the MAF research service in the wider national context, its organizational relationships within the ministry, and its cooperative relationships with the other components of the system. The review team was also asked to make recommendations on the ministry's staffing plan and personnel policies, its research programs and projects, institutional issues, and the responsiveness of its research work to actual farming needs and national priorities of development. The team was further asked to recommend manpower development for research and for more effective research-extension linkages. The overall objective of the review was to make the system more efficient in planning and programming areas and in research organization policies.

The detailed terms of reference of the review team are given in Annex 1 of this report.

In its report, the Agricultural Research Review Team made a series of recommendations. Basically, it called for strengthening the ministry's research system by creating a capacity for applied and adaptive research and by improving its scientific manpower base for this purpose. The report also proposed the creation of an Agricultural Research Board with an advisory function and an Agricultural Research Office headed by an assistant secretary to serve as the research secretariat of the ministry. The recommendations of the review team are enclosed as Annex 2 to this report.

ISNAR's Participation

ISNAR's contact with the Agricultural Research Review Team started with the visit of Mr. Sadikin S.W. to The Hague in September 1985, on completion of the first phase of the team's work. Mr. Sadikin S.W. had detailed discussions with the ISNAR staff and director general on the major findings and recommendations the team was proposing to make. ISNAR sent three of its senior staff members -- H.K. Jain, M. Dagg, and D.M. Wood -- to Manila in early October 1985 for two weeks. They had detailed discussions and interacted with the full team as it presented its recommendations to the Minister of Agriculture and Food, Dr. Salvador H. Escudero III. They also joined in the discussion on the team's recommendations as they were presented to senior officials of the ministry, including the Deputy Minister of Agriculture, Dr. O.J. Sacay, the assistant secretaries, the bureau directors, the regional directors, and the staff of the Agricultural Research Office. The ISNAR team had further interviews with a number of senior officials, including some of the bureau directors and the Head of the Agricultural Research Office. Finally, the ISNAR team sought the views of the Executive Secretary of PCARRD and his colleagues and of the Director of Research in the College of Agriculture of the University of the Philippines at Los Baños. One of the ISNAR staff (H.K.J.) took the opportunity to have similar discussions with the Minister of Science and Technology, Dr. Emilio Q. Javier, in the course of his visit to Washington, D.C., for the Centers' Week of the Consultative Group on International Agricultural Research.

The analysis presented in this report by ISNAR is based on these discussions and a detailed study of the review team's report and other material made available by the different agencies in the Philippines. Its roots must be traced, however, to the 1971 report of the National Agricultural Research System Survey Technical Panel, and its context seen in the long-term evolution of the national research system in the Philippines.

In the following chapters, we discuss the reorganization of the agricultural research system in the Philippines in the last 15 years and its impact in relative terms on the research service of the Ministry of Agriculture and Food. The needs of this service in the long-term evolution of the country's research system are considered, both in respect of activities and organization. The development of scientific manpower in the ministry, which is crucial to the future growth of its research service, receives special attention. One of the chapters is devoted to the consideraton of issues relating to the formulation of research programs. This, we hope, will be of wider interest in the context of the new investments in research which are now being made in the country.

Chapter 2
REORGANIZATION OF AGRICULTURAL RESEARCH IN THE PHILIPPINES

This chapter analyses the changes in the National Agricultural Research System of the Philippines since the early 1970s and the roles and responsibilities assigned to the different components of the System. The impact of reorganization on agricultural research and development in the Ministry of Agriculture and Food is examined, especially in the context of the lead role of the colleges of agriculture and universities in the process of technology generation.

Reorganization and Policy Decisions

The Philippines, like many other developing countries in Asia, has made major policy decisions in the last 15 years to reorganize and strengthen its national agricultural research system. This was done in recognition of the fact that the agricultural research services as they had evolved in the country did not have the required strength to respond to the needs of a more modern and productive agriculture. They lacked the necessary organization and management structure; also, they lacked the planning mechanisms to direct national resources and efforts on problems of agricultural development as determined by the planners and policymakers. There was little coordination of research activities undertaken by the different agencies and there were no institutional structures to forge strong links between research and extension. Agricultural research in the Philippines, thus, suffered from lack of commitment and a strong sense of purpose and direction.

The Government of the Philippines responded to this situation by creating the Philippine Council for Agricultural Research (PCAR), which was later expanded to become the Philippine Council for Agriculture and Resources Research and Development (PCARRD). The change was made in two stages to extend the Council's scientific mandate and, subsequently, to stress its commitment to development. PCARRD was conceived as an apex organization charged with the responsibility "to establish, support and manage the operations of a national network of centers of excellence for the various research programs, in crops, livestock, forestry, fisheries, soil and water, mineral resources and socioeconomic research related to agriculture and national resources." Above all, PCARRD was given the responsibility of coordinating research on a national basis and creating a planning forum which would help to evolve research priorities, programs and projects with a strong commitment to the modernization of the country's agriculture, and make it an effective instrument of achieving food self-sufficiency, promoting exports, substituting imports, and generating employment. PCARRD was given operational control over a significant component of the total research budget of the country in order to provide a strong focus on development.

The government also made important policy decisions providing additional resources to strengthen the country's research infrastructure. This called for a careful analysis, as the existing

resources of research were not distributed uniformly among the different agencies. The National Agricultural Research System Survey Technical Panel, whose work and recommendations in 1971 led to the creation of PCAR, had noted that "the available expertise for agricultural research is overwhelmingly concentrated in the universities and colleges of agriculture because of high salary scales and better opportunities for professional growth. . . . On the other hand, although with serious inadequacy in the quality of research manpower capability, the research units of the Department of Agriculture and Natural Resources agencies and commodity institutes own some well-equipped field stations and laboratory facilities in strategic locations." Over and above this disparity, the panel noted that in the past, the country had seen a proliferation of experiment stations, very few of which were adequately manned and equipped for productive research. The technical panel, therefore, strongly recommended the establishment of a national network of selected agricultural centers and stations to operate within the PCARRD network. The major role in this was to be given to the College of Agriculture of the University of the Philippines at Los Baños, although several other colleges have recently become active and play key roles.

Impact of Reorganization on the MAF

Many of the current problems in the organization of agricultural research and its management in the MAF must be seen against the background of the above recommendations and, more particularly, the steps that were subsequently taken to translate some of them into practice. The recommendations in themselves made good sense. The limited resources for research had been too thinly dispersed over a large number of stations, many of which did not have a critical mass of qualified manpower and materials to be effective. The panel's recommendations, however, were implemented in a such a way that they had the unintended effect of isolating the MAF from the mainstream of the country's programs of agricultural research, and eroding its capacity to mobilize the national research effort for agricultural development, for which it had and continues to have the main responsibility.

In the wake of the panel's recommendations, the Government of the Philippines made two key decisions which have moulded the national research system in the country during the past 13 years. First, as indicated above, through a presidential decree, the Philippine Council for Agricultural Research (PCAR) was created in November 1972, and this must be considered a turning point in the history of agricultural research in the country. During its short existence, the council has provided a strong focus and a sense of purpose and direction to agricultural research in the country. The other major decision was to build on the existing strength of the system, and, since the largest concentration of highly qualified and trained scientific manpower was to be found in the universities, it was decided that these institutions must be given a lead role for the generation of new technology. This is where most of the new investments were made. Interestingly, it was the former Minister of Agriculture, Arturo R. Tanco, Jr., who made most of these important policy decisions, ignoring in a sense the claims of the research stations of the bureaus of his own ministry, which were better equipped in terms of field and laboratory facilities, to take up greater responsibility for research.

The technical panel, many of whose recommendations Tanco endorsed, had had a national network of experiment stations in mind, with the University of the Philippines research complex in Los Baßos as the nucleus, serving as a national center for agricultural research. The regional needs of technology were proposed to be met through a series of peripheral stations, which would be linked with the national agricultural research center at Los Baños through research programs on various commodities. In retrospect, it is possible to argue that the decision to assign to the colleges of agriculture and universities a central role in organizing the national network of research stations and to become a major focus for technology generation was made to buy time and to make sure that research made a quick impact on production. It would have taken much longer for the bureau stations to be equipped with scientific manpower of the required calibre, who could assume leadership for research and spearhead a major national effort. The idea probably was not that the bureau stations should be divested of their important research responsibilities and relegated to a secondary position in the national research effort. Despite their limitations in scientific manpower, the bureau stations did have a long history of research, and some very useful work had been done by their scientists. Above all, as the technical panel recognized, the bureaus of the MAF (and the commodity institutes) had better equipped research stations than other agencies. The idea must have been (or should have been) that, even as the existing university manpower was harnessed to meet the immediate needs of the accelerated programs of agricultural research and development, the MAF stations would be developed to take up greater responsibility in the years to come.

Decline of the MAF stations

In real terms, however, the effect of these policy decisions has been that the research stations of the MAF have seen considerable decline in the last 13 years. What is even more disappointing, many officials in the ministry have come to accept a situation where there is a division of responsibility in the country's efforts for the modernization of its agriculture. The responsibility for most of the research work, and more particularly for advanced research relating to technology generation, is believed to lie with the colleges of agriculture, while responsibility for development, including some extension-oriented research, is believed to be the main concern of the ministry. In contrast, in addition to the colleges of agriculture, the semiautonomous institutes continue to have an important technology-generating role in research for crops like sugarcane, tobacco, coconut, cotton and for forestry. Another policy decision made by Minister Tanco at that time was to rely on the International Rice Research Institute (IRRI) for most of the research on rice, which placed responsibility for research on the country's most important commodity outside of the ministry.

This downgrading of research in the ministry was brought out clearly in a memo of 18 May 1985 from the Director of the Agricultural Research Office to the Minister of Agriculture and Food. The memo stated that since the creation of PCARRD, the ministry had taken a very strong position that the development of national agricultural research should be anchored on the strengthening of agricultural colleges and universities which already had certain essential elements such as staff, facilities, libraries, etc.

The impact of the policy decisions of the early 1970s on the MAF research system can also be clearly seen if we analyse the growth of the different agencies involved in agricultural research in the last 13 years. This growth has resulted in the development of a national research network, coordinated by PCARRD, consisting of national research centers, regional research centers, and cooperating field stations. The research centers and stations clearly show a hierarchical organization in terms of the level of their research capacity, although all of them may be performing an important function. The basic and applied research for technology generation is conducted by the national research centers, while the regional research centers and the regional consortia focus their efforts on region-specific research. The cooperating field stations dispersed throughout the country concentrate mostly on extension-orientated research for microenvironments within the region and for service-oriented functions, e.g., seed production.

It is interesting to note that all four multicommodity national research centers are located in the universities and colleges of agriculture and all seven single-commodity national research centers are located either in the universities or in the autonomous commodity organizations like the Philippine Sugar Commission or the Philippine Coconut Authority. Of the eight regional research centers, five are located in the university sector and only three in the MAF. The former bureau stations mostly have the status of cooperating field stations in the national network. It is also interesting to note that in grouping the regional research centers and field stations into consortia created to strengthen research at the regional level, the leadership for coordination has essentially been given to the universities and the colleges of agriculture.

Depletion of manpower

The impact of the 1972 decisions on the research service of MAF can be seen in other ways: the scientific manpower in the ministry, never very strong, has continued to decline. The technical panel in its report noted that, of the total number of 879.5 scientific man-years devoted to agricultural research in the financial year 1970/71, 39 percent were in the Department of Agriculture and Natural Resources (DANR), 38.5 percent in the commodity institutes, 20.5 percent in the universities and colleges and the rest in NSDB and the private sector. The total number of agricultural researchers in the country was 1,875, but many of them, especially those in the universities and colleges, worked on a part-time basis. Today, the proportion of scientists in the MAF is smaller. In its 1985 report the Agricultural Research Review Team noted that the number of research workers in the MAF was reduced to 17.0 percent in 1985, compared to 29.0 percent in 1972. Also, very little has been done to improve the quality of scientific manpower and to retain it in the ministry. Table 2-1 lists the number of M.S. and Ph.D. graduates working in research in the Ministry of Agriculture and Natural Resources (MANR) and colleges of agricultural universities over different periods of time. It will be seen that while the colleges and universities have added significantly to their scientific manpower, especially in qualitative terms, relatively little of such addition has taken place in the MAF. Indeed, there has been a decline.

Table 2-1

Scientists with postgraduate qualifications in Colleges and Universities and in MANR

Agency	M.S. 1970	M.S. 1977	Percent change	Ph.D. 1970	Ph.D. 1977	Percent change	Total 1970	Total 1977	Percent change
Colleges and Universities	292	428	46	143	192	34	435	620	42
Ministry of Agriculture	51	39	-23	3	4	33	54	43	-18

Based on data supplied by the Agricultural Research Office, MAF.

Relative reduction in budgetary support

A similar situation can be seen for the research budget. The Department of Agriculture and Natural Resources accounted for 16.7 percent of total expenditures on agricultural research from government sources in 1970-71, while the universities and colleges accounted for 23.1 percent. In 1985, the recommended budget for research for the MAF was 22.93 percent of the total, while it was 48.95 percent for the universities and colleges. Thus, in relative terms, the ministry's share of the national research budget has declined. Agricultural Research Development Projects 1 and 2, initiated by PCARRD, had a provision of 15 million dollars for the creation of a new research infrastructure. Most of these investments have been made in the university sector. In more recent years, the Agricultural Support Services Projects (ASSP) of the MAF, funded through a World Bank loan has provided over 45 million dollars, but the ministry's share in it is limited mostly to the Regional Integrated Agricultural Research (RIAR) program and the associated technology-verification trials on farmers' fields. These do serve a useful purpose but most of the work relates to transfer of technology rather than to research. In fact, the verification trials are carried out by extension personnel trained for this purpose. The research component of ASSP has been placed mainly with the University of the Philippines at Los Baños (UPLB) and PCARRD. The project has the following major components:

- creation of the Research Coordinating Committee and the Agricultural Research Office to enhance coordination of MAF research activities;
- establishment of the Regional Integrated Agricultural Research System (RIARS) to have a technology verification network;
- strengthening the Institute of Plant Breeding of the UPLB;
- establishment at UPLB of a farming system and soils research program;
- conduct of technology-generation studies in PCARRD's research network;
- development of an applied communication program under the PCARRD network;

PCARRD and the Evolving National Research System

The establishment of PCARRD has made a most important contribution in the planning of a national research strategy, in evolving priorities, and in coordinating research efforts of different agencies and institutions. Agricultural research in the Philippines today has a strong national focus in relation to development which was missing in the early 1970s. It should be recognized at the same time that PCARRD has not evolved to take up all the roles and responsibilities that were expected of it in terms of its mandate. PCARRD was conceived to establish, support, and manage the operation of a national network of centers of excellence in different fields of agricultural research. In reality, PCARRD's main role in the last 13 years has been more in the area of priority setting, planning and research coordination, and in the screening and supporting of projects proposed by individual scientists. PCARRD has not established any research centers of its own nor does it manage the operation of any of the other national or regional research centers.

The 1980 review of PCARRD (PCARR at that time) by an external panel noted that PCARR could not point to specific research achievements because PCARR does not conduct research. It cannot be held responsible if the flow of technology is inadequate or a serious disease or pest outbreak that requires emergency research attention occurs. PCARRD has, instead, promoted through funding support -- both internal and external -- the organization of a national network of research centers, including regional consortia of experiment stations, all of which continue to be managed by their respective agencies. The fact that PCARRD does not operate experiment stations of its own has important implications for the translation of its plans and priorities into field and laboratory research programs, as was pointed out by the 1980 review panel. These implications are further discussed in chapter 4 of this report, which shows that PCARRD faces serious limitations in generating a response to its research priorities in the form of well-defined and integrated multidisciplinary research programs at the field level. Equally important, evolution of PCARRD on its present lines has important implications for the MAF, which needs production technologies that respond to its development needs and are acceptable to farmers.

Most technology generation is being done at present by the national and regional research centers in the universities and the colleges of agriculture (in addition to the commodity institutes). It is possible to argue that this kind of central role for the university sector was envisaged by the policymakers not as a short-term measure but as a long-term strategy for the organization of agricultural research in the country. If this policy continues to be followed in the future, it is clear that further strengthening of agricultural research in the Philippines would continue to see, as it has in the past 13 years, increased investments in the colleges of agriculture and universities with a continuing decline in relative terms of the MAF research service.

MAF and the University Sector

The division of responsibility for research and development as it has emerged with the establishment of PCARRD may be an entirely sensible solution in the context of the Philippines. In most other countries -- both developing and developed -- the ministries of agriculture prefer to organize their own research services to build up highly effective systems to meet the technical needs of their development programs. This, however, is not the only model of research organization, and it is recognized that any system works well as long as the research service is fully equipped to meet the needs of development and organizes its institutions, structures, and cooperative relationships in a manner consistent with those needs.

Land-grant institutions -- a comparative analysis

The best example of a university-based research system, which takes responsibility of this kind for the development of the country's agriculture, is to be found in the United States of America. The U.S.A., more than any other country in the world, has developed a highly effective system of land-grant colleges of agriculture, which play a crucial role in providing research and extension support to the country's agriculture. They have developed for this purpose a very definitive organization consistent with their mandate and responsibilities and with the socioeconomic milieu of the country. It is this organization and its cooperative relationships which account for the success of the land-grant system in the United States. The colleges of agriculture in the Philippines have been influenced by the land-grant philosophy. It should be useful for the purpose of our present analysis to examine how far they incorporate in their structure and organization the institutional characteristics of their counterparts in the U.S.A.

Historical evolution. The land-grant colleges in the U.S.A., established with the Morrell Act of 1862, have a long history as institutions built for the development of the country's agriculture. Further leglislation was enacted by the federal government through the Hatch Act of 1887, which called for the establishment of an agricultural experiment station in each state, and the decision was made to locate these stations in the land-grant colleges.

Thus, the Hatch Act helped to transform the basic character of colleges of agriculture. They were no longer simply academic institutions. They became at the same time major agricultural research centers of the country. To take one example, the Agricultural Experiment Station of the Cornell College of Agriculture and Life Sciences at Ithaca has 17 different departments with research budgets representing all the major disciplines of agricultural science.

The universities in the Philippines, on the other hand, had more traditional beginnings as seats of academic learning, and it has only been in the last 15 years or so that serious efforts have been made to involve them in agricultural research and development. An exception, of course, is the College of Agriculture at UPLB. An experiment station was established at Los Baños as early as 1918 through a grant made by the government. The station, however, failed to develop its potential because of a lack of continued funding. It was in the course of the two decades of cooperative relationships in agricultural education and research between UPLB and the New York State College of Agriculture and Life Sciences at Cornell University (supported by the United States Agency for International Development and the National Economic Council of the Philippines) that the experiment station was revived during 1952-1960. This period saw several significant developments, including the improvement of physical facilities, equipment, and land conditions for research, the employment of professors and staff directly connected to the central experiment stations with research as their major responsibility, and growing coordination and cooperation with various government bureaus.

Because of these developments, UPLB is much better equipped than any other institution in the Philippines for undertaking applied and basic research in agriculture. It should be recognized at the same time that funding in the form of a separate budget for the experiment station still remains a constraint and the college must look to PCARRD for much of its research support through its competitive grant system, based on approval of individual projects. Also, UPLB will be increasingly called upon to take up research in disciplines that are basic to agriculture, such as microbiology, biochemistry, plant physiology, and virology. And it must take the country into the rapidly developing field of agricultural biotechnology. The present emphasis on agronomic research in the country is justified, but agriculture in the Philippines, as in other developing countries, will require greater support from basic sciences and UPLB is the only institution in the country that can provide support of this kind.

Staff and funding support for teaching and research. In a typical land-grant college there is a large proportion of staff devoted mainly to research or to extension. These staff members make a contribution to teaching but they do so mostly through supervision of graduate students. There is an additional component of core staff whose major responsibility is teaching. In the Philippines, on the other hand, most of the colleges of agriculture continue to be organized more in the form of academic departments than agricultural experiment stations. There is little separate budget or staff provided for research. The concept of a triology of higher education, research, and extension is accepted in the colleges of agriculture in the Philippines as in the U.S.A., but there is little supporting infrastructure and built-in funding mechanisms to put

it into practice in the Philippines. The budget of a typical land-grant college in the United States may allocate as much as 40 percent for research. Most of the staff members in the Philippines have their primary responsibility in the field of teaching; the research component mostly takes the form of projects, which indiviual scientists undertake on the basis of a system of competitive grants instituted by PCARRD. The staff members who succeed in mobilizing support for their research projects receive an honorarium for their research work, which is carried out over and above their teaching responsibilities.

It is true that in recent years some of the colleges of agriculture, and more particularly the one at Los Baños, have set up a number of research institutions outside their academic departments with funding provided by the Ministry of Agriculture and Food. Thus, the Los Baños campus now has an Insititute of Plant Breeding, a National Crop Protection Center, and a Farming Systems and Soils Resources Institute -- all established with funding from the MAF. This is a welcome development but these are specialized centers not to be compared with the state agricultural experiment stations of the land-grant colleges which have a wider mandate comparable to that of the agricultural research institutes in other countries.

Not only are the research funds provided by the federal government for the state agricultural experiment stations administered by the United States Department of Agriculture (USDA), the latter also examines and approves all the research projects supported by these funds. Also, the state and federal governments are strongly represented on the policy-making bodies of the land-grant colleges and have evolved effective mechanisms to communicate to them their technological needs. In the Philippines the organization of the colleges of agriculture is based largely on the traditional concept of autonomy of academic institutions. The body that is able to influence their research programs is PCARRD through its funding support. And this support, as we saw earlier, takes the form of approval of specific research activities put forward by individual scientists, not for integrated research programs of the station as a whole (see chapter 4).

Land grant and federal stations. The land-grant colleges in the U.S.A. have a state or, at most, a regional focus in their research. But this is not the only stream of research that the country has. The USDA has a federal research service of its own with a number of experiment stations located on different parts of the country. These federal stations work on problems of wider national significance and they often collaborate with the state agricultural experiment stations. Indeed, in many cases they are located on the campuses of the land-grant institutions. This provides yet another effective method for the USDA to interact closely with the scientific staff of the state experiment stations in the land-grant colleges. Over and above all this, the USDA scientists may be placed in the state experiment stations so that they can work in close collaboration with them. In the Philippines, this latter possibility does exist in some of the regional research consortia, which PCARRD has helped to establish in recent years. However, with a weak research base of its own, the ministry is in no position to work as an effective partner in these consortia. The role of the ministry can be expected to decline further in these regional groupings of research stations.

Links with extension. Finally, the land-grant institutions in the U.S.A. derive considerable strength from the fact that they are also directly responsible for the country's extension service. Agricultural extension in the United States is a joint venture between the federal, state, and county governments and farmers' associations. The system, however, is managed by the land-grant colleges, which appoint the 3,000 county extension agents dispersed all over the country. The technology delivery system is obviously greatly facilitated with this kind of integration of the state experiment stations, the land-grant colleges, and the extension service. The extension service in the Philippines, as in most developing countries, is operated by the Ministry of Agriculture and Food. This would not be a serious limitation if the colleges of agriculture and the extension service in the field could develop institutional mechanisms for close collaboration. In a recent report on the performance of the regional research consortia, an interagency Filipino team commented, "there is a need to strengthen the center/consortium technology transfer mechanism to the farmers and users in collaboration with government agencies and private enterprise. This aspect is utterly wanting as only a few appropriate technologies resulting from research work are adopted by farmers."

Agricultural scientists in the Philippines have been conscious of this problem, and the main issues were discussed in 1983 in a seminar organized by PCARRD in association with Visayas State College of Agriculture. The relative isolation of the university researchers from the extension staff and the farmers, however, has continued. Recognizing this, the MAF has taken steps to organize RIARS under the Agricultural Support Services Project. It is now generally accepted that this initiative is a beginning toward providing a useful interaction between research and extension -- the element missing earlier. However, much more remains to be done to institutionalize the linkages between research and extension since the ASSP is not a permanent project and is scheduled to end in 1988. Further, as noted earlier, the major focus is on technology verification and not research.

MAF and Future Growth of the National Research System

In the last 13 years, the Philippines has done well to establish PCARRD. The technical panel in its 1971 Report had observed that priorities consistent with national needs had not been established in the overall research planning for agricultural development and that the needed interdisciplinary team approach for solving problems had not been put into practice. In retrospect, it is clear that significant progress has been made in evolving research priorities consistent with national needs and research coordination at a national level has been achieved. If an interdisciplinary program approach could not be put into practice, the problem must be seen within the framework of the existing institutional structures. The colleges of agriculture have done their best to respond to the mandate that was given to them. This must be considered all the more creditable because in real terms they have few of the institutional characteristics of the land-grant insititutions on which they are modelled. The country, however, must now build on these foundations and take a longer term view of the system as it should be evolving in the future. Fifteen years ago, time was not on its side and the country had to tackle some urgent problems. The time has now come when solutions of a more lasting nature must be explored.

Role of MAF stations in long term growth

In the projected growth of the national research system in the Philippines, the colleges of agriculture and the universities will continue to have an important role. It is also clear that in the next 10 to 15 years, much of the technological support for the development of the country's agriculture will continue to come from the universities and the colleges of agriculture. It is equally clear, however, that an effective national agricultural research system cannot be built around them on a permanent basis. Their mandate should change with time and the research stations of the MAF should become important partners in the process of technology generation. Their major limitation is a shortage of qualified manpower. The next 10 years should be used for an intensive program of manpower development as the ISNAR team has proposed in chapter 5.

That the research stations of the MAF should have an important role in the process of technology generation, working with the university scientists in nationally coordinated programs, was also the view of the technical panel that recommended the creation of PCAR. The panel had proposed that setting up the national center at Los Baños would require a complementary establishment of agricultural research centers and research stations in association with the DANR agencies. The panel, however, was careful to avoid any proliferation of the station network. If one were to look farther into the future -- say to the next 25 years, it would seem more logical that the universities and the colleges of agriculture should be moving more and more into areas of strategic research, while a large part of applied research for technology generation would become the responsibility of the MAF research service and the commodity institutes, supplemented by the R & D efforts of the agribusiness sector. The colleges of agriculture should find themselves far more comfortable in a role of this kind, considering their present structure and organization.

Rationale for growth

There are five main reasons for the MAF to reorganize and strengthen its research service, taking this long-term view.

1) The MAF has a long history of organized agricultural research -- longer than that of any other agency in the country. Some of this research has proved to be highly successful, and valuable experience has been gained. Over this long period, the MAF has built a large number of experiment stations which would not be easy to duplicate. It does not seem logical that these stations should lose the momentum of their research work and fail to develop their full potential. They need greater staff and budgetary support, which should be increasingly available as the present training programs get under way and new personnel policies are instituted.

2) The MAF will be in a better position to influence PCARRD in its process of priority setting, program planning, and evaluation if it continues to have successful experiences of its own in the organization of research. The ministry will need well-qualified scientists respected for their work to be able to interact

effectively with the PCARRD staff. In the last 15 years the MAF has become a very unequal partner in the PCARRD network of research stations and has to make extensive use of UPLB and other scientists to represent it.

3) The MAF operates the country's extension service and works closely with the farmers. Many of the problems of transfer of technology would be easier to solve if the ministry was also directly involved, along with the scientists in the colleges of agriculture and the commodity institutes, in the process of technology generation.

4) The project approach which has characterized much of agricultural research in the Philippines in recent years has to be replaced with multidisciplinary teamwork built around integrated programs. The ministry's experiment stations and the commodity institutes provide excellent opportunities for teamwork of this kind. This should help to foster a research environment based on continuity and a process of review, monitoring, and evaluation.

5) The colleges of agriculture have responded well to a crisis situation, but it would be unrealistic to believe that the national research system can be built around them on a regular basis. They will always be an important component of this system but they will not be able to substitute for other equally important components.

Chapter 3
STRENGTHENING OF RESEARCH IN THE MAF

This Chapter builds on the preceding analysis and considers ways in which the research service of the MAF should assume greater responsibility in the evolving national agricultural research system and how it could reorganize its existing infrastructure for that purpose.

Kinds of Research

Ministries of agriculture interested in harnessing science and technology in support of their production programs have to make judgements about the kind of research that would best serve their needs and would be consistent with their resources. There are four different kinds of research activities which could provide long- or short-term support to agricultural development. These are

1) Fundamental research adds to the knowledge base and improves our understanding of natural phenomena. It is not undertaken to solve any specific problem. The expectation and the experience is that the new knowledge may find valuable applications in ways that could not be defined at present. For example, a great deal of fundamental research has been carried out in the last 30 years in molecular biology to improve our understanding of the structure and function of genetic material. The enhanced knowledge base has now created a potential for manipulating genetic material for practical purposes in ways not considered feasible earlier.

2) Mission-oriented basic research or strategic research is that which helps to generate new knowledge to find solutions to specific problems. A good example is the problem of improving the efficiency of the nitrogen-fixing organisms in the soil. A great deal of research is in progress at present to understand how rhizobial bacteria infect the roots of leguminous plants and fix atmospheric nitrogen. The new knowledge is being generated to help in better nodulation of legumes and, more ambitiously, to transfer the nitrogen-fixing trait to a wider range of organisms. This type of research can be very rewarding but it has a long-term perspective.

3) Applied research is organized to harness existing scientific knowledge for creating new technologies. The development of an improved variety of rice using the Mendelian techniques of crop breeding, for example, represents a technological innovation for increasing the production or improving the quality of this important cereal. The goal here is clearly defined and there is a reasonable chance of success in a given timeframe in the hands of a competent team of scientists. To be successful, applied research in agriculture must result, however, in technologies which would find expression on farmers' fields. The agricultural scientists must, therefore, work with a farming system perspective. In recent years, a great deal of stress has been laid on farming systems research to drive home to breeders and other agricultural scientists the

importance of this perspective. Basically, farming systems research helps to gain a better understanding of the farmers' motivation, experiences, and practices and the rationale for those practices, and to analyse the problems that farmers face in adopting the new technologies being offered, which may have done well on experiment stations.

4) Adaptive research is undertaken to evaluate and modify already available technologies from different sources for a particular set of agroecological conditions and farming systems. This is the simplest kind of research in terms of the demand that it makes on scientific and other resources. It is particularly valuable for those small countries that are not in a position to organize a full research service of their own, although all countries must find it potentially useful. They introduce technology from international agricultural research centers and from some of the larger national programs and adapt it to their needs. The main role here is for agronomists, who must develop a package of practices to be recommended in terms of suitable varieties, planting dates, fertilizer doses, irrigation schedules, pest control, and other measures for the specific regions under consideration. In developed countries a great deal of adaptive research is done by the agribusiness sector as part of its extension efforts, which result in increased sale of various farm inputs.

Farming systems perspective

Donald Winkelmann of CIMMYT explains that research with a farming system perspective involves singling out groups of farmers in terms of society's concerns, assessing the circumstances of those farmers, assigning priorities to research programs, which would help to find appropriate solutions to important problems and undertaking experiments under the circumstances of farmers representative of the group. Farmers' decision making is influenced by many considerations, which make for complex farming systems and a wide range of production practices. Farming systems research, therefore, involves working with farmers on their own farms and it has a specific purpose as defined above. Another type of on-farm research is also carried out by the scientists and its purpose is verification of already generated technology before recommendations are made about its release. Both farming systems research and verification testing involve on-farm research but their purposes are quite different.

The messages coming out of farming systems research are important for research planning at the experiment stations. These messages help to increase the effectiveness of the proposed research. No experiment station exists in a vacuum and the scientists there already have some understanding of the farmers' production systems and their needs of improved and appropriate technologies. Farming systems research could increase this understanding and provide an institutional mechanism for the planning of programs so that research stations can operate on surer grounds with regard to the relevance and acceptability of the technology they propose to generate.

It should be emphasized in this context that decisions have to be made not only at the research station level but also at the policy-making level in the Ministry of Agriculture and Food, while considering the findings from farming systems research. There are important issues

involved here. If the scientists engaged in generating new technology remain preoccupied with the farmers' socioeconomic circumstances, the progress they make will be limited. Most developing countries, faced with mounting population pressures, must work for a major production advance and not for slow improvements of the kind achieved in earlier years of traditional agriculture. The pressures for a major increase in production are often so overwhelming that policy decisions must be made that change farmers' circumstances by creating a new infrastructure in terms of agro-services of various kinds. These would include the production, supply, and distribution of modern farm input, extension of credit to farmers, and above all, offering incentives in the pricing structure so that they would be motivated to adopt the new technology. With farmers' limited resources and in the absence of a new institutional framework, new technologies would not be readily accepted. Thus, while the farming systems perspective is important, the choices for the scientists are not easy. These choices must be made in consultation with the policymakers, who need to be educated about the potential that the new technology offers.

On-farm verification of technology

As far as on-farm research for technology verification is concerned, it is designed mostly to provide feedback on already developed technology before it can be widely recommended. This feedback is not concerned with the appropriateness of the technology to the farmers' socioeconomic circumstances. It has more to do with problems of a practical nature. Thus, a newly evolved crop variety may be late maturing so that it is caught in the rains at the time of harvest or may not fit in a preferred cropping system. Or a new farm implement may require mechanical modifications before it can be used by farmers. With suitable changes the new technolgy may be widely adopted. Also, of course, on-farm evaluation helps to determine the economic viability of the new technology under actual farming conditions.

It should be stressed that farming systems research must be viewed in the wider context of the applied research programs of experimental stations. It is not research recommended in its own right in isolation of the technology-generating programs. The whole purpose is to contribute to more effective research programs and policies. A great deal of farming systems research carried out in recent years has involved the participation of social scientists in lead roles. They collaborate with the agronomists and others in the conduct of on-farm research and the analysis of the data gathered from it. Verification testing, on the other hand, is carried out primarily by agronomists, who often collaborate with the extension staff for this purpose. The role of social scientists in such verification trials is to help assess the cost-benefit ratio of the new technology.

Research Objectives of the MAF

Keeping in view its limited resources and the urgent need for development, the MAF should not be involved in fundamental research. The kind of research that is not site-specific is mostly undertaken at

present in the developed countries. The MAF could participate in mission-oriented basic research, but in the context of its available scientific manpower, the ministry would like to leave this to the universities, which are better equipped for it. It is the applied research activities in which the MAF could make the greatest contribution. The production technologies resulting from it could respond most directly to programs of agricultural development. The rationale for the MAF to become involved in this kind of research has been spelled out in the preceding chapter. The question that we now consider is, what should be the ministry's share in the applied research programs of the country and how should the ministry organize its research service to manage these programs?

Applied research programs of the MAF should have the following major objectives:

- sensitivity and responsiveness to farmers' needs of improved technology in different agroecological regions and in different production systems;

- organization of a multidisciplinary team approach and integrated programs with a sharp focus on development objectives;

- asssumption over a period of time of a leadership role in conducting of research on commodities of great national importance, taking into consideration the production gaps which are likely to emerge and the potential of the MAF research stations to develop a comparative advantage. A similar role is needed for research in basic resources such as soils and water;

- building on the MAF's its past experience and maximizing returns from its research station network;

- optimum utilization of its scientific manpower, including the large number of staff currently enrolled for higher degrees.

Development of Research Infrastructure

In order to achieve these objectives, the MAF should consolidate and further develop its existing research infrastructure to organize two types of research facilities -- central research stations and regional research centers. The former will have their main focus mostly on commodity research while the latter will be concerned mainly with research on production systems. Table 3-1 helps to identify the more important commodities in the national economy.

Table 3-1

Production, value, and area of important commodities in the Philippines (preliminary estimates for 1984)

Crops	Production (million tonnes)	Area (million hectares)	Value (million pesos)
Rice (rough)	7.84	3.14	15311.7
Maize (shelled)	3.35	3.27	5166.8
Fruit & nuts (minus citrus)	6.30	0.49	8531.9
Citrus	0.12	0.02	451.3
Root crops	2.22	0.42	2380.4
Vegetables (incl. onion and irish potatoes)	0.44	0.06	1819.1
Beans and Peas	0.04	0.05	339.7
Coffee	0.11	0.14	2725.2
Coconut	3.04	3.22	12428.4
Sugarcane	3.26	0.48	11151.0
Tobacco	0.07	0.07	836.3
Cotton	0.09	0.01	41.6

Based on the Report of the Agricultural Research Review Team on the MAF Research System, 1985.

The commodity institutes

A number of research institutes attached to the various semiautonomous boards/commissions already focus their efforts on individual commodities. Thus, there are single-commodity institutes managed by these organizations for coconut, sugarcane, tobacco, cotton, and forestry. Institutes of this type, having a clear mandate and offering, in general, better service conditions and research facilities than those managed by the government, are generally quite successful. For this reason, many developing countries prefer to organize research on some of their more important export commodities in autonomous institutes of this kind. The ISNAR team recommends that these institutes continue to form an important component of the country's research system for agriculture. The MAF, while ensuring their autonomy, should be able to monitor and evaluate their work. This should be done through the ministry's representation on the boards of management of these institutes and through periodic reviews. The head of the ministry's research service (a position which we propose later in this chapter) should be a statutory member of the board of management of these institutes and the Minister for Agriculture and Food should institute a system of external review of their progress. The review should be conducted every five years by an external panel of scientists and management specialists constituted by the Minister. The review panel should report on the scientific contributions of the institutes and their management efficiency and seek ways to integrate the applied research results into effective production packages.

Proposed central research stations

Considering their economic importance for the country, a number of other commodities should receive highly focussed attention from multi-disciplinary teams of scientists. The rice crop dominates the country's agriculture and the ISNAR team understands that the Government of the Philippines has already made a decision to establish a national center for rice research, departing from its earlier policy that research support for the rice crop would be provided mainly by IRRI. While commending the proposed initiative, the ISNAR team would like to suggest that the new center be organized in the form of one of the central stations of the MAF. The ministry has a good record of successful rice research in the past and its station at Malagaya has the potential to be further developed for this purpose. A substation for upland rice research could be developed at another ministry site, for example, in the province of Zamboanga.

The MAF should organize a similar central station for multi-disciplinary research on maize, which is the second most important cereal crop in the country (a potential site would be Claveria, where the MAF already has a station). The Plant Breeding Institute of the College of Agriculture at Los Baños has already carried out very useful work on the genetic improvement of maize but what is being proposed now is a more comprehensive approach to meet the production technology needs of diverse agroecological situations in the country.

The other central research stations of the MAF should be devoted to a number of groups of commodities, including temperate horticultural crops (Baguio), tropical horticultural crops except citrus (Davao), citrus (Lipa), and grain legumes (La Granja). In addition to these central research stations for crop commodities, the team proposes two other central stations for livestock -- one in the area of animal health (Alabang) and the other in the area of animal production (Bukidnon). Also, a central station for fisheries research should be set up at one of the existing sites with a major focus on coastal resources. Crops like grain legumes may not be very important in total monetary terms, but they have social and dietary significance which should not be overlooked. In addition, the MAF should organize a Central Soils Laboratory with a national mandate for soil research on the basis of its past experience and the resources which it has developed for this purpose. The social science research that the ministry has conducted for a long time should be integrated into the research programs of the various central stations for crops and livestock.

These stations will be characterized by strong multidisciplinary teams of scientists concentrating all their efforts on the improvement of a single commodity (or a group of related commodities), and their mandates will transcend regions. The improved genetic material and more basic practices of crop and animal production and protection developed at these stations would be made available to all the regional research centers for utilization in their programs in response to specific agroecological needs. These central stations should be small in size and the emphasis would be on generation of improved genetic material and practices rather than adaptation of technology to a specific set of conditions.

Proposed regional research centers

The MAF should reorganize the 12 RIARS into regional research centers with the main objective of identifying production technologies responding to the needs of each region. The research work of these centers would be production-oriented and the scientific leadership would be provided mostly by agronomists. The regional research centers, like the central stations, would require support from other relevant disciplines in order to evaluate, modify, assemble, and integrate the diverse components of technologies emerging from the central stations and from other research centers in the country and outside, including the international agricultural research centers and more particularly, IRRI. The regional research centers would be expected to operate in close collaboration with the extension service of the MAF and would develop grass-roots contacts with the farming community for verification of newly developed technologies on farmers' fields. Each of these centers would consist of a number of field stations, depending on agro- ecological considerations and the diverse needs of the region. The overall supervision of these stations would be the responsibility of the center manager, who, in turn would report to the regional director.

The (RIARS) established in the last five years under the Agricultural Support Services Project have served a useful purpose. They have helped to overcome an important weakness of the PCARRD network in that its earlier contacts with farmers and extension staff had been limited. For the first time perhaps (apart from the Masagana 99 and Kabsaka projects), large-scale on-farm testing is being carried out, and this serves the useful purpose of technology verification and technology extension. Important as the concept of RIARS has been, the Ministry of Agriculture and Food should clearly have a broader role and responsibility regarding regional research. The responsibility must be to carry out production-oriented research that helps to meet the specific needs of farmers in the region. It is, therefore, recommended that the RIARS should be reorganized as regional research centers in the research service of the MAF with technology verification on farmers' fields as one of their functions. The other important functions will derive from their mandates which are given below both from the central research stations and the regional research centers.

Central research stations:

- Organize applied research programs for improved genetic materials and associated agronomic and crop protection techniques, which will help to achieve major advances in production in the mandated commodity.

- Collaborate with the international agricultural research centers and the national programs of other countries for the introduction of new genetic materials and components of production technologies and their evaluation for use in the Philippines.

- Participate in nationally coordinated research programs of PCARRD in respect to the commodity concerned.

- Distribute improved germplasm and breeding materials and components of production technologies to the regional research centers for testing, evaluation, and further selection in the different agroecological regions.

- Organize training courses for the younger scientists from the regional research centers.

- Organize and undertake national surveys for monitoring the build-up of pests and pathogens attacking the particular commodity and devise a strategy for controlling them. This may involve crop diversification and the development of integrated control measures.

- Organize farming systems research in collaboration with the regional research centers in different parts of the country to achieve a better perspective of potentially valuable technologies for the commodity concerned.

- Interact with the planning departments of the government through the Research Service at the headquarters of the ministry on the production potential of the commodity and the scientific strategy required to achieve this potential over a period of time.

Regional research centers:

- Harness improved genetic materials and other research results from the different national and international research centers. Through a combination of adaptive and applied research develop improved production technology packages for recommending to farmers in the region.

- Collaborate with the central research stations in farming systems research to achieve a better understanding of the existing crop and animal production systems with a view to upgrading them. As production begins to increase, attempts should be made to change the existing production system in order to move into a more modern and a more productive approach to agriculture.

- Develop close linkages with the extension service for organizing technology verification trials on farmers' fields. This on-farm research should provide feedback for modifying the new technology to make it more acceptable to farmers and for determining its economic viability under actual farming conditions. The trials should be designed to be useful also as demonstrations to farmers and in this way help in extension.

- Organize training programs for extension staff and farmers to introduce them to the latest technological innovations.

- Prepare on-station demonstrations of improved production technologies for the benefit of visiting farmers and extension personnel. Also, organize farmers' fairs periodically around these demonstrations.

The ISNAR team would not like to make detailed proposals for the staffing and equipping of the different stations. The staffing pattern broadly discussed in chapter 5 as well as the suggestions made in this chapter about the proposed location of the central stations are nothing more than tentative. What is being recommended is the need for policy decisions by the ministry to establish a number of central research stations and regional research centers as part of the process of

rationalization of its research service within the framework of the country's evolving national research system. The detailed scientific structure of these stations and centers in terms of staff, equipment, and other field and laboratory facilities will require careful study after policy decisions have been made.

Proposed Research Service and Its Management Structure

The need for the Ministry to strengthen and streamline its administrative and management structure for research arises from several considerations. First, many developing countries now recognize that the traditional organizations and management procedures as they have evolved in the past do not help to generate the right scientific culture for research to thrive and make a contribution to development. A different administrative framework is needed for the research service to function more effectively. To take one example, the research service needs a line budget of its own in order to ensure the stability and continuity of research programs. To take another example, a different kind of personnel policy is needed for research to build up strong teams of scientists for sustained work around programs that may often take several years to yield useful results. Nothing is more demoralizing for the staff of an experiment station than the loss of its team members time after time. A certain amount of staff mobility should be considered healthy but the research stations should also be able to attract good scientists from outside, even as their own staff members leave to take up new positions elsewhere. The MAF research stations have no such assurance at present in view of their differential service conditions, compared to those of the scientific staff in other research institutions, where the NSTA terms apply.

Second, the creation of PCARRD has changed the role and relationships of the ministry's research service within the national system. This calls for a review of its research management policy if its service is to be effective in the changed research environment. Third, the reorganization of the MAF in 1977 which invested the bureaus with staff functions and decentralized research has created a new situation in terms of administration and management, and this has not been satisfactorily resolved. Fourth, the advent of the Agricultural Support Services Project has created new management demands, which have been largely met through ad hoc arrangements. The Research Coordination Committee, set up in the wake of this project, has not been very effective and the Agricultural Research Office has continued to function largely as an office of the World Bank Project. The larger role envisaged for it in terms of an Office Order of the MAF has not been implemented. Perhaps the Office Order did not fully address all the issues.

The management of the central research stations and the regional research centers which we recommend here calls for the creation of a new identity for research in the MAF. The establishment of the research service as a distinct entity in the administrative structure of the ministry also becomes important, taking into consideration its newly recognized role in the process of development (consider, for example, the contribution made by Masagana 99 to development). The research service of the ministry can interact effectively with PCARRD only if its own credentials are high.

Taking into consideration all these factors, the ISNAR team recommends that the MAF consolidate its present research units into an integrated agricultural research service of the ministry. This service should take the form of the "Research Institute of the Ministry of Agriculture and Food." The institute would include an agricultural research management board (ARMB) and a directorate of research at the headquarters of the ministry. It would further consist of research divisions in the offices of the regional directors of the ministry and a network of central research stations and regional research centers. The head of the Agricultural Research Service would be designated as the Director General of Research and he would report directly to the Minister of Agriculture and Food or to one of the deputy ministers nominated by the minister for this purpose. The director general would have his secretariate in the Ministry with the required scientific and administrative support staff.

Functions of the director general. The director general will perform the following functions:

1) Assist the Minister of Agriculture and Food in developing the research policy of the ministry. Plan the MAF's agricultural research strategy.

2) Supervise and review the work of the central research stations through appropriate reporting and monitoring procedures.

3) Screen and evaluate research programs and projects formulated by the central research stations and regional research centers for funding support from PCARRD.

4) Prepare the budget of the research service for total investment, with the balance allocated according to different components and different sources of funding, including external assistance.

5) Establish mechanisms of close cooperation and coordination with PCARRD and other components of the national research system, specially colleges of agriculture and universities.

6) Develop a manpower plan and arrange training programs (postgraduate, in-country, and on the job) for the scientific and technical staff.

7) Organize programs of cooperation and collaborate with the different international and national agricultural research systems. Coordinate bilateral and multilateral assistance programs for research in the MAF.

8) Develop close linkages with the extension service and with the other divisions and departments of the ministry dealing with agricultural development.

9) Project the image and needs of the Agricultural Research Service in the higher counsels of the government.

The Board of Agricultural Research Management will have an advisory role and will be composed of the bureau directors, regional directors (four of them to be nominated on a rotational basis for two years),

the Executive Director of PCARRD and a number of other members representing diverse interests in the development of the country's agriculture who will be nominated by the Minister of Agriculture and Food. The Director General of the Research Service will be the member secretary of the board and will be responsible for recording its minutes and for initiating action on the board's recommendations. The Minister of Agriculture and Food or one of the deputy ministers nominated by him will be the chairman of the board.

Functions of the Agricultural Research Management Board. In its advisory role, the board will provide a sense of direction to the MAF research service. It will perform the following specific functions:

1) consider the research policy of the MAF and make suggestions to keep it in line with the development needs of the government and the technological requirements of the farmers;

2) review the research programs of the central research stations and regional research centers through periodic reports prepared by the Director General of the Agricultural Research Service in the ministry;

3) review the programs and mechanisms for testing technology on farmers' fields and for strengthening research-extension linkages;

4) examine and approve the budget of the Agricultural Research Service, taking into consideration its balance between the central and regional stations and the different program areas;

5) review the administrative, management, and personnel policies of the Agricultural Research Service to bring these in line with the required environment for productive research.

At the regional level, the regional directors will have the overall responsibility for planning and managing research activities. The regional directors will be assisted by a small research division consisting of specialists in different fields.

Chapter 4
RESEARCH PROGRAM FORMULATION

This chapter reviews the processes of planning and formulation of the research program, stressing the need for formal mechanisms in MAF to ensure flows of information from the government and producers to scientists at the stage of program formulation.

The immediate purpose of an agricultural research system is to carry out a research program to provide reliable information to clients. All of the allocation of funds and careful management of manpower and resources are aimed towards that immediate end. Therefore the system should pay close attention to how that program is formulated to ensure that the program is aimed efficiently at national objectives. The component experiments and studies must ask the right questions; if the questions asked are not the most relevant possible, there will be a degree of inefficiency in the management.

The process of research program formulation in MAF was not addressed in the ARRT report, although there were discussions and recommendations concerning priority setting, planning, and coordination and evaluation of research programs. Some of the emphasis on centralized management and control might be good for administration of personnel and finance, but it might not encourage efficient research program formulation. Further discussions with members of the ARRT and members of the research staff of MAF suggested that program formulation did not follow a well-known, systematized procedure.

This chapter therefore discusses the process of research program formulation, admittedly from a limited base of consultation. After considering some general principles about research management, planning, and program formulation, the specific situation in MAF is considered.

Two Elements of Management

There are at least two important features of management in agricultural research (and in research organizations in general):

1) administrative and financial;

2) research policy and program.

Administrative and financial management is handled within a hierarchical structure where authoritative decisions and rules are handed down from above: a pattern which is common, and appropriate for all bodies responsible for administering public funds. It is reasonably appropriate for handling the implementation of agricultural research programs, although some flexibility is desirable to accommodate the inherent uncertainties of research activities.

To a certain extent the formulation of research policy is also a "top-down" hierarchical process, but the formulation of a research program is best handled by a collegiate, "first amongst equals," managerial approach, where there is widespread consultation among researchers, and leadership is more important than authority. A research program basically consists of the aggregation of many individual experiments and studies put forward by scientists. Frequently the scientists proposing the details of these experiments are more competent to do so than their directors; in principle even the youngest research officer makes direct and original contributions to the program. This collegiate approach is not a familiar pattern of management in many civil services, but it is common in universities and in R&D divisions in industry (in contrast to the strict hierarchical control in production and sales divisions).

In practice, the head of a unit in agricultural research in a ministry is usually held responsible both for administration and program, and the two roles can become confused. But different management instruments are required for the two functions, and it is important that appropriate mechanisms and organizations be in place to facilitate efficient research program formulation. The following section considers what functions these instruments must serve.

Research Program Formulation -- Information Input from Clients

Agricultural research, as indicated earlier in chapter 3, is a continuum from the most fundamental research through strategic and applied research to adaptive and technology "verification" research. The national agricultural research service in most developing countries is the industrial research organization servicing by far the biggest industry, and it requires a research effort at all stages of the continuum. It is not simply concerned with increasing the knowledge base of agriculture, but with solving the most urgent and important problems facing its major industrial clients: the government development planners and the producers (and processors).* The policymakers and planners are anxious to have information on production possibilities and constraints on which to base reliable policies to improve the national economy in areas of high national priority. The immediate positive product of research is information on the potential for improved productivity. Whether the potential is realized or not involves a lot of other factors and agencies other than research. Any increase in production, however, will only come through producers and, in general, producers will not increase production unless this improves their well-being. Where small farmers are averse to risk taking, it is essential that the research service confirm that the proposed technologies can genuinely offer realizable benefits to the producer.

For the research program to be highly relevant to the problems and needs of its clients, there must be an information flow to the researchers from both government development planners and producers (and the world of science). Characteristically, flows should come into the process of program formulation at different stages. Information from

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* There is a third major client of the researcher, the world of science, but this is not commonly neglected.

the national government on development objectives must be available to the highest research council at the stage of determining national priorities and allocation of resources for agricultural research among major commodities and problem areas. On the other hand, information from the producer is particularly important at the "lowest" stage of selecting which experiments and studies will be proposed as basic components of the research program. A review of the full cyclic process follows.

Research priorities and planning

Information on new opportunities for development should also be coming continually from the research community to government planning departments, but to start the iterative process with the national government, national goals are translated into development objectives and thence into broad research objectives to solve development problems and generate opportunities. From these objectives, top research priorities are determined (by PCARRD in the Philippines).

A complex range of criteria is usually applied in deciding national priorities for research. In briefest outline, the criteria include groups concerned with

1) improvement in important aspects of the national economy (level of commodity production, comsumption, employment, income, foreign exchange, etc.);

2) demand and markets for incremental production;

3) urgency for a solution to problems in development programs;

4) distribution of expected benefits (rich/poor, urban/rural, male/female, etc.);

5) chances of success in generating a potential for improved productivity;

6) chances of realizing potential improvements in productivity (dependent on such factors as capacity of input supply services, prices and marketing, farmers' capabilities and constraints, etc.).

In the initial priority-setting and planning stages, emphasis tends to fall more on the first four categories.

The national research priorities are transmitted to the research agencies, usually with a mandate for research in specific areas (or commodities) appropriate to each agency. Financial resources are often allocated along with the mandated responsibility, and suballocations are then made within the agency. Sometimes operational research resources are held in a central fund to be released only when detailed research programs are prepared on a project basis. Sometimes there is a combination of both, depending on national circumstances.

Commodity research planning

An important suballocation of responsibility and resources is then made within a given research mandate (say, for a commodity), bearing heavily on criteria in groups 5 and 6, especially 5. It is essential that the body making allocations (which should include users of technology) has advice from a broad, multidisciplinary group that can highlight the most important constraints to improved production of the particular commodity. This helps to ensure that an integrated and balanced research plan for improved productivity of the commodity can be agreed, and that the suballocations can be efficiently made to those disciplinary areas (or multidisciplinary efforts) that can make the most timely impact. However, it should be noted that this is still a process of planning and allocation of responsibility that is prescribing guidelines for the research program.

Program formulation

These guidelines finally reach the research stations, university departments, and scientists with responsibility for devising experiments and studies on components of the problems facing national development. No matter how tightly focussed the planning mechanism may have been at each stage, the guidelines from the plan will still be wide enough to permit a choice from a very large number of experiments within the priority guidelines. But it is these specific experiments and studies, chosen at the research station level, that are aggregated upwards to form the sectional, departmental, agency, and national research programs.

Choice of experiments

The scientist again has to apply criteria and values to help make these critical choices. Again he/she will be guided by groups 5 and 6 of the criteria indicated above. In addition, however, there is an additional group of criteria:

7) researcher satisfaction (including contribution to world knowledge, progress in discipline, prospects of recognition, reward, promotion, etc.).

These are all laudable, but in the national interest they should not be permitted to dominate, and management should ensure that rewards match contributions to national interests rather than international interests.

It is at this point that a flow of information to the scientist from other clients becomes so important -- from the producers and the supply services of extension -- because the limitations of farmers' resources and farming systems place significant contraints on the kinds of solution to problems that can be accommodated by them. Such restrictions can, for instance, severely limit the range of treatments that can be feasibly tried in an experiment or sharply focus the kind of information that is worth collecting in a survey. Whether information from the farmer is available at this stage can profoundly affect the relevance of the experiments or studies chosen and hence the efficiency of the overall research program.

Moreover, it is the definition of the farmers' main constraints at that point that can determine which research contribution in which discipline may be most relevant in reducing the main limiting factor in production. And it is at this stage that the professional scientific expertise and creativity of the research worker can have its highest expression (and where the information flow from world scientific knowledge suitably interpreted can impinge most effectively). The most relevant experiment may still be within one discipline, but the choice of experiment should be made after consideration by a multidisciplinary group where relative contributions to the production problem can be assessed. Usually (except in developed countries) farmers are not articulate and precise about their technical constraints and they need interpreters in the form of agronomists, socioeconomists, or specially skilled extension workers to serve as proxies for them in such a group.

After this crucial choice of experiments, a reverse process then ensues: experiments are aggregated to section programs, to station programs, and so to ministry research programs and the national research program. On the way, cuts or trimmings will have to be made at strategic management committee meetings to match budgetary resources and national priorities. In particular, the body responsible for preparing the commodity research plan should consider carefully how far the emergent program matches the urgent requirements of the plan and should balance the program elements accordingly to yield a well-integrated commodity research program. But the primary experiments that ultimately determine the relevance of the program to the producers often remain untouched in substance in this process.

Situation in the MAF

Program formulation has been set out at length in order to stress the process and the importance of the two streams of information to the researcher at the research station stage: macro-development requirements from the national plan from the top and micro-requirements of practical profitability and appropriateness (not just ecological) from the farmers in the regions, from the bottom. It is important for management to ensure that efficient mechanisms are in place to facilitate these processes.

The discussion given in the ARRT report on both MAF and PCARRD concentrates mainly on the phases of priority setting, planning, coordination and evaluation of proposed projects and on the monitoring and evaluation programs that are implemented. But the report does not explicitly discuss the process of choice of experiments and studies at the grass-roots stage of program formulation.

Research priority and planning

The boards and committees, in place and proposed in the ARRT Report for establishing research priorities and plans from "the top," seem appropriate to the task if operating regularly and serviced by efficient secretariats. (However, it is noted that the existing Senior Research Coordinating Committee of MAF has not been operating regularly, to the detriment of coordinated research in the ministry.)

PCARRD is well organized to give clear priority guidelines for the national research plan, with good linkages to government policymakers and planners, and a strong secretariat. The share of national research responsibility to be vested in MAF is not well defined at present but would be addressed by the proposed Agricultural Research Board serviced by an appropriate secretariat (or by an agricultural research management board serviced by a directorate of research as suggested in chapter 3). Similarly the regional research committees, with their secretariats, are well structured and linked with the PCARRD regional research coordinating consortia. They should be able to transmit national research priority guidelines to their research stations. The mechanism to facilitate the flow of information from the "government plan" client to the research scientists seems assured, whatever decision might be reached about the precise share of national research responsibility that should be allocated to MAF (as discussed in chapter 2). It is however very important that MAF have strong and determinant representation in the bodies responsible for drawing up integrated and balanced research plans for those commodities for which MAF has primary responsibility for production.

Program formulation

On the other hand, communication from the other client, the producer, does not seem to be so well served. The channels for bringing information on farmers' critical technical constraints to the stage of experiment selection and design do not appear to be clear. The line of communication from producer to researcher to guide program formulation is not discussed in detail in documentation on the PCARRD organization, the accent being heavily on communication and technology transfer from the researcher to the farmer. This is perhaps understandable as this is a direct concern of PCARRDs. However, the stage of program formulation at which experimental details are selected is within the research agencies' stations and not under PCARRD's jurisdiction.

The MAF research system has the great advantage of being closely associated with farmers and extension workers and has the opportunity to establish close linkages. However, formal linkages to research workers are not described, and the ARRT account suggested that research program decisions were to be determined by small groups well above the level of the research station. Careful consideration should be given to ensuring that formal mechanisms are in place so that relevant, interpreted information on farmers' needs reaches the research scientists responsible for the earliest stages of program formulation.

One such formal mechanism could be the requirement that all proposals for experiments or studies must be proposed, discussed, and agreed upon within a group (commodity group, station group, or farming system group, etc.), of those scientists involved, incorporating several disciplines and with proxies to represent farmer and extension interests, meeting as close to the station or field situation as possible. There may need to be some external participation of experienced senior researchers if only in an advisory position.

However, it is not clear where such groups should meet in current circumstances. Experiments need to be selected and designed by professional scientists adequately trained in research methodologies.

Starting with technology verification trials, extension staff with three weeks of extra training cannot be expected to be competent to design sensitive PTVT trials. Such trials will have to be selected and designed at the research station level, at least, where there is a minimum core group of trained researchers. However, research scientists posted on research stations large enough to have a significant range of disciplines should, in due course, be adequately trained to have a group meeting on the station to select experiments leading towards technology modification.

If there are not enough trained professional research staff on a regional research station, it may be necessary to have meetings to formulate primary programs at regional headquarters or the regional research centers, in combined regional or area meetings, or split up perhaps into specific commodity or farming systems groups. As such meetings must involve all the individual scientists proposing experiments, they could be large and lengthy. But they would represent a good investment in time as they are very important for the relevance of the research program and perhaps present the best opportunity in the year for the group to be exposed to realistic feedback from client producers.

The essential requirements for such early meetings are that they be interdisciplinary, have proxies for farmers and extension service capabilities, and be formal, with recorded conclusions. To give them real weight, it could be ruled that only research proposals passed and recorded at such meetings could be considered for inclusion in the research program at the levels of the regional research center, the agricultural research management board, and eventually at PCARRD. In this way, a formal requirement can be incorporated into the system, ensuring that all proposals have been examined at the earliest stage and in the regional setting for compatability with at least some farmers' systems and constraints. This should be one of the major objectives of the regional research system of the MAF for all research programs.

The research program components arising from the regional research stations would be reviewed at the regional research center and ARMB. This would be done to ensure agreement with the research plan priorities previously handed down and for compatibility with budget constraints before they are forwarded to PCARRD suitably grouped into program elements. It is especially important for the national body responsible for deciding on the research priorities within a commodity to review the emergent programs and adjust the balance to match plan requirements.

If findings from on-farm trials or regional station trials reveal deficiencies in technologies that cannot be remedied by adaptive research on regional MAF stations, then the defined problem would naturally be relayed on to the appropriate central research station of MAF, or other appropriate research agency in the PCARRD network, or even onwards to very specialized international research centers.

Relation with PCARRD research network

Regardless of any decision to readjust the balance of MAF efforts in applied research, as discussed in chapter 2, PCARRD is expected to rely heavily on MAF for carrying out the component of adaptive and technology-verification research that is an essential part of the continuum of the national research effort.

The regional research centers will be an important source of feedback about farmers' needs and reactions to newly proposed technology -- reassuring when all goes well, and when it has not gone well, a source of information of why it has not -- and what modifications to the technology might be necessary. Ideally, the scientists reponsible for technology generation will themselves visit the on-farm trials with regional research center staff, but the center staff will remain an independent source of information -- a critical channel of one of the two sources of information necessary at the time experiments are chosen and designed at all levels of applied research.

If PCARRD wished to build in some assurance of attention to farmer requirements in all research designs, it too could insist on formal clearance of research project proposals at interdisciplinary meetings of scientists at an early stage of program formulation where representatives from regional research centers could attend as proxies for farmer interests.

The essential linkage of PCARRD with MAF as far as government policy and national priorities is concerned is at the highest level at the center. The essential linkage of MAF and technology-generating research agencies where the producer client's interests are concerned is in the regions, at the earliest stage of project formulation.

Conclusion

For research priority setting and development of research plans based on national government requirements, it is recommended that the MAF develop the reorganized central and regional research committees into effective bodies with strong servicing secretariats.

For research project formulation, it is recommended that there be established formal multidisciplinary research groups consisting of scientists directly involved in preparing research proposals and representatives of extension and PTVT staff and/or farmers, who must approve research proposals for forwarding to the regional research committees.

Coherent, integrated programs from each regional research center, addressing major production system constraints, and equivalent integrated programs from each central research station addressing commodity constraints, should be presented to the agricultural research management board for submission to PCARRD for release of funds.

Chapter 5
MANPOWER AND TRAINING

This chapter considers the present capacity of the Ministry of Agriculture and Food to conduct research in terms of its trained staff and proposes an increase in both quality and quantity if the ministry is to conduct applied and adaptive research as discussed earlier. The need to establish a scientific career system for ministry research staff and the consequences of not having one are also discussed.

Recent Developments

The policy decisions made in the 1970s to strengthen agricultural research have led to a marked build-up of scientific and technical staff and facilities throughout the Philippines. The two USAID loans (US$5 million in 1975 and US$10 million in 1979) to PCARRD for strengthening research capability in the PCARRD networks were used for a comprehensive development program, including site and utility development, infrastructure, and the provision of modern research facilities. In addition, an extensive manpower development program was initiated. The main thrusts of these efforts were to develop the networks and to increase the quality and quantity of trained manpower necessary to conduct and manage research. However, the principal beneficiaries were the colleges and universities, and the ministry's role has progressively diminished.

The 1981 World Bank Staff Appraisal Report for the ASSP noted that only 0.7 percent of MAF employees held postgraduate credentials and that the ministry was particularly short of highly qualified staff to provide technical leadership in applied research, planning, laboratory analysis, and so forth. The ASSP and other programs are beginning to address this imbalance by awarding postgraduate training opportunities to MAF staff. However, some of the ASSP training slots have been awarded to non-MAF staff because of difficulties in finding MAF staff with qualifications for postgraduate training.

In order to turn the situation around to the point where MAF research personnel are on a scientific and technical par (not to mention salary, research climate, and resources) with their colleagues in the colleges, universities, and PCARRD, a major, long-term commitment to strengthen the MAF will have to be implemented. On paper, the MAF has hundreds of scientists, but in a strictly scientific sense they are not research scientists. The MAF does have an excellent base on which to build. The bureaus are reasonably well equipped and have extensive physical facilities throught the country, but what they lack is trained manpower.

Policy decisions during the past 15 years have had a negative effect on the morale and quality of MAF research personnel. Research on the major commodities in the Philippines -- coconut, sugar, rice, and maize -- is the responsibility of organizations outside the MAF. Associated with this diminished mandate for agricultural research have been the enhanced career opportunities in outside organizations/institutions.

Monetary rewards, increased prestige, and an improved research climate and mandate have attracted many of the MAF staff, while top graduates have tended to not even consider the MAF for a research career.

The ISNAR team proposes in chapters 2 and 3 that the MAF depart from the recent past and take the steps necessary to build up its own strenthened research program. In this context, the team notes that for the first time a serious effort has been made to sharply define the scientific personnel (Position Classification and Compensation Administration Study of Research Positions in the Ministry of Agriculture, September 1983) but this is just one of many steps needed to achieve the objective. Quality is the decisive factor in any research program, and the MAF must agressively seek to bring high-quality researchers back into its programs.

Implications for Training

Concurrent with the commitment to build up applied research and strengthen adaptive research within the MAF over the next 10 to 15 years must be an assessment of the human resources necessary to implement the plan. Since a comprehensive human resource plan for agricultural research for the next 5 to 10 years has not been developed, nor should it be until a clear policy on agricultural research is first laid down, no detailed estimates can be made on proposed net additions to the current stocks of research scientists. Nevertheless, an on-going program of postgraduate training is a feature of the Philippine situation. The data in table 5-1 indicate that a considerable amount of money (both foreign exchange and pesos) is being spent on training. In addition, numerous in-country training activities occur annually. This is not an argument to discontinue training, but to spend the time and money for training in the context of a master manpower plan. Decisions about future training (in-country versus foreign; M.S. versus Ph.D.; agronomy versus plant breeding; etc.,) should be within the context of the plan. A training office should be created within the ministry to coordinate the activities.

The pattern of training indicated in table 5-1 may correspond to specific needs of the MAF, but in the absence of a needs assessment and a master plan, the ISNAR team concludes that the M.S. and Ph.D. degrees being pursued are more the choice of individual students than what the MAF requires. Further, the trainees come from a random number of sites within the Philippines. Upon completion of their postgraduate training, the students return to their home sites, resulting in a random pattern of specific skills scattered throughout the country. This approach may eventually raise the level of competence to the point where good multidisciplinary research could be conducted; however, it will be very expensive in both time and money and is no guarantee that needed research will be conducted. Strong agricultural research programs are characterized by competent scientists working in their given disciplines (entomology, plant breeding, agronomy, soil science, plant pathology, etc.) within the framework of a multidisciplinary team. The master plan for research, followed by an assessment of human and material resources, will also have to address the issues of which teams need to be built up and what skills are needed to form the multidisciplinary teams. A postgraduate training program will follow naturally. Training without clear plans and objectives is a luxury and does not fit in with pressing development problems.

Table 5-1

Foreign and local postgraduate training funded by the Agricultural Support Services Project and the Rainfed Agricultural Resources Project as of 30 June 1985

Ph.D.		M.S.	
Plant Breeding	7	Agronomy	21
Soil Science	6	Animal Science	14
Farming Systems	4	Soil Science	9
Plant Pathology	4	Veterinary Microbiology	6
Agronomy	3	Agricultural Economics	5
Agricultural Economics	2	Food and Nutrition	5
Agricultural Education	2	Rural Development	5
Agricultural Engineering	2	Extension	4
Community Development	2	Plant Pathology	4
Entomology	2	Agribusiness	3
Horticulture	2	Animal Nutrition	2
Microbiology	2	Development Communications	2
Animal Science	1	Pest Management	2
Aquaculture	1	Veterinary Medicine	2
Plant Physiology	1	Veterinary Pathology	2
Public Health	1	Agricultural Engineering	1
Sociology	1	Chemistry	1
Veterinary Pathology	1	Genetics	1
		Horticulture	1
		Plant Breeding	1
		Sociology	1
TOTAL	44	TOTAL	92

Training programs and refresher courses (in-country, on-the-job, and nondegree courses abroad) are important for both research scientists and research technicians. This latter category of personnel is frequently overlooked and the ISNAR team did not come across any reference to training programs for research technicians. If that is the case, it represents a serious weakness in the overall efforts to harness the research potential of the Philippines to solve development problems. The manpower master plan should include training programs for research technicians just as the career system (discussed below) should also include this category of personnel.

Dimension of Training Needs

Until research plans for the proposed national stations and regional centers for the next 10 to 15 years are developed, it will not be possible to explicitly discuss a recruitment policy or the numbers to be trained or the degrees in specific disciplines required to conduct the research. However, estimates can be made on the basis of the proposed upgrading of central stations and regional centers. Each central station would be headed by a research manager and should have a multidisciplinary team of not fewer than eight disciplinary-based principal scientists (agronomists, entomologists, economists, etc.) at the Ph.D. level and an equal number of junior scientists at the M.S. level. Thus, a center would have a minimum of 20 scientific research personnel.

It is more difficult to estimate minimum numbers for the regional centers since they will include stations existing throughout the provinces of the region. These stations (formerly with BAI, BS, BPI) will be the focal point for the provincial technology verification teams (PTVT) and production-oriented research. It is the ISNAR team's opinion that the number of stations could be significantly reduced, but that again will depend upon a national master plan which includes the production-oriented research teams for the regions.

The number of stations forming the regional research center in a region will vary depending upon the number of distinct agroecological zones, commodities grown, and population density. A very rough estimate would be at least one animal-based and not less than two crop-based teams per region. The production-oriented research conducted at these stations should have scientific research teams of at least 10 people at the M.S. level. Thus, a minimum estimate is about 40 scientific research personnel per region. The production teams should be at the M.S. level with the long-term goal of Ph.D.s for the staff comprising the research division for the region. Each region would then have about four stations constituting the regional research center with one of the senior scientists designated as manager for the center as a whole.

In addition to the professional staff at each central or regional station, about two subprofessionals (research technicians) per scientist are required. Eventually this category of personnel should come under the career system the MAF adopts, although the initial emphasis will be on building up the scientific staff to conduct applied and adaptive research. Associated with the central stations and regional centers could be service-oriented staff, e.g., seed multiplication and certification, soil analysis, etc., but they would not be covered by the scientific career system.

The MAF will also have a research secretariat, as proposed in chapter 3, and the staff of this unit will come under the scientific career system. A target number for this unit, including the training office mentioned above, would be about six, with most of this staff having qualifications at the Ph.D. level.

Manpower Plan

The Philippines is one of the few developing countries recognized for the high quality of its education system, and the MAF should take advantage of this fact by sending the majority of its staff to the country's own institutions rather than abroad. Foreign education is more costly per year and usually takes longer than in-country training. The MAF will further benefit because the research will be more relevant and appropriate for Philippine conditions. Nevertheless, a small percentage of the trainees will have to go abroad for specialized courses and degrees not available in the Philippines. In addition, and depending upon foreign reserves, foreign financing, and scholarships, another small percentage should be allowed to pursue advanced degrees abroad to ensure a plurality of ideas and techniques and prevent "in-breeding".

In addition to recruiting and training new staff, considerable emphasis should be placed on the training requirements of existing senior staff and technicians. The relative decline of the MAF's role in research has contributed to a decline in morale. In-country training courses, workshops, and seminars are effective and efficient mechanisms to revive the sense of direction, enthusiasm, and esprit de corps essential for research. One of the first duties of the person assigned to the training office (to be created) in the research secretariat will be to develop the seminars and refresher courses for existing MAF research scientists and technicians. The recruitment of new staff must not overshadow present staff who have continued to work for the MAF and who have made significant contributions. Regular short-term training courses are essential components of any well-designed training strategy for senior agricultural research personnel. These short-term courses could include, among other things, the following: in-country technical courses, in-country or Asian-region monitoring tours, overseas technical courses and conferences, and specialized agricultural research management courses.

As is widely recognized, agricultural research scientists and their support staff must continually keep abreast of advances in agricultural science during their careers. For the most part this updating process must be their own responsibility, requiring them to keep well informed by reading appropriate literature, publishing, and corresponding with scientists locally and abroad who are engaged in similar research. It was reported to the ISNAR team that library facilities and access to the scientific literature at the MAF research stations are not adequate. Increased resources should be devoted to this area as the MAF moves to upgrade its staff and facilities.

The goal to strengthen and expand the role of MAF scientists in applied research will provide new opportunities for current staff as well as new recruits. A central component of the training plan is the need to undertake master's and doctoral degree training during the next five

years. Priority should be given to MAF staff who already have demonstrated interest and capability. Generally speaking, newly recruited staff should have a minimum of two years of satisfactory on-the-job experience before being allowed to begin a formal master's degree program. The ISNAR team recommends that those scientists who have completed a master's degree and who have the commitment and competence should be allowed to register for the doctoral degree. Postgraduate degrees are expensive and guidelines should be established that clearly spell out acceptable time limits for obtaining master's and doctoral degrees in the Philippines and abroad. Above all, however, is the need to select candidates for specific postgraduate degrees that fit into the MAF's overall research strategy.

Career System

There is an urgent need to introduce new grade and salary structures for the research scientists and research administrators employed by MAF. While it is recognized that there are serious economic and legal constraints that will have to be surmounted with sufficient managerial commitments to the policy decisions, it should be feasible to implement the career system gradually over a period of 5 to 10 years. It must be emphasized that what is proposed is not new and revolutionary but will merely bring MAF's research scientists' system of career advancement into line with the prevailing system in NSTA and PCARRD. A career advancement system is a common feature of agricultural research organizations in both developed and developing countries. The objective should be a system to recognize and reward excellence in research and research management. The long-term goal must be a system that includes subprofessionals (research technicians), but initial emphasis will be on the career system for professional staff.

Promotion for ministry researchers has been through the civil service system, which tends to move researchers into administrative positions and away from research. Research is a long-term process and frequent moves can be very disruptive. The MAF research personnel should have a career system that promotes them for their excellence in research but allows them to remain researchers. A policy to recognize and reward quality research with appropriate salary incentives and promotion in place should be made, along with a career system and terms of service similar to NSTA and PCARRD. However, without a career system, the MAF will continue to put money into training only to have people leave (after the mandatory two years for each year of training) for better-paying and scientifically more rewarding jobs elsewhere in the Philippines or abroad. The career system should be selective enough to attract and retain the best researchers. The ISNAR team strongly urges the adoption and implementation of a career system for the MAF research scientists.

The adoption of a proposed career system should contain clear statements regarding the responsibilities and qualities of the individuals to be employed under it. Staff must be recruited and appointed according to their potential as researchers or research managers with a trial period for initial appointments. Peer review of their research will be one of the features of the career system and will occur throughout their service. The terms of service for scientific career staff must be attractive enough to retain them, although

attrition, for whatever reasons, is a common feature of all systems and will have to be factored into the manpower plan.

Conclusion

The priority actions proposed by the ISNAR team are predicated on the basis of the MAF making the policy commitment to an expanded and invigorated research program.

1. The MAF, vis-à-vis NSTA, PCARRD, and the other colleges and universities, has been at a comparative disadvantage in recruiting, motivating, and retaining qualified research scientists and technicians during the past 15 years. In order to reverse this "brain drain" and bring a strong research contribution by the MAF back into its national responsibilities of agricultural development, a career system of employment for research scientists and managers should be established. The Philippines has endorsed the career system concept for researchers and research managers (NSTA/PCARRD) and this should be used as the basis for developing one suited to the MAF. This system should be for motivated research workers and should be applied rather selectively. The long-term goal for the MAF career system will be the inclusion of subprofessional staff (research technicians) who are also a very important factor in all research programs.

2. Appointments to the career system and opportunities for postgraduate training should be within the framework of specific research needs. A manpower plan should be developed along with the adoption and implementation of the career system. A training office should then be created and charged with developing a 10-year program of postgraduate training. The ASSP, Rainfed Resources Development Project, and other programs have large numbers of MAF personnel currently enrolled in master's and doctoral programs. However, many of these people may not be interested in the new research service or they may not qualify because their degree is not in one of the priority areas. Additional sources of funding might be sought to augment training efforts although the numbers away for training from one of the national stations or regional centers should not be so great that the program is seriously impaired.

3. The goal is to build up interdisciplinary teams at the Ph.D. and M.S. levels at each of the central stations and at the M.S. level for the regional centers. The MAF research secretariat, of about six professional staff, should also be at the Ph.D. level. The 10 central stations should each have a minimum of about 20 professional staff with Ph.D. and M.S. degrees split equally. A rough estimate per region is one animal production- and three crop production-oriented research stations, each with a professional staff of about 10 at the M.S. level.

To summarize:

	Ph.D.	M.S.
Research Secretariat	6	-
Central Stations (10)	100	100
Regional Centers (12)	-	480
Total	106	580

Training programs and recruitment to achieve these numbers should take place over the next 5 to 10 years so that the multidisciplinary teams are fully operational within 10 to 15 years. The MAF should target about 20 percent of this staff for Ph.D.s.

4. An integral component of a strong national system will be refresher courses, workshops, seminars, and professional meetings for both the scientific and technical staff. A vigorous program will have to be developed and implemented by the training office. Also associated with this commitment to continued and improved opportunities for professional growth is a need to create adequate libraries at the central stations and regional centers. Library facilities and materials and the timely arrival of national and international scientific journals represent small incremental costs but are essential elements in professionally run research facilities.

Chapter 6
CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes the main findings from the analysis and presents our recommendations.

In the early 1970s, the Government of the Philippines made two important policy decisions to reorganize the national agricultural research system in order to make it an effective instrument of support for agricultural development. One of these decisions, leading to the establishment of the Philippine Council for Agriculture and Resources Research and Development (PCARRD), has marked a turning point in the history of agricultural research in the country. The council, in the last 13 years, has provided a strong sense of purpose and direction so that research in the Philippines today is strongly focussed on development.

The other important decision was to give a lead role to the colleges of agriculture and universities providing technological support for the modernization of the country's agriculture. This was dictated by the practical consideration that much of the country's scientific strength was to be found in these institutions, as the technical panel whose work and recommendations in 1971 led to many of these decisions had determined. The panel noted that the Ministry of Agriculture and Food had the country's better-equipped experiment stations but it had relatively few highly qualified scientists to lead the research drive to modernization.

In retrospect, it is possible to argue that this second decision was taken to buy time and that the idea was not to divest the experiment stations of their important role in applied research on a long-term basis. This perspective, however, got lost with time and it has been increasingly accepted by the policymakers in the Ministry of Agriculture and Food that its own role is mainly in the field of development, while research support will be provided by a network of central and regional stations created by PCARRD, mostly in the colleges of agriculture and universities. The result is that the experiment stations of the bureaus in the Ministry have suffered a relative decline in the last 13 years. Another factor that has contributed to this decline has been the decision of the government that the research function in the Ministry of Agriculture and Food should be decentralized and that the bureaus should mostly have a staff function. A positive development has been the creation of regional integrated, agricultural research stations (or systems) in the provinces, but their role is mainly in the process of technology verification on farmers' fields.

Our own analysis (presented in this report) leads us to conclude that while the colleges of agriculture and the universities will continue to have an important role in the Philippines, it would be unrealistic to believe that the national agricultural research system could be organized mainly around these institutions. They have responded well to the difficult situation that the country faced in the 1970s, but they have

few of the organizational and institutional characteristics of the land-grant colleges of agriculture in the U.S.A. on which they have been modelled. We believe that looking farther into the future, say the next 15 years, the experiment stations of the Ministry of Agriculture and Food should become a more important component of the national research system, which would collaborate with the other components in national and regional programs of applied and basic research. The universities and the colleges of agriculture will be increasingly called upon to take up more basic research during this period. To meet these long-term objectives, the ministry's research system would require modification in structure and organization and would need to upgrade its research staff and career structure.

Recommendations

Based on our analysis, the ISNAR team would like to make the following recommendations:

1) The Ministry of Agriculture and Food should consolidate its present research infrastructure and further develop it into an integrated agricultural research service. This service should take the form of a "Research Institute of the Ministry of Agriculture and Food." The institute would consist of an Agricultural Research Management Board and a Directorate of Research at the headquarters of the ministry. It will further consist of research divisions in the offices of the regional directors of the ministry and a network of central research stations and regional research centers.

2) The ministry should develop on a selective basis a number of central research stations with their main focus on some of the important commodities in the national economy. One of the existing bureau stations or field sites should be identified for this purpose to become (over a period of time) a lead center for multidisciplinary research for that particular commodity. The proposed central stations will work on rice (Malagya), maize (a suitable site could be Claveria), temperate horticultural crops (Baguio), tropical horticultural crops except citrus (Davao), citrus (Lipa), and grain legumes (La Granja). In addition to these central research stations for crop commodities, we propose two other central research stations for livestock -- one in the area of animal health (Alabang) and the other in the area of animal production (Bukidnon). In addition, a central station for fisheries research should be set up at one of the existing sites with its major focus on coastal resources.

   Over and above these stations, the ministry should organize a central soils laboratory with a national mandate in soil research. Social science research in the ministry should be integrated into the research programs of the different stations for crops and livesock.

3) The MAF should organize 12 regional research centers in each of the different regions with the main objective of identifiying production technologies responding to the need of each region. The main focus of research would be on production systems in collaboration with the central research stations, rather than generation of the different

components of technology. These regional centers would collaborate closely with the extension service of the MAF and would have an important responsibility in on farm verification research.

4) The existing commodity institutes should continue to form an important component of the country's research system for agriculture, and the ministry should monitor and evaluate their work through periodic reviews. Also, the ministry should be strongly respresented on the boards of management of these institutes.

5) The ministry should strengthen its administrative and management structure for research. The head of the agricultural research service should be designated as the Director-General of Research and would report directly to the Minister of Agriculture and Food or to one of the deputy ministers nominated by the minister for this purpose. The director-general will have a secretariat in the ministry with required scientific and administrative support staff.

6) The Board of Agricultural Research Management, forming part of the service, will have an advisory role to the minister and will be composed of bureau directors, regional directors (four of them to be nominated by the minister on a rotational basis for two years), executive director of PCARRD, and a number of other members representing diverse interests in the development of the country's agriculture. They will be nominated by the Minister of Agriculture and Food.

7) The regional directors will have the overall responsibility for the planning and management of the research activities of the regional research centers. They will be assisted by a small research division consisting of specialists in different fields.

8) This organization should be effective in determining research priorities, planning resource allocations, and coordinating and monitoring research programs from research centers and stations for project formulation. At the level of the research stations, there should also be formal multidisciplinary research groups consisting of scientists directly involved in preparing research proposals and representatives of extension and PTVT staff and/or farmers who must approve research proposals for forwarding to the regional research division.

9) A career system should be established for the proposed MAF agricultural research service. The NSTA/PCARRD norms recently adopted should serve as a model for the MAF to create one for itself. The MAF's career system would cover the grade structure, conditions for promotion, evaluation, remuneration, and other terms of service.

10) In order to staff the proposed central research stations and regional research centers, a comprehensive manpower plan and training program should be developed. The current strength of MAF employees with postgraduate degrees is very low and significant increases would be needed. Over 100 Ph.D. and 580 M.S. research scientists will be required to staff the proposed stations and centers in the next 10 to 15 years.

ANNEXES

ANNEX 1
Terms of Reference of the Agricultural Research Review Team
of the Ministry of Agriculture and Food

1) Review the status of the MAF research system, with special emphasis on, but not limited to, the following:

   a) its role in the overall/national research system;

   b) specific research programs and projects (including those funded with foreign assistance);

   c) the research functions and relationships of the MAF Research Coordinating Committee (RCC), Agricultural Research Office (ARO), the staff bureaus, regional offices and units, and international research organizations;

   d) the staffing plan, performance rating, and reward system for research personnel;

   e) institutional and technical issues in agricultural research relative to the national, regional, and provincial research thrusts;

   f) its relevance to actual farm needs as well as to existing national research policies and priorities;

   g) existing facilities and manpower including the training program for research staff.

2) Review research and extension linkages within the MAF and between the MAF and relevant institutions, and recommend improvements in linking research and extension.

3) Review the research functions and relationships of the MAF Research Coordinating Committee (RCC), Agricultural Research Office (ARO), the staff bureaus, regional offices and units, and international research organizations.

4) Review research programs and projects of bureaus and regional and foreign-assisted projects with respect to their organization, management, and budgetary systems.

5) Review institutional and technical issues in agricultural research relative to the national, regional, and provincial research thrusts.

6) Review national policies in agricultural research, i.e., livestock research, fisheries, plant and animal breeding, etc., and their relevance to actual needs; recommend research policies for consideration by MAF officials.

7) Review the staffing plan and performance rating and reward systems for research personnel and make recommendations for their improvement.

8) Review the training program for research staff and design an improved research staff/manpower development program responsive to the overall research system and the national thrusts in agriculture.

9) Develop alternative strategies and recommend necessary actions to make the entire MAF research system more efficient, particularly with respect to

   a) the research system itself;

   b) research policies;

   c) personnel management and administration;

   d) program and planning implementation.

10) Recommend further activities/measures necessary to effect a more efficient research-extension linkage.

ANNEX 2
Recommendations of the Agricultural Research Review Team
of the Ministry of Agriculture and Food

1) The Ministry of Agriculture and Food should not limit itself to organizing verification trials; it should also strengthen its capacity in adaptive research based at the regional integrated agricultural research system as well as its applied and adaptive research based at a number of selected stations of the bureaus of the ministry.

2) The research service of the MAF, in consultation with PCARRD, should formulate a 10-year plan for strengthening the adaptive research and verification capacities of the 12 regional offices and for improving the applied research capacity of the MAF research stations on selected commodities.

3) The MAF should concentrate its efforts on three of the regional integrated agricultural research systems in regions 6, 8, and 10 in order to develop them as models.

4) The regional research divisions should be developed as the research arm of the regional offices of the ministry. The chief of a research division must be a person who knows and understands research and has overall responsibility for the quality of research in the region. This individual should integrate, coordinate, and monitor research activities in the region, and should establish linkages with the extension and support services and should develop contacts with the different research institutions in the PCARRD network.

5) The MAF, in consultation with PCARRD, should formulate a 10-year plan to upgrade selected MAF research stations into full-fledged research stations to do applied research on commodities and areas, which will help to overcome current weaknesses in the national research network, for example, in rice and other food crops, horticulture, livestock, animal health, and marine fisheries.

6) The Agricultural Research Office is the logical agency to manage the research stations of the MAF, and for this purpose, the Agricultural Research Office should become institutionalized as an organizational unit of the MAF.

7) The Bureau of Agricultural Economics should be upgraded and strengthened in respect to its manpower base and capacity for undertaking agricultural economics research, studies, and surveys.

8) The research divisions of the regional offices and the research stations of the MAF should submit their research proposals in the form of impact-oriented research programs through the proposed Agricultural Research Board to PCARRD for approval. The existing project approach for this purpose should be replaced.

9. The MAF should make policy decisions that ensure a more simplified procedure for release of funds from the source to the researchers.

10) A reclassification of all research workers of the MAF should be inititiated according to qualification standards formulated by the ministry.

11) The MAF, in consultation with PCARRD, should develop a 10-year plan for building and strengthening the manpower resources for research.

12) The Agricultural Research Board should ensure that procedures are developed for

    a) assessment of existing usable technologies;

    b) periodic review of research and development performance across various stations and regional offices;

    c) strengthening of research, extension, and farmer links through cooperative on-farm verification trials;

    d) formulating and implementing policies to ensure timely and adequate flow of support to research stations.

13) The MAF should compile complete inventories of equipment needed for research, reallocate existing research facilities to five proposed central research stations and 12 regional research stations, ensure sharing of underutilized laboratory and field facilities among MAF research units, repair idle but usable equipment, and strengthen library facilities of the MAF research system.

14) The function of the Research Coordination Committee should be redefined as a policy-making body, and the committee should be renamed as the Agricultural Research Board to be chaired by a deputy minister.

15) The Agricultural Research Office should be headed by an assistant secretary, who would have the overall responsibility for the quality of research and for the efficiency of the MAF research system. The MAF budget for research should be kept in the minister's office to be allocated to the research programs on the recommendations of the head of the Agricultural Research Office.