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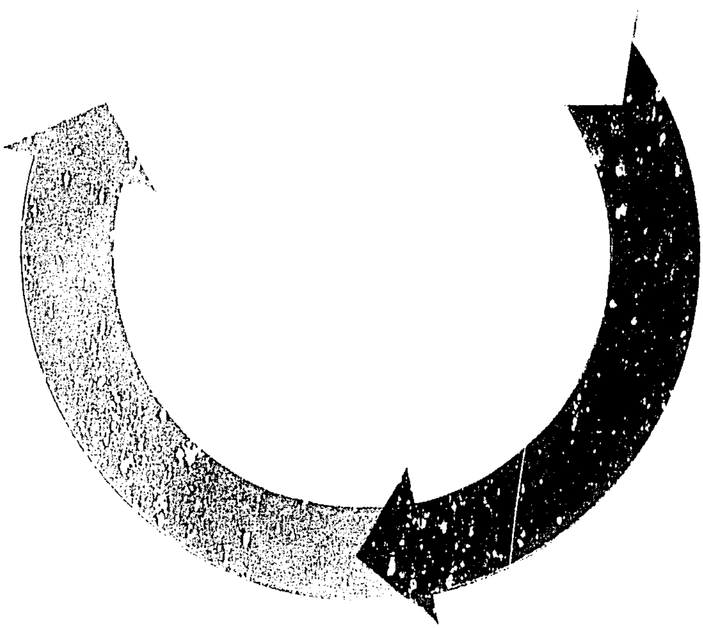
Proceedings of the Workshop on Research Management in Agriculture and Natural Resources in the Philippines, DAP, Tagaytay City, Philippines, 13-17 June 1988



PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY
AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT
Department of Science and Technology

TERNATIONAL SERVICE FOR NATIONAL AGRICULTURAL RESEARCH

RAINFED RESOURCES DEVELOPMENT PROJECT
United States Agency for International Development
And the Government of the Philippines

The cover projects the **Management Cycle.** The yellow arrow stands for **Direction**-giving guidance to the workers, stating objectives, assigning tasks, delegating problems, giving direct instructions, and helping them to understand what constitutes good performance.

The red arrow means **Visibility** – observing ongoing processes and studying key measures of performance.

Lastly, the orange arrow illustrates **Control**-comparing the observed results with the expected or desired results, and giving new direction as required.

Inside the management cycle is the Philippine map which nests the Philippine Research and Development System in Agriculture and Natural Resources.

This Proceedings envisions to embed in the Filipino leaders' psyche, the **Vision** to carve the future of the R & D system, the **Skill** to analyze and solve the day-to-day problems, and the **Creativity** to motivate employees to give their best in fulfilling the System's objectives.

BOOK SERIES NO. 82/1989

Research Management in Agriculture and Natural Resources in the Philippines

Proceedings of the Workshop on Research Management in Agriculture and Natural Resources in the Philippines, Development Academy of the Philippines, Tagaytay City, 13-17 June 1988

PHILIPPINE COUNCIL FOR AGRICULTURE, FORESTRY AND NATURAL RESOURCES RESEARCH AND DEVELOPMENT
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RAINFED RESOURCES DEVELOPMENT PROJECT
Government of the United States Agency for International Development and the Government of the Philippines

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Foreword

The 1988 Workshop on Research Management in Agriculture and Natural Resources in the Philippines was held in the Development Academy of the Philippines, Tagaytay City on June 13. This was organized by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) together with the International Service for National Agricultural Research (ISNAR) based in The Hague, The Netherlands.

It was a major gathering aimed to orient the then new Regional Directors and Assistant Regional Directors for Research of the Department of Agriculture (DA), the Regional Executive Directors and Regional Technical Directors of the Department of Environment and Natural Resources (DENR) and Presidents of state colleges and universities (SCUs) on the organization and management of the research and development (R and D) system in agriculture, forestry and natural resources, and update them on the current trends in research management. During the workshop, experts from the national R and D system and ISNAR discussed major issues in research management; planning and priority setting for R and D in agriculture, forestry and natural resources; and, building and managing the national R and D network.

The response to the workshop was more than what was expected. The high quality of papers presented and the open exchange during the ensuing discussions brought forth new ideas to strengthen research management in the country, at both national and regional levels. The workshop and informal sessions promoted exchange of ideas and information and greater collaboration among agencies concerned with R and D.

This publication documents the papers presented during the workshop. It also includes the lists of speakers and resource persons; moderators and workshop convenors; participants; the steering committee; and the workshop secretariat.

We hope that the workshop was helpful to the participants and that this proceedings will add to the value of the event.

RAMON V. VALMAYOR
Executive Director
PCARRD

Acknowledgment

The success of the Workshop on Research Management in Agriculture and Natural Resources in the Philippines held in June 1988 and the subsequent publication of this proceedings were due to the support of numerous individuals, groups, and institutions.

We would like to express our deep gratitude to the members of the Steering Committee who provided valuable contributions throughout the planning and conduct of the workshop. We have benefitted from the advice and guidance provided by all members. We wish to recognize, particularly, the assistance and support of Dr. Emil Q. Javier and Dr. Larry W. Zuidema of the International Service for National Agricultural Research (ISNAR). Their inputs during the planning stage, and during the workshop have contributed greatly to the workshop's success.

Warm gratitude goes to the participants for their enthusiasm during discussions and workshop sessions; to the resource persons for sharing their time and expertise; and to the moderators and convenors for facilitating workshop deliberations. Their names are listed on pages 363 to 370.

We are indebted to ISNAR for co-sponsoring the workshop, and for cost-sharing the publication of this proceedings. Special thanks also goes to the Rainfed Resources Development Project funded by the United States Agency for International Development (USAID) and the Government of the Philippines for its financial support for the printing of this publication.

We also owe a great deal of thanks to the Department of Agriculture – Agricultural Training Institute and Bureau of Agricultural Research, and the Department of Environment and Natural Resources – Ecosystems Research and Development Bureau for co-sponsoring and providing support services during the conduct of the workshop.

We wish to commend the entire workshop secretariat, particularly Ms. Nora M. Valera, Ms. Bessie M. Burgos and Ms. Virginia L. Mabesa who made excellent preparations and ensured the smooth conduct of the workshop.

Appreciation also goes to the volume editors, Ms. Maruja V. Lorica, Ms. Norma V. Llemit, Mr. Andre L. Acedera, and Ms. Lorna C. Malicsi for editing this proceedings, and Ms. Camela B. Alcala for typing the manuscripts.

Finally, deep gratitude is due the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), through the Executive Director, Dr. Ramon V. Valmayor, for providing financial support for the workshop.

DP Gapasin

DELY P. GAPASIN
Deputy Executive Director
for Research and Development
PCARRD

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Op..aing Remarks

Dely P. Gapasin
Deputy Executive Director
for Research and Development
PCARRD, Los Baños, Laguna

Today is another important landmark in the history of research management in the Philippines. This is the first time that we have gathered the top leaders of agriculture, natural resources, and education under one roof, which is quite a feat, to address the subject of research management. This workshop offers a great challenge and opportunity to all of us, and we are very pleased that you have come here and be with us for the next five days.

This workshop is the first of a series of workshops for the National Agriculture and Resources Research and Development System (NARRDS). This is a joint effort of the International Service for National Agricultural Research (ISNAR) based in The Hague, The Netherlands, the Department of Agriculture, through the Agricultural Training Institute (ATI) and the Bureau of Agricultural Research (BAR), and the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development. We hope that this activity will be the start of a fruitful and continuing partnership between ISNAR and the Philippine research and development system.

For a five-day workshop, the coverage of topics seems formidable, but considering their interconnections, we are positive that we will be able to tackle them satisfactorily. We have planned this workshop since early last year because we want the new leaders of the agriculture and natural resources sectors, who will be involved in research and development decisions and policy making, to understand the R and D system in the country. However, it took this long for the government reorganization to settle down so we can get our right audience. It is for this reason, too, that the workshop has been purposely held here in the Development Academy of the Philippines in Tagaytay, a relatively secluded place, so that all of you can be held captive amidst this beautiful surroundings, to provide an opportunity for closer and more meaningful interactions.

PCARRD in the exercise of its mandate to coordinate the National R and D system in agriculture and natural resources, has always believed that highly trained and motivated personnel are the greatest resource. The success of our R and D efforts is determined by leaders like you and your own researchers who can enhance our development goals. No amount of funding or facilities can work towards our goal of excellence in R and D, unless the right people are involved and properly motivated.

Research has to take place in an environment which we need to understand in a continuing basis, so that we would be able to manage research and development activities more effectively. This is the major reason that has impelled us to hold this workshop to gear our new leaders at the frontliner of R and D, especially at the regional level, to play a more active and dominant role. We feel the need to orient you on how the R and D system works and to update you on the current trends in research management.

In addition, the workshop also provides an excellent opportunity to open to scrutiny the national research and development system. While we would like to think that we have done well in the past, the new insights and fresh ideas that you may bring to this forum, especially our colleagues from ISNAR, can help us do our job better in the future. In the next five days, we hope that we can fully discuss the tasks at hand with a sense of openness and camaraderie. We would like to learn from everyone.

On behalf of PCARRD and the organizers of this workshop, through Drs. Emil Javier and Larry Zuidema of ISNAR, Dr. Segundo Serrano of ATI and Dr. William Dar of BAR, may I express our sincerest welcome and best wishes for a very successful interaction among everyone concerned.

Thank you and good day.

Agricultural Research Management Problems in the Philippines

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Introduction

In the 1970s, the Southeast Asian Center for Graduate Study and Research in Agriculture (SEARCA) embarked on a project called "Research Management: Asia" with financial support from the International Development Research Centre (IDRC. The project was a long-term training program to improve agricultural research management in Asia. The project's achievements included. 1) training of top administrators, middle-level managers, and research staff of numerous research institutes, ministry research stations, and universities; 2) publication of books and case studies in research management; and 3) inclusion of research management in the course offerings of some universities.

"Research Management: Asia" lasted for a decade and ceased in 1982 when support from IDRC was phased out. Some felt it had served its purpose, while others felt there was still a need for it. This workshop indicates a revival of interest in research management in the Philippines. Perhaps the need is now felt because many of those trained under "Research Management: Asia" have assumed new responsibilities, moved out of research, or retired. Obviously, the new research administrators and project managers need training in research management. We are fortunate that the International Service for National Agricultural Research (ISNAR), represented by Dr. Emil Q. Javier and Dr. Larry W. Zuidema, is providing assistance to PCARRD in this undertaking.

Levels and Areas of Concern in Research Management

Various studies have shown that agricultural research yields high returns to investments. This is not the place and time to review the literature on this matter. It is, however, important to give just one good example. The modern rice varieties and related technologies which ushered the "Green Revolution" in the Philippines have enabled the country to produce enough rice, except in years of destructive drought and typhoons, to feed its growing population on the same area, 3.4 M ha, planted to rice since 1965. It has been estimated that if the Philippines has to continue depending on traditional season-bound and lodging varieties, this country would have to be importing over 4 M t of rice worth about US$1 B to feed 58 M people every year.

We have to make similar breakthroughs in corn and other commodities to reduce imports. As much as possible, we have to increase exports to earn foreign exchange which the country badly needs for industrialization. Our chance of making breakthroughs in research depends much on our capability to improve the efficiency and effectiveness of our agricultural institutions. In this regard, training in research management is important particularly because national leaders responsible for planning, budgeting, and critical policy decision-making affecting agricultural research have no scientific background or appreciation for research. Also, most of those providing leadership in research at the operational level have the technical background but have no training in management. Management skills can be developed through training and experience.

Four levels of research management deserve our attention: 1) national level, 2) regional level, 3) institutional level, and 4) research project level.

At the National Level

Research management problems at the national level involve science statesmanship and national policies. Science statesmanship is important in formulating appropriate national policies to:

- Increase investments in agricultural research;
- Rationalize and support a coordinated national agricultural research system to minimize unnecessary duplication of research and wastage of resources, and increase

focus on high priorities;
- Strengthen national scientific manpower development and retention programs; and
- Ensure an atmosphere conducive to scientific creativity and innovation.

The issues at the national level are: 1) How do we develop science statesmanship among key political leaders of the country? 2) How can we ensure the formulation of correct national policies to strengthen the national agricultural research system? Is there an active role that the science community can play to influence correct policy decision-making and national research planning?

At the Regional Level

We recognize the fact that agricultural research, to be relevant, must address actual problems of production in the farm. Agricultural technologies are location- and situation-specific.

For this reason, PCARRD and the Department of Agriculture (DA) recognize the importance of regionalization. For instance, PCARRD's national network of agricultural research institutions consisting of regional research centers and cooperating stations are organized into regional consortia. The DA also organized the Regional Integrated Agricultural Research Systems (RIARS) consisting of key experiment stations charged with the responsibility of adaptive research and technology verification. The RIARS is under the responsibility of DA Regional Directors, while the Regional Research and Development Coordinating Committee provides leadership and establishes policies for the regional consortia.

Research management issues that should be addressed at the regional level include: 1) How can coordinated regional research planning, implementation, monitoring, and evaluation be strengthened? 2) How can we ensure the integration of research planning and budgeting at the regional level? 3) How can we strengthen the linkage between regional research and extension service?

At the Institutional Level

In 1977, the Visayas State College of Agriculture (ViSCA), in cooperation with SEARCA, and Central Luzon State University (CLSU) conducted a survey of research management problems of agricultural research centers and stations in the Philippines. The survey covered 17 major agricultural colleges and 21 research stations of the Department of Agriculture and commodity research institutes. The respondents consisted of 128 researchers, 80 middle-level research management staff, and 38 top-level research administrators. I have a feeling that the findings of this 1977 management survey are still valid today. The survey disclosed among others the following:

- About one-third or 36% of the research administrators tacitly admitted they lacked training in research management; they also lacked competent research directors and experiment station managers.
- Although 95% felt that they had enough freedom to effectively manage their respective units, 14% bewailed the fact that the authority given to them by the governing board or institution head was disproportionately small compared to their responsibilities.
- About 98% of the research administrators felt that the success of the research institution depends on the availability of competent research personnel. Forty-two percent claimed that lack of research personnel was the cause for rejection of research proposals. Forty percent said that research proposals were rejected or disapproved because they were poorly prepared by the research staff.
- About 57% of the institutions reported rapid turnover of research staff due to low salaries.
- Some administrators had negative attitude toward staff development. One administrator said, "Why should I send my research staff for graduate studies when I shall only lose them after they get the M.S. degree?"
- Only 44% of the respondents communicated with other researchers within the country.
- About 43% passed the research proposal through a research committee or review panel; 34% relied on the evaluation done by the research director.
- Sixty-one percent of the middle level management and 83% of the researchers suggested that funds be allocated on project basis so that "misuse of funds can easily be

traced." Almost one-half (44%) of the middle-level management staff also added that there should be an adequate system of performance evaluation of each unit or project to serve as a basis for allocation of research funds.

- Regarding the time lag between approval of the budget and release of funds, only 24% of the top level administrators said that funds were released immediately or within one week after approval. Thirty-seven percent said it took one to four months to release funds. Sixteen percent said funds were not fully used before the end of the year because of late releases.
- Some of the DA stations or commodity research institutes complained about too many activities other than research.
- There seemed to be a clamor for greater autonomy and decentralized operations, as indicated by the following suggestions of respondents;
  - o Regional research centers must be given wider discretion to manage local projects.
  - o Approval of research project must be decentralized.
  - o Redtape must be reduced.
  - o There should be a purchasing unit for every research unit.
  - o Project funds should be entrusted to the regional office rather than held in the central office in Manila.

The issue of decentralization and greater autonomy is a concern largely of the 27 DA research centers and experiment stations.

Although many of these findings may still be valid today, the situation may have changed in some areas of concern. It would be worthwhile to conduct a similar survey to verify current problems of research management at the institutional level. This should be part of a research program on research management.

At the Project Level

Problems of research management at the project level arise depending on institutional leadership and policies as well as the management capability of the project leader himself. A project leader has to contend with policies and practices in his own institution, as well as the human, physical, and financial resource constraints of the project. He has to be resourceful to overcome the constraints. He has to establish linkages with other research departments and with service units within his institution and with external agencies.

The project leader should efficiently and effectively manage his time and those of his research assistants, technicians and laborers. He must ensure the success of the project to maintain his professional prestige and obtain support for succeeding projects. Of course, the success of his project will be judged by the target beneficiaries or end-users of technology – the farmers themselves. Thus, the project manager must be in touch with his target clientele to know their problems and environment, and produce technologies that are useful to them. He must work with extension agents who are responsible for the dissemination of useful research findings.

Some of the important problems at the project level are: 1) How can we develop project leaders who are multidisciplinary in their thinking, who appreciate and use the systems approach to problem analysis, and who are highly motivated and always productive? 2) What evaluation system should be instituted to ensure that there is a regular evaluation of the cost-effectiveness and impact of the project on productivity, livelihood, and environment? 3) What can be done to ensure that institutional policies and support services are supportive of, rather than constraints to, research projects?

Summary

I believe that the ability of a nation to feed its growing population and earn foreign exchange needed for industrialization depends much on the efficiency and effectiveness of its national agricultural research system (NARS). No developing country has a future without a strong agricultural research and development system.

Improvement of research management at the national, regional, institutional, and project levels is important. Management problems and issues differ at these different levels. Management training is important particularly because those responsible for far-reaching policy decisions, planning, and budgeting at the national level usually have no scientific background, or lack the proper orientation. Also, those providing leadership at the regional, institutional, and project levels have technical training but lack training in management.

Lastly, research on research management must be given more attention in order to understand fully the actual research management problems. Research management training courses, to be effective and useful, must address the real problems of research management at the operational level. Otherwise, research management courses or training programs become too academic and useful only insofar as improving the curriculum vitae of those who take the course.

Module I:
Selected Issues
in Research Manageme1

Organizational Design Issues in Agricultural Research in the Philippines: Structure at the National Level

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Introduction

Organizations are social entities where people take part to achieve some shared purpose through division of labor continuously over time. To make them work properly, organizations must be appropriately designed and structured, staffed, and provided with resources. Designing organizations is the task of bringing about coherence among the goals and purposes for which the organization exists, the patterns of division of labor and inter-unit coordination, and the people who do the work.

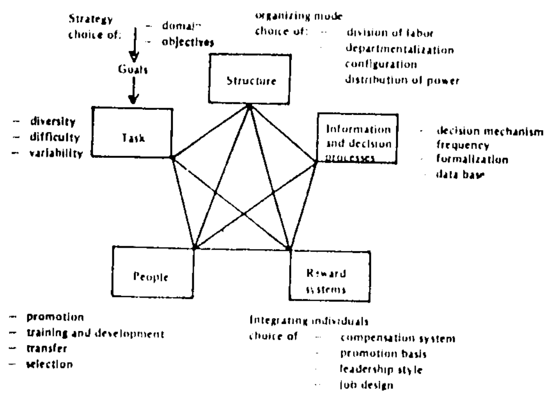
Galbraith's Pentagon

The concept of organizational design is readily understood and grasped in the model in Figure 1 developed by Galbraith (1977). In this conceptual model, the task of managing organizations becomes a matter of making strategic choices among the five major variables of **tasks, structure, information, reward systems and people,** and maintaining coherence of these intertwined choices over time.

McKinsey 7-S Framework

The literature is replete with conceptual models of how organizations work and how they are supposed to be managed. Galbraith's pentagon is only one of several popular oversimplifications of what is a very complex structure and process.

A more recent example is the McKinsey 7-S framework (Figure 2). Peters and Waterman (1982) in their widely acclaimed



From: Galbraith, J.R. 1977. Organization Design, Addison-Wesley. p. 31.

Fig. 1. Concept of Organization Design.

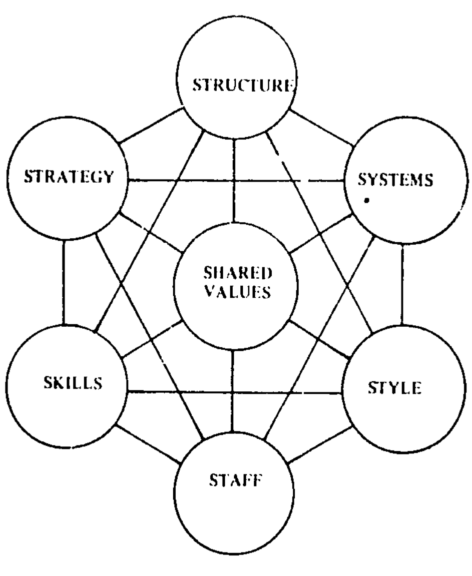


Fig. 2. McKinsey 7-S framework.

paperback "In Search of Excellence" studied 43 of the largest and the most successful businesses in America with the objective of synthesizing the lessons that can be learned from America's best managed companies. The pair summarized their observations in seven major factors which for effect they expressed in words all starting with S and which they arranged in a benzene ring with a focal point.

The McKinsey 7-S framework covers essentially the same ground as Galbraith's but with a stronger emphasis on the human side of the enterprise, particularly the crucial role of **shared values.**

The Twelve Cardinals of ISNAR

Directly relevant to our concerns is another conceptual framework, developed by ISNAR, which was based on several years of experience working with developing countries. ISNAR identified 12 factors, broadly defined as policy, structure, and management, which are critical points of intervention in building effective national agricultural research systems:

The policy context of agricultural research

- Interactions between national development policy and agricultural research.
- Formulation of agricultural research policy: priority setting, resource allocation, and long-term planning.

Structure and organization of agricultural research

- Structure and organizations of research systems.
- Linkages between NARS and policymakers.
- Linkages between NARS, the technology transfer system and users.
- Linkages between NARS and external sources of knowledge.

Management of agricultural research

- Program formulation and program budgeting.
- Monitoring and evaluation.
- Information management.
- Development and management of human resources.

- o Development and management of physical resources.
- o Acquisition and management of financial resources.

These three conceptual models are in fact checklists of the key considerations, both in designing and managing organizations. The considerations represent the variables which managers and leaders continually adjust and manipulate to make organizations work. A key variable common to all is organizational structure.

Structure as a Key Organizational Design Issue

Organization as a System of Flows

Structure is the established pattern of relationships among the components or parts of the organization (Kast and Rosenzweig, 1985). The whole is differentiated and divided into major components and subcomponents which are kept together by a pattern of formal relationships and duties. This planned system of patterned relationships among components is recognized as the **formal organization** we find in organograms, manuals, and position descriptions.

However, the formal structure, while it serves the purpose of being the basic framework, only describes partly how an organization works.

The dichotomy of formal vs informal structure is explained by Mintzberg (1979) in his modern view of **organization as a system of flows**. The formal structure represents the flow of formal authority as between superiors and subordinates, as well as the flow of regulated activity in the organization. Regulated activity includes the standard operating work flow, the flow of control information and decisions, and the flow of staff information.

Outside the formal flows are: 1) flows of informal communication, 2) system of work constellations, and 3) system of ad hoc decision processes.

This modern view of structure and organization is very pertinent to the discussion as the informal aspects of structure explain how organizations with identical formal structures can behave and perform so differently. Expressed in a different way, these suggest how organizations can be made to work even with very difficult formal structures.

Structure at the National Level in the Philippine Agricultural Research System

The Philippine agricultural research system has been reviewed many times over and its ills diagnosed at length. There is by and large a meeting of the minds of what the problems are, but the debate continues on their causality and relative importance. External observers, probably less burdened by parochial interests, are quick to give solutions. And as usual those who have to live with the solutions find it difficult to decide.

As one who has been closely associated with the system and who has probably contributed to its difficulties, I am probably the least qualified to render a diagnosis much less prescribe a cure. But enjoying the advantage of distance and invoking the privilege of wearing a different institutional hat, I will proceed to do so, not so much as to provide an answer, but more in the spirit of stimulating thinking and discussion.

After some reflection, it appears to me that the problems of Philippine agricultural research are derived from two basic conditions — the inadequacy of resources and the fragmentation of research efforts. The former obviously is more important to most researchers and managers in the system but it is not the focus of this paper.

The Problem of Multiple Organizations and Overlapping Mandates

The fragmentation of agricultural research in the country traces its origins to the structure of the Executive branch of the government. At the cabinet level, the departments are organized along different dimensions which logically end in a multiplicity of cabinet level organs with a stake in and responsible for agricultural research. Along the commodity dimension, crops, livestock, and now fisheries are in one department, while forestry is in another. Intersecting with the commodity dimension are the social services functions of education, science, and health (nutrition aspects). And, of course, agrarian reform.

In addition, in the previous government, there were three commodity parastatals which reported directly to the Office of the President.

Each of these national level organizations has implementing units, wholly or partly dedicated to agricultural research, geographically spread all over the country.

Basic National Research System Models

The problem of overlapping mandates is not unique to the Philippines, and it is a universal organizational dilemma. Different countries have dealt with the problem in different ways. The structures which have evolved may be broadly categorized into four basic models[1] as follows:

1. Dispersed System Model
   - o research dispersed over several ministries and universities
   - o coordination usually achieved, if at all, through an expert body which loosely advises government and the ministries on research directions, priorities, and broad levels of support

2. Ministry of Agriculture Model
   - o the bulk of research conducted in a dominant Ministry of Agriculture
   - o the research branch is part of the Ministry of Agriculture's bureaucracy

3. Semi-Autonomous and/or Autonomous National Research Institute
   - o the main body of agricultural research is organized into a semi-autonomous and/or autonomous national institute
   - o usually attached to the Ministry of Agriculture for purposes of coordination and its board chaired by the Agriculture Minister

4. Research Council Model
   - o research dispersed across several ministries and universities
   - o coordination achieved by a research council usually chaired by the Minister of Agriculture or the Minister of Science
   - o may have a combination of policy coordination, research coordination, administering, and funding functions

[1] The basic system models do not exist in pure form. Very often, a combination of features is found.

Given the four typologies, it is interesting to recall how the Philippine system evolved to what it is now. Fifteen years ago, before PCARRD, the Philippine system was essentially a Dispersed System Model with a relatively innocuous body (the former NSDB) providing loose policy direction and coordination and with limited funding. People were generally lukewarm, if not unhappy, with the system, and there was a call for reform. The government convened a multisectoral national task force to assess the situation and to make a recommendation.

The national task force must have recognized and considered the different basic options but came up with the research council model. Why?

Since the bulk of agricultural research cannot be found in the Department of Agriculture, the second model must have been summarily ruled out. Regarding the third type, a semi-autonomous or autonomous research institute would have meant the dismemberment of the powerful bureaus in the Department and would have been violently objected to. In fact this tug of war continues to the present. In any case, the universities would have objected to it, and the National Science Development Board (NSDB) would not have consented unless the new national institute was under it. The most obvious option, therefore, was the research council model.

The inspiration to the council model was the Indian Council of Agricultural Research (ICAR), which in turn was patterned after the United Kingdom Agricultural Research Council (UK-ARC). In retrospect the decision was a foregone conclusion when the task force under external funding was sent to India to observe ICAR.

As pointed out earlier, research councils may have policy coordinating, research coordinating, administering, and funding powers. The Indian Council was an administering council attached to the Federal Ministry of Agriculture and operated its own implementing institutes. In addition, it has responsibility over the federal agricultural universities.

There was an attempt to fashion the proposed Philippine council in the mold of ICAR but the idea was voted down by the universities.

This brief history is very relevant as it explains the background to the problems which the national research system now faces.

Problems of a Coordinating Council

Denied the authority to administer, the new Council was left with the coordinating function and a hunting license to fund research. However, coordinating councils are only as effective as the administrative weight and authority they can throw around and the resources at their disposal. This is certainly true in the Philippines.

Unfortunately, the new Council had very preciously little of either. It was a lightweight administratively and its funding clout relied on the good graces of the Department of Budget and Management (DBM) which was not very keen on its creation. Fortified with external grants, the Council had a lot of clout in the initial years but that soon dried up. The then Minister of Agriculture lent much of his weight to his creation but he soon passed away.

The preceding discussion is not at all meant to suggest that PCARRD was a fatally flawed model. The concept was a product of its time and its principal architects. Except, perhaps for a few who strongly insist otherwise, most people who have been associated with Philippine agriculture during the last two decades believe it has essentially achieved the purpose for which it was designed.

But it was not a perfect model by any means. The weakness incipient to a coordinating council with little administrative clout and limited resource sharing potential cannot be denied. It must have been obvious to those who battled for a powerful council at its conception and even to those who delimited its role. There were many interests to be served. And unfortunately that condition was the price of its birth

But organizations are not inert. As living social institutions they have to continually adapt to the changing environment to perform and survive. Organizational design, therefore, is never complete; it is a continuing, ongoing process (Kast and Rosenzweig, 1985). A well-designed organization is not a stable solution to achieve but a development process to keep active (Nystrom and Starbuck, 1981).

It is in this spirit that the Philippine national research system and the Council should look at itself and the future.

A Review of Alternatives

It is always an irony that in order to peer into the future, one has to look to the past. Indeed as we approach the end of the century, what are the alternatives as far as the basic structure of the national research system is concerned? Let us return to the four major typologies.

Dispersed System Model

The Philippine research system is more dispersed now than 15 years ago. Instead of one national university with most of the high level manpower and the better facilities, now there are several regional universities with very well trained staff, good leadership and much improved facilities.

There is nothing inherently wrong in a decentralized, dispersed research system. In fact this appears to be the dominant model in developed countries where there are many universities with strong research traditions. Research quality issues are effectively dealt with by the autonomous subcenters. Relevance and accountability are built into the system through the natural checks and balances inherent in open societies where there are strong producer groups, articulate consumer and environmental lobbies, free and effective communications, and a very active private sector.

Under these conditions, all one really needs is a highly respected body such as a national academy of science to advise government and the ministries of broad directions and priorities, and levels of support and a conduit for non-structural (i.e. competitive) research grants.

With the former NSDB and the venerable National Research Council of the Philippines (NRCP), this was in fact what we had. Since the system did not work satisfactorily, one can assume that the enabling conditions are not present. In other words, we had a modern structure for a Third World environment.

One of the alternatives proposed in the last government reorganization was the **Land Grant Universities variant** of the dispersed system model, a system unique to the United States but which was only partially adopted when the Philippine agricultural research system was started under American colonial administration at the beginning of the century. The proponents sought to capitalize on the strength of the universities and suggested that the state universities formally take over the research responsibility in their respective regions.

Under this scheme, a lot of new resources will have to be channelled to some universities in order for the regions to be equitably served. Since resources are limited, this will mean that the lack of capacity in the Department of Agriculture which to my mind is the most immediate concern will have to be addressed at some later date.

As one who had been in the university in all my professional life, in the context of our situation in the Philippines, I have reservations to this model at this time. For one the commitment of university administration to research is uneven. All our state universities have severe resource inadequacies. In a budget crunch and with strong student pressure, research is usually sacrificed for the needs of the main function of teaching. For example, recent developments in the national university have raised serious questions on the priority accorded to research. In addition the agricultural faculty will not always be dominant in the prevailing comprehensive university model in the educational system.

In any case, the government apparently was not ready to accept the proposal. I will not be surprised if the issue is raised again, say, 15 years from now, by which time it may get a better hearing.

The Ministry of Agriculture Model

During the American occupation, through the Commonwealth and early post liberation period, the Bureaus of the Department of Agriculture constituted the greater part of our research capacity in agriculture. Thus for about 50 years, we had a Ministry of Agriculture model. The shift occurred during post war rehabilitation, with the UP-Cornell contract and rapid development of UPLB, further reinforced by PCARRD's support to the other universities during the martial law period.

For the Department of Agriculture to regain its dominant position, substantial resources will have to be generated to recruit and train scientists and build up facilities within the Department. Unfortunately, it will be a tragic waste of resources to duplicate the established competence in the universities. Thus to adopt this model at this time, the Department has to take over the free-standing research in the universities like the tobacco and cotton centers in Mariano Marcos State University (MMSU); agriculture and postharvest in Central Luzon State University (CLSU); Institute of Plant Breeding (IPB), National Crop Protection Center (NCPC), Farming Systems and Soil Resources Institute (FSSRI) and Dairy Training Research Institute (DTRI) at the University of the Philippines at Los Baños (UPLB); rootcrops and coconut at Visayas State College of Agriculture (ViSCA); beef cattle and pastures at Central Mindanao University (CMU), and corn and plantation crops at the University of Southern Mindanao (USM). The Department must at the same time improve the conditions of service of its scientists.

However, in addition to the opposition the universities will certainly put up; it is extremely doubtful if a naked, bureaucratic grab will be a practical and effective arrangement. Since the research institutes cannot be physically transferred, their day-to-day supervision is better retained by the universities where the research units can avail of the utilities, services, and the administrative infrastructure of the parent universities.

The only way the model can work is for the Department to assume funding responsibility for the free-standing university research units, have control over general directions and priorities, but leave the appointments, salary scales, business operations, and general administration and supervision to the universities. The Department can be assured of relevance of research to Department priorities without being bogged down with the day-to-day task of organizing and implementing research. Many of the universities probably will be only too happy to be relieved of the funding obligation.

Thus, one would have a hybrid Ministry of Agriculture – University basic structure.

Semi-Autonomous or Autonomous National Institute Model

The basic justification for a semi-autonomous or autonomous national research institute model is the hoped-for autonomy and flexibility the status would imply. In the present context in the Philippines, the need for autonomy and flexibility is not at all that pressing. The privileges of an autonomous research institute can be no more than the parastatal status of the commodity authorities; the critical agency designation of the Department of Science and Technology (DOST) and the academic freedom in the universities. The only research units which do not as yet enjoy relative autonomy and flexibility are the research units within the Department of Agriculture proper.

Thus, the Department of Agriculture may decide to put all its research programs into a semi-autonomous research institute attached to the Department. This institute, however, will not be a dominant feature of the national system.

Any attempt to incorporate the free-standing research units in the universities to a proposed national institute will meet the same objections as the Ministry of Agriculture model.

Research Council Model

All the above lead us back to the Research Council Model and its several variants.

Administering Council Variant. Its attraction to those who prefer to see a strong research council which can truly set directions and priorities remains. This would mean centralizing research institutes and centers from the universities and the ministries under the supervision and control of the research council. This will certainly improve coordination but would be challenged whether this will necessarily lead to more relevant, quality research and to better coordination with extension.

As this will require a major restructuring which will affect established institutions, a consensus in the research community itself is unlikely. The issue boils down whether there is sufficient political will to get on with it inspite of the expected objections.

Coordinating Council with Budget Clout. The problem with coordinating councils is that they work only on paper. The only exception is the National Economic and Development Authority (NEDA), but only because the President of the Republic chairs it. Even then, at some point economic policy planning in the previous government was dictated by the Department of Finance and by the Industry. The Department of Agriculture was able to effectively coordinate agriculture only by creating RCPCC and its successor agency, the National Food and Agriculture Council (NFAC), with the President also at the chair. In order to function well, coordinating councils must have a lot of administrative weight to throw around backed up by resources. This is certainly as true in the Philippine bureaucracy as elsewhere.

Since it is unlikely that we can convince the President to chair PCARRD, the only recourse is by endowing the Council with more budget clout. At this point, PCARRD has been able to negotiate an arrangement with the DBM for the latter to consider the Council's budget recommendations. However, PCARRD's role is informational and advisory and not binding.

The DBM probably has gone as far as it is willing to accommodate PCARRD. Realistically, PCARRD cannot and should not expect more.

The nearest thing to a permanent solution is a policy decision preferably at the Cabinet level which will expand the Grants-In-Aid (GIA) budget of the Council to a certain level which will allow PCARRD to steer the national research system without dominating it. From experience if 20-30% of the total research pie can be disbursed by the Council on a competitive grant basis, PCARRD should be able to effectively coordinate research as it did during its early years. Unfortunately PCARRD's GIA is only 5-10% of the market.

Epilogue

The treatment of the subject so far had been from a strictly structuralist point of view. Recalling the concept of Mintzberg, we have been occupied solely by the flow of authority as a determinant of organizational structure.

If the Council has performed, as many of us strongly believe so, inspite of the weakness of a coordinating council without budget teeth, i.e., a deficiency in the basic structure which has to do with the flow of real authority, then the informal systems of flows in the Mintzberg terminology must have been at work.

It is the role of those concerned with organizational design and those managing and leading the system to recognize and further reinforce these non-formal dimensions even as the system struggles for fundamental reform in its basic structure.

Adjustment Mechanisms to a Suboptimal Structure

In the review of alternatives, we went over very briefly the four major typologies of national level system structures. It should be pointed out that no single model fits all circumstances. The appropriate model is determined by many variables. One has to look into the specifics of each situation to assess the fit of the structure with considerations like size and complexity, bureaucratic tradition, with available expertise and resources, the nature of the major problems confronting the system, etc.

In principle, we can make over our research system along the lines of any one of the four major typologies and others which may yet emerge. However, the change-over will require different amounts of restructuring. The problem really is the amount of restructuring which a system is willing and able to tolerate.

Depending upon one's perspective, either the present Council is hopelessly inappropriate and should, therefore, deserve a major restructuring; or the present Council can be made to work better with evolutionary rather than revolutionary changes. It should be obvious that the present discussion is partial to the second course.

This last action draws attention away from the basic structure problem and moves on the adjustment mechanism which organizations employ to cope or make do with their existing structure.

One set of adjustment mechanisms are events, arrangements and processes outside the formal flow of authority, materials, decisions and information which somehow reinforce and strengthen the suboptimal structure of the Council.

These informal processes of course are known to those who participate in them. I will highlight several and hope the ensuing discussion will bring to light more of these coping mechanisms.

The other adjustment mechanisms have to do with the other sides of the organizational design polygon: the adjustment of tasks, of information processes, of people, and of reward systems.

Subject Matter Work Constellations

In management language, informal ,work constellations are voluntary cliques of individuals and subcomponents of an organization which perform useful work, but which cut across vertical (hierarchy) and lateral (departments) structures in the process. They are loosely coupled, quasi-independent cliques who work on decisions appropriate to their own level in the hierarchy (Mintzberg, 1979). Many such work constellations operate at the individual level. The major ones at the institute level are officially sanctioned but are informal in the sense of being outside the formal structure.

A very long standing subject matter work constellation which has long served the country and the research system well is the Philippine Seed Board (PSB) and its supporting national cooperative variety trials. The PSB mechanism transcends the formal bureaucratic boundaries but effectively coordinates a very important facet of agricultural research from crop breeding to selection to variety release and seed production and distribution.

Another long and fruitful subject matter work constellation is the tie-up between the Bureau of Plant Industry (BPI) and UPLB on crop protection research, training and pest surveillance, and monitoring.

In livestock research, the work constellation on artificial insemination involving the Bureau of Animal Industry (BAI) and DTRI was very successful for many years. The present carabao upgrading project involving CLSU, UPLB and BAI builds upon that experience.

Regional Work Constellations

Some work constellations have distinct geographical character. One recent example is the DA Region VIII — ViSCA farming systems linkage. The coverage includes research as well as training and extension.

At the onset, PCARRD management recognized the need for close collaboration at the regional level and has tried to formalize its response by way of regional research consortia. Unfortunately, the concept has had indifferent results and apparently has been overtaken by the regionalization of extension and research in the Department of Agriculture.

The problem of regional work constellations remains as one of the real major challenges facing the Department, the universities, and the Council. During the week I hope we shall give sufficient attention to the problem of how to make the system work at the regional level.

Functional Differentiation of Institutional Roles in the Research Extension Spectrum

A major organization design variable is the strategic choice of institutional domains and tasks. The formal mandates of the independent components of the Philippine research system are overlapping. Should each of the components insists on full implementation of its respective charter, there will be chaos. The institutions are fully aware of these potential conflicts and have adjusted their domains and tasks accordingly.

What is interesting in the phenomenon though, is none of the components have amended their formal mandates. Neither have they changed their operational mission statements. In other words, major organizational decisions are being taken in a rather informal nevertheless decisive way.

This process of adjustment is most pronounced in the evolution of the UP College of Agriculture, the principal implementing research unit of the national system. The University of the Philippines yielded to the pressure of its campuses, particularly Los Baños, for autonomy and evolved into a multiversity with several semi-autonomous units, UP Los Baños, being one of them. UPLB in turn differentiated further into more subcomponents and gave birth to a College of Arts and Sciences.

Partly in recognition of the reality of a College of Arts and Sciences in the campus and the growing strength of the other state colleges of agriculture, UPCA began to stake out a niche where before it had the whole field for itself. This found expression in the establishment of specialized research units in the faculty of agriculture, namely, the Institute of Plant Breeding (IPB), the National Crop Protection Center (NCPC), the Farming Systems and Soil Resources Institute (FSSRI), the Institute of Animal Science (IAS), and the Institute of Food Science and

Technology (IFOST).

The idea was to position UPCA in the applied-strategic research part of the research spectrum, giving way to the Department of Agriculture and the regional schools in the area of adaptive research, and nudging the College of Arts and Sciences to move upstream. The transition was completed later by UPLB with the creation of three basic science institutes (chemistry, biology, mathematics) in the College of Arts and Sciences.

The other state colleges and universities followed suit and organized similar specialized research units, often with the blessing of the Council. However recognizing their comparative advantage in terms of location specificity, several of the state colleges of agriculture and universities at the same time developed linkages with the regional offices of the Department of Agriculture for adaptive research and extension.

Part of the Department of Agriculture, on the other hand, was going downstream research-wise. Keenly aware of the need for adaptive research to link directly with its extension functions, regional research units called Regional Integrated Agricultural Research System (RIARS) were established in the 12 regional administrations.

Figure 3 is a diagrammatic representation of what might be the roles of different parts of the research system along the research-extension spectrum. Should the components find the construct acceptable, they should be encouraged to move for-

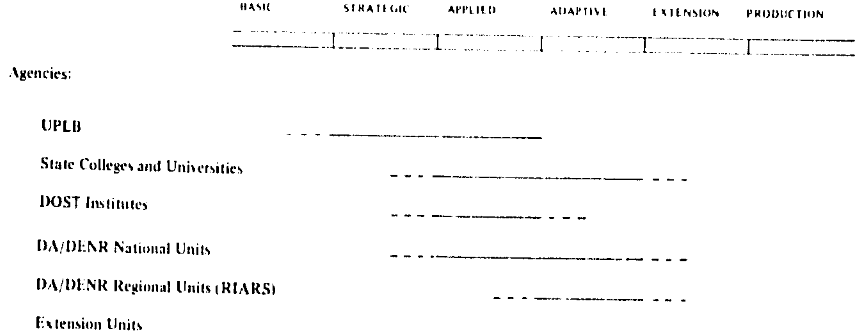


Fig. 3. Functional differentiation of roles in the research-extension spectrum

mally along these lines and thereby effectively providing the bases for a functionally differentiated but integrated system.

Information Processes

In performing work to achieve the purposes for which the organization is established, work must be divided and shared among the individuals and components of the organization. Tasks are differentiated vertically (hierarchy of authority) and horizontally (departmentalization). For all parts of the organization to function smoothly, the appropriate information and decisions must flow through the sytem in a timely manner.

The standard flow of information and decisions is through the hierarchy of authority. In the absence of a formal hierarchy, the next best way of influencing decisions and behavior of autonomous institutions is through information.

PCARRD should be commended, therefore, for its relatively well-developed information and communication system. Given the autonomy of the different parts of the system, an information system widely shared among all members allows the members to make rational decisions vis-a-vis their respective roles and functions in the network.

Reward Systems

Reward systems operate at the level of institutions and individuals. A unique feature of the Philippine research system is the practice of additional compensations for research – the honoraria system. Formally, the objectives are to encourage individuals to conduct more and better research. A second feature, quite common to coordinating councils, is the practice of competitive matching research grants.

Both practices have been imaginatively exploited by the Council to make up for its lack of authority. The Council encourages or develops research proposals in areas which it considers of high priority. With the prospects of additional funding and the personal incentive of the honoraria system, the Council has succeeded in influencing a great deal (not all!) of the programs of the autonomous parts of the system.

Summary and Conclusions

Structure is the established pattern of relationships among the components or parts of the organization. It is one of the key variables in the design and management of organizations.

Structure at the national system level continues to be a serious concern in the Philippine agricultural research system. The system achieved substantial progress during the last 15 years with the present research coordinating council. However, the research council's lack of real authority raises doubts in its ability to effectively steer the research system in the coming years.

Among several alternatives, it is suggested that providing the research council 20-30% of the total research pie to disburse on a competitive grant basis should give the council sufficient leverage without unnecessarily dominating the system.

Given the reality of a suboptimal national level structure, attention was drawn to the adjustment mechanisms outside the hierarchy of authority which tend to make up for structural weakness. Several examples of informal subject matter and regional work constellations were cited as part of the informal system of flows which probably has enabled the Philippine research system to perform inspite of a research coordinating council with limited administrative authority and funding clout.

Strategic choices in the other major design variables of tasks, information and reward systems were similarly discussed and related to the problem of structure.

The participants in the workshop who are senior managers of the national research system are encouraged to recognize and seek yet more examples of the informal adjustment processes and mechanisms which tend to reinforce the research system even as it struggles for fundamental reform in its basic structure.

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Priority Setting and Resource Allocation In Agricultural Research: An Overview

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Introduction

As public expenditures rise for agricultural research, there is increasing pressure to apply the same rational, economic standards by which other forms of public investments are judged. Increasingly research institutions are asked to make their research objectives more explicit, their research outcomes and expected dates of completion more definitive and the expected costs and benefits more transparent.

Crucial to this demand for greater transparency and accountability are the questions: What are the priorities for agricultural research? And how are they set?

Conceptual Difficulties in Priority Setting

Priority setting in public agricultural research has traditionally been an intuitive, largely informal and subjective exercise. It is also often very diffused, and contrary to some popular notions, outside the scientific community, extremely complicated. In practice decisions are made on the informed judgement by its most senior practitioners and administrators backed up by experience.

In trying to understand the research priority setting process, particularly the difficulties involved in the attempts to make it more formal, objective, systematic and quantitative, the following issues come to mind:

Agricultural Research as a Mission-Oriented Activity

As a publicly funded activity, agricultural research derives its legitimacy from its proven capacity to contribute to the attainment of certain goals of society. Unlike other branches of science which are fundamental in nature, agriculture by definition is a a mission-oriented or goal-driven activity. Thus all agricultural research however conceived seek and find their justification in some potential public good.

Multiplicity and Lack of Ordering of National Development Goals

However, relating agricultural research to the public good is at the same time simple and difficult. The goals of national development are always multiple, often overlapping and at times conflicting. Perhaps for this reason there is rarely a national consensus on their ordering of priorities. Obviously the optimization of a function involving multiple, overlapping and sometimes conflicting objectives is a complex political and mathematical exercise.

Uncertainty Inherent in Research Inputs and Outcomes

Unlike in many government projects and services, where results can be predicted with a great amount of precision, research is fraught with uncertainties of all kinds. Although no scientist ever embarks on a research enterprise without absolutely any chance of success very few would voluntarily dare a formal and precise prediction of a positive outcome. One discovery leads to another and some of the most important discoveries and inventions were certainly not planned. Therefore, estimates of research inputs, outputs, and timing could be very speculative.

Attribution of Impact to Research Results

Research results by themselves usually do not contribute independently and directly to the attainment of development goals. They are subsumed, embodied and/or combined with several other factors which collectively bring about the realization of such goals. A good hybrid seed will have no impact until someone produces and markets the seed and convinces the farmers to plant it. Since researchers have little control over these downstream activities, many hesitate to factor them in research assessment which may unfairly be equated to their performance.

And after achieving an impact, there is the problem of attribution. How much of the increased productivity can be claimed as having been contributed by the seed vis-a-vis the irrigation system, the use of fertilizers, improved policy on grain prices, agrarian reform, extension, and other factors?

Multiplicity of Levels and Institutions

The priority setting process is played out at different levels of aggregation often with a multiplicity of institutions and actors. Rarely are all agriculture-related functions in government lodged in an all-powerful department/ministry of agriculture. Neither is research. Given the autonomy of institutions and different branches of government, a priority setting exercise involving all categories of research is often unmanageable and impolitic.

Priorities and Resource Allocations

Ultimately priorities have to be translated into resource allocations. Very often though, priorities are defined in one language and resource allocations in another. Thus at the national level, budgets are appropriated to departments and ministries and not at all in terms of major development goals.

At any rate priorities do not automatically translate to resource allocations except in gross terms. The most important activity need not receive the most amount of resources if the same could be achieved for less. In research some types of research are inherently more resource-intensive than others.

Fear for the Loss of Control Over the Research Process

Finally at the back of the mind of some managers and members of the research community is their fear for the loss of control over the research process itself. A formal, quantitative process of setting priorities applied unimaginatively will take the flexibility and spontaneity out of the system. In the absence of an absolutely satisfactory process, many scientists believe that their professional judgment is still the best guarantee for accountability in research.

Priority Setting Practice – A Generalized Process

These difficulties notwithstanding, national research institutions do set priorities and implement research obviously with varying levels of success. The process varies from country to country and from institution to institution but follows a general pattern (Figure 1).

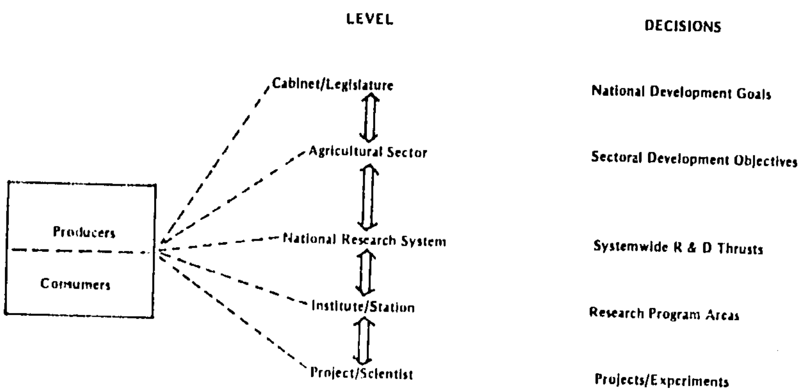

Fig. 1. Levels of priority setting.

Essentially research priorities are decided in at least five levels. The degree of disaggregation or specificity increases as one goes down the hierarchy. Priority setting at the upper levels take on the functions of strategic, macro- and long-term planning while those below are more concerned with annual planning and programming of individual research projects and experiments.

At the sectoral level the decisions are generally expressed in terms of priorities for major commodities, national problems, or concerns, and occasionally in terms of regions and population sectors. Accordingly, the national research system defines its principal R and D thrusts under each of the major sectoral priorities. Quite often though the national research system expresses its priorities in a language different from that of the agricultural sector. This lack of clear correspondence between sectoral priorities and systemwide research priorities, unless properly explained, sometimes opens the research community to charges of irrelevance.

The scientists more or less have full control at the lower levels. The broad choices have been narrowed down considerably and the decisions are circumscribed mainly by unit mandate, competence of individuals, immediate availability of resources, and the results from previous experiments.

The process is not by any means a top-down process. Ideally it should be iterative. In most places in fact it is more like from the bottom up. Many governments until now leave their agricultural scientists alone to sort out their priorities. They do not provide them plenty of support either.

The role of producers and consumers varies among systems. Larger producers tend to be heard more than small farmers. Except for the younger and weaker national research systems particularly in Africa, there is often sufficient competence to look over research quality. The problem in many instances relates more to relevance suggesting the general weak linkages between the research community and the farming community.

The State of the Art

There is a wide range of actual practice in the art of setting agricultural priorities. In most national institutions in the developing and developed countries and in international organizations, priorities are still arrived at by informal analyses, consultation, and consensus building among scientists, research leaders, and administrators in-house. However, more and more research institutions are adopting more formal and more open processes often with the participation of individuals external to the organization.

Following are two examples to illustrate the state of the art – a national experience in Pakistan and that of an international organization, the International Institute for Tropical Agriculture (IITA) based in Nigeria.

A. Priority Setting in an International Research Institute.

The most recent example of the state of the art is the 1988 strategic planning exercise of the International Institute for Tropical Agriculture (IITA)[1/]. This exercise is particularly useful for the purposes of the discussion as it brings out several key points:

- Provides one context in which priority setting is set,
- Describes the process and the key participants involved,
- Demonstrates the range of relevant indicators, how they are constructed and the way they are used, and
- Spells out clearly the decisions reached on the basis of the study.

Context. The occasion was a strategic planning exercise justified by the approach of the Institute's 20th anniversary, a change in center leadership (new Director General), and as a natural follow up to the recently concluded priorities and strategies exercised by the parent organization, the CGIAR.

Process and participants. The exercise was a two-phase planning process which involved:

o a strategic diagnosis of IITA's environment (ecological, economic, institutional)

o a formulation of program objectives and a vision of IITA's future role

o setting of program strategies and priorities to realize the objectives, and

o translation of these into strategic plans for the future.

[1/] IITA is one of the 13 international research institutes supported by the Consultative Group for International Agricultural Research (CGIAR).
Source: IITA Strategic Plan 1989-2000. March 1988. TAC Rome.

During Phase I, the center management brought together five Study Groups composed of center scientists and management and a number of carefully selected international consultants. The Study Groups reviewed the Institute's past achievements and current research and recommended strategies and priorities within each program.

In Phase II, IITA management with the Study Group chair persons, members of the Board of Trustees and representatives of the Technical Advisory Committee of the parent body, CGIAR went over the outputs of Phase I and made adjustments on the eventual strategies, priorities, and future allocation of resources.

Conceptual framework. The conceptual framework of the exercise is diagrammatically summarized as follows:

IITA Mandate

↓

Operational Program Objectives (4)

- develop systems for management and conservation of resources for sustainable agriculture
- increase performance of selected crops in production systems
- strengthen national agricultural research capacity
- develop postharvest technology for selected crops

↓

Program Strategies (4)

- primary emphasis on West and Central Africa
- focus on African smallholders
- ecological orientation
- farming systems orientation

↓

Relevance Indicators in Priority Setting

Resource and Crop Management Research
No relevance indicators used
Commodity Research (Table 1)
Relevance of commodity to IITA goals (13 indicators)
Research productivity (13 indicators)

Outcomes. The relevance indicators used were both quantitative and qualitative. However, no weights were given to individual relevance indicators. It appears though that final decisions

Table. 1. Relevance indicators for commodity research.

Relevance of commodity to IITA goals	Research productivity
Importance of the commodity in the diet – calorie contribution – protein contribution – additional nutritional aspects (fats, vitamins, minerals etc.) – utilization aspects (storage, transportability, conversion, etc.)	*Researchability* evidence that progress in production or productivity is constrained by lack of knowledge and/or technology *Research history* – current knowledge base – past gains/failures
Importance of the commodity in the production system – value of production (share in global/regional production) – contribution to sustainability – multiple purposes (livestock feed, energy, by-products) – area harvested – agroecological suitability	*Research opportunities* – extent of genetic diversity – yield levels, yield trends and potential gain – yield stability and defense of achieved gains – potential agroecological amplitude – unexploited areas for research – scope of application of results – estimated returns to proposed research
Relevance to target groups – income/employment generation – nutritional factors	
Future gaps in demand and availability – self-sufficiency (macro-level) – food security (micro-level)	*Potential for breakthrough* – technologies in the pipeline – emerging knowledge from basic research
	Time frame Comparative advantage for IITA in research on the commodity

Source: IITA Strategic Plan 1989-2000. March 1988 TAC Rome.

were heavily based on three sets of information synthesized from different sources as follows (Tables 2, 3 and 4):

- shares in total production of calories, and protein,
- labor productivity in calories/man-day,
- production trends in major food crops.

The relevance indicators were then summarized into three categories:

- projected importance of commodity,
- productivity of research,
- IITA comparative advantage in research.

The commodities were scored outstanding, high, medium and low (Table 5) and on the basis of these scores, the following decisions were reached:

Primary Commodities — cassava, maize, cowpeas
Secondary Commodities — yams, plantains and soybeans
Transfer rice to WARDA, another CGIAR center
Transfer sweet potato to CIP, another CGIAR center
Drop cocoyam

Table 2,. Shares in the production of calories and proteins in West and Central Africa of major crops (cassava as reference):

Crops	Calories	Protein
Cassava	100.0	100.0
Maize	39.1	112.4
Rice	14.7	35.0
Cowpea	6.2	50.0
Yam	38.1	93.5
Sweet potato	6.7	11.2
Plantain	14.2	15.6

Table 3: Labor productivity in different crops in Nigeria (cassava as reference):

Crops	Labor Productivity (Calories/man-day)	Yield (t/ha)
Cassava	100.0	100.0
Maize	106.8	16.7
Rice	18.6	16.7
Yam	50.8	133.3

Source: IITA Strategic Plan 1989-2000. March 1988 TAC Rome

Table 4. Production trends in major food crops of West and Central Africa, 1961-1980 (percentages)

Crops	Share of all major food crop production		Share of total increase of all major food crops	Annual growth rate 1961–1980	
	1961-1965	1976-1980	1961-1980	Yield	Harvested area
West Africa					
Maize	8	9	14	0.4	0.9
Cassava	13	15	16	0.1	1.5
Millet/Sorghum	40	37	16	–0.7	1.1
Rice (husked)	4	7	27	1.2	2.7
Total	65	68	73	0.2	1.4
Central Africa					
Maize	14	13	11	–0.9	3.4
Cassava	43	44	46	–0.4	2.2
Millet/Sorghum	11	8	2	0.1	0.9
Rice (husked)	1	2	4	0.0	7.2
Total	69	67	63	–0.4	1.8

Source: IITA Strategic Plan 1989-2000. March 1988 TAC Rome.

Table 5. Analysis of IITA's comparative advantage in commodity research.

Crops	Projected importance of commodity	Productivity of research	IITA comparative advantage in research
Maize	O	O	H
Rice	O	O	L
Cassava	O	O	H
Cowpea	M	H	M
Yam	H	M	M
Soybean	L	L	M

Table 5. Cont.

	Projected importance of commodity	Productivity of research	IITA comparative advantage in research
Plantain	M	M	O
Sweet potato	H	H	L
Cocoyam	L	L	L

Notes:
O = outstanding
H = high
M = medium
L = low

Source: IITA Strategic Plan 1989-2000. March 1988 TAC Rome.

B. Priority Setting: A National System Experience (Pakistan)

Context. Agricultural research efforts in Pakistan are highly fragmented with at least seven ministries and eight provincial departments conducting research independently at various levels. There was a perceived need to have them coordinated at the national level and have them organized into a network to have an efficient agricultural research system. The Pakistan Agricultural Research Council (PARC) was established earlier to accomplish this but two major issues remained to be resolved: the division of responsibility between the PARC and the provinces and the role of the universities. The National Economic Council asked for a "National Agricultural Research Plan" and called upon PARC to prepare it.

Process and participants. PARC through its Planning Directorate appointed an ad hoc committee of 10 national experts reinforced by three international consultants provided by FAO. This national committee undertook detailed discussions and interviews with over 120 scientists, planners and administrators at the federal level, in the universities and in the different provinces and made use of previous reviews.

The draft plan was presented to the Provincial Secretaries of Agriculture, the University Vice Chancellors, Heads of federal and provincial institutes, Heads of planning divisions, Additional Secretaries and Commodity Commissions in the Ministry of Food, Agriculture and Cooperatives. In addition the technical parts of the plan were critically reviewed by about 60 agricultural researchers.

Conceptual framework. The conceptual framework of the process is as follows:

Goals of Sixth Pakistan Five-Year Plan
- Growth – 6.5% GDP annual growth rate
- Equity – special provisions to vulnerable sectors

↓

Agricultural Production Goals
- Targets – wheat 5.5% p.a.
  - cotton 4.7% p.a.
  - poultry 14.9% p.a.
  - etc.

↓

Research Subject Areas (9)
- Crop Production and Protection
- Water and Soils
- Forestry Development
- Fisheries Development
- Socio-Economics
- Special Categories

↓

Goals (25)
- Objectives (81)
- Programs (355)

Example

Research Subject Area - Crop Production and Protection
- Goal II Achieve improvement of yields of food grains, oil seeds, pulses. . .

Objective a – Improve genetic potential. . .
Program II – Continue introduction and evaluation of IRRI rice germplasm

Outcomes. Research priorities were organized into nine more or less conventional research subject areas. Under each subject area were several goals arranged in priority order. And under each goal were specific objectives further broken down into programs presumably listed in priority order as well.

Thus the agricultural research universe in the country was divided into nine subject matter areas, 25 goals, 81 objectives and 355 programs. This framework is now expected to guide research agencies at the federal and provincial levels and the universities in the formulation of their respective research portfolios.

To guide the longer term evolution of the system, the following projections of research allocations were suggested:

Subject Matter Area	Sixth Plan	Ninth Plan
	% of Agric. Research Budget	
Crops	52.1	32.0
Water and Soils	17.0	20.0
Livestock	14.9	20.0
Watershed and Wildlife	6.0	10.0
Forestry	7.8	8.0
Fisheries	0.2	3.0
Policy and Marketing	0.4	2.5
Socio-Economics	–	2.0
Training and Services	1.4	2.0
Overheads	0.2	0.5

C. Commentary

It should be enlightening to highlight a few aspects of the process in both illustrations, namely:

1) Priority setting to be done properly is a resource-intensive exercise particularly of top scientists and managers. There must be a compelling reason(s) to conduct one and there must be a firm commitment to the process of those who will make the decisions. In the IITA exercise, the context was a strategic plan-

ning exercise. In Pakistan, the occasion was the development of the National Agricultural Research Plan.

2) Both exercises took care of the politics of decision-making. They took care of it in IITA by involving:

- the scientists whose jobs will be effected,
- the management who will have to implement,
- the board who will lay down the policies,
- the TAC and external international experts who are proxies for the donors and sponsors.

In Pakistan the process involved:

- the scientists who will implement the plan,
- the heads of different institutions who are expected to abide with the priorities,
- international experts as a guarantee of *objectivity and fairness* as far as the provinces and universities were concerned, and *realism* in so far as interested external donors are concerned.

3) There are two major research groups at IITA – *resource and crop management* and *commodity research*. Relevance indicators were put up for commodity research but not for resource and crop management research. In addition, of the 26 relevance indicators cited, about half were backed up by statistics and the other half by reasoned, qualitative assessments.

It would appear, therefore, that many factors relevant to priority setting are not readily captured in quantitative terms for lack of reliable data or simply by their qualitative nature. (Note: There were a number of highly respected agricultural economists in the panels).

4) The decisions in the IITA exercise were very clear and definitive. This is not common at all to public institutions. Such drastic decisions are reminiscent of private companies undergoing restructuring. One would wish more public institutions, national and international could be more decisive.

5) The Pakistan exercise was not very explicit in the relevance indicators used and the weights attached to them. However, a system of priorities was devised and the outcome was legitimized by presenting the draft plan to all parties concerned to criticize and comment upon.

The list of programs is so comprehensive that any research conceived by a scientist in the country will find an appropriate entry. In other words, everybody has a place in the queue however low.

Nevertheless, the Plan did indicate shifts in relative allocations among major subject areas in the succeeding five year plans. As long as the base is assumed to be expanding generously, institutions and individuals are not threatened and would not object violently.

Given the national context in which the priorities were set and the sensitive role of the agency (PARC) conducting the exercise, it is difficult to conceive of a radically different outcome.

6) There was an attempt in the IITA exercise to demonstrate how priorities are arrived at down to the level of specific research problems e.g. rice blast disease vs grain quality research and the manner by which allocation requirements are built up.

7) The Pakistan scientific community was aware of the need to demonstrate accountability in standard economic terms. As part of the background, the National Agricultural Research Plan cited a local research which indicated rates of return of 58% and 19% on wheat and maize, two of its more important commodities.

Limits of Current Practice and the State of the Art

The purposes of setting priorities normally are two-fold:

- to rationally set priorities among competing research areas to most optimally meet national development goals, and
- to provide guidance in actual resource allocation.

However there are other reasons why an organization may wish to undergo a formal priority setting process, namely:

- to justify the institution's use and claim to resources, in the hope of generating more from its public, and
- to rally and mobilize the scientists and staff towards the attainment of institutional objectives.

It is against this background that one should assess the adequacy of current practice and the state of the art.

Rationally Set Priorities

If one takes the two illustrations given, one must conclude that reason and logic prevail in setting agricultural priorities. Research priorities are framed against national needs and sectoral objectives. The difficulty of research problems, the chances of success, the potential for adoption, the competence of scientists and availability of resources are taken into account in the priority setting process.

Having no reason to reject the integrity and professional competence of the scientists and administrators in both exercises, they in most probability have got the priorities right.

What is missing, however, is the transparency with which goals are weighed and the exact contributions of the relevance indicators to those goals on which the priorities are based.

Provide Guidance to Actual Allocation of Resources

Except in broad terms, present practice yields little guidance in actual resource allocation. Research areas are simply ranked – 1–2–3 but there is little indication of magnitude. It appears that most practitioners consider priority setting and resource allocation as conceptually two separate processes with probably different algorithms.

Justify Use and Claim to Resources

Present practice fulfills partly this requirement. Openness, the use of external experts, involvement of client, donor, and cooperator representatives and validation by appropriate bodies provide the aura of objectivity and legitimacy that is needed.

However, in the context by which economic and planning ministries, bankers, and the private sector judge investments, present practice fail to provide the kind of econometric measures they understand – benefits/costs, rates of returns, net present values.

Increasingly too, the publics of research require information on the disaggregation of expected costs and benefits to producers and consumers, among regions, among different sectors of the population, among industries, and even among generations (environmental issues). Present practices enumerate these factors as considerations, but they are not transparent as to what extent they are provided for.

Rally and Mobilize the Scientists and Staff Towards Attainment of Institutional Objectives

People must have a sense of control of their destiny and must be encouraged to identify with institutional objectives. Priority decisions affect their work and it is sound institutional strategy to make the staff a party to these decisions.

If we take both examples again, this purpose is adequately met by current practice.

Incidentally very recently, a huge national research system in a developed country suffered 25% cutback in resources. Very wisely, the system invoked an open, participatory and scientist-dominated priority setting exercise to lay the groundwork for terminating scientists, abolishing programs, selling of institutes to the private sector, and merging institutions.

In another huge national research system in the West, the universities were very critical of priorities. They were co-opted in the next priority setting cycle.

Priority Setting Techniques

The techniques for establishing priorities fall into more or less four categories listed as follows in an approximate order of increasing sophistication:

- Scoring Techniques
- Domestic Resource Cost Ratios
- Cost/Benefit Analyses
- Linear and Dynamic Programming
- Systems Analyses and Simulation

Scoring with its many variations is most widely used. The rest are models requiring varying degrees of quantitative analyses using a lot of econometric data. Domestic resource cost ratios and cost/benefit analyses are frequently used in project analyses and general economic planning and appear favored by many agricultural economists. However, they have yet to be adopted formally in priority setting for agricultural research beyond their development as techniques in research on research. Mathematical programming and systems analyses appeal to system research people and those with access to good computer systems. Most of them have been done once using dummy entries (not real life entries) to demonstrate the power and data requirements of the technique.

Scoring Techniques

Scoring techniques come with different names – checklists, congruence methods, and weighted scoring models. Scoring could be very simple and straightforward and could be used at any level of decision making. The data requirements expand as the assessors decide on the level of sophistication and effort they are prepared to commit to the exercise. The key to the effectiveness of the effort is the integrity and competence of the assessors.

The assessors agree on a *check list* of questions, considerations, and factors which they believe should be the criteria against which the suitability of research areas should be judged. These relevance factors include broadly, contributions to goals, researchability, and availability of resources.

Having agreed on the criteria or relevance indicators, the assessors seek a consensus on how to describe research areas i.e. as commodities, problems, factors of production, level of research and disciplines.

Parenthetically, the listing of criteria and the listing of research areas are potentially extremely contentious issues. Of course if the assessors are like-minded people with very similar backgrounds, these decisions are settled very quickly. For this reason research priorities are easily agreed upon at the institute, station and project levels.

The research areas are arrayed against the criteria and each assessor logs an entry at each intersection as yes or no (1 or 2); high, medium or low (1, 2 or 3), or ranges of 1 to 5 or 1 to 10.

The outcomes from all the assessors are put together and those research areas which consistently get positive or high marks go to the top of the priority list. Similarly, those with consistently negative and low marks go to the bottom.

The assessors debate and discuss further those in the middle range to sort their places out in the priority ranking.

In the *congruence method*, the assumption is made that the priority of a research area is directly proportional to its share of a vital agricultural statistic. In its extreme application only one agricultural statistic is used e.g. value of production. However since no one statistic can capture all the dimensions of development and of research, several sets of statistics are used as criteria. The priority of a research area is derived from its scores in the different sets of statistics or sets of congruences.

In the *checklists and congruence* methods, the criteria are not assigned formal weights. Since it is very unlikely that assessors consider all criteria of equal weight, one must assume that the assessors assign implicit weights. Statistically if one has enough assessors and with a good sampling of backgrounds and experiences, biases should cancel out.

The *weighted score model* pushes the process a step closer to transparency by making the relative weights explicit. The assessor rating multiplied by the factor weights are added together and averaged out to arrive at the priority ranking.

Domestic Resource Cost Ratios. Domestic resource cost ratios are mathematical expressions indicating the comparative economic advantage of a country in producing a commodity versus importing the same. The basic argument is that a country should be able to make most use of its scarce resources by concentrating on those products it is or can be potentially efficient in producing.

A DRC ratio of less than one indicates that the country is an efficient producer. It is implied that the lower the DRC ratio, the higher priority that commodity should have in research.

Since DRC ratios do not take into account non-economic factors, obviously they cannot serve as the sole bases for priority. In addition DRC ratios are applicable only to commodity research thus limiting their use further.

Nevertheless DRC ratios can be very dramatic arguments in jolting governments (and research systems) to recognize their folly in pursuing policies which favor commodities which are simply uneconomical to produce domestically. The World Bank uses DRC ratios in its project leading activities. One of the leading international research institutes in agriculture is strongly advocating their application.

Some agricultural economists argue though that DRC ratios require the same rigor and effort as benefit/cost analyses but provide less information.

Benefit/Cost Analyses. Benefit/cost analyses are routinely applied on investment decisions. The idea is to compare the stream of benefits that can be derived from an investment against the associated stream of costs. Research areas with higher benefit/cost ratios are considered better investments for research and therefore accorded higher priority and resource allocation.

The benefits could be in terms of added production, improved product quality, saved potential losses, improvement in the environment, improvement in the nutrition of disadvantaged people, etc. associated with a successful research outcome, provided the benefits are converted into a common currency.

This potential benefit is discounted for probability of research success, adoption rate and ceiling of adoption.

The costs are those associated with the conduct of research itself and with the cost of adoption of technology, both private and public.

Since both benefits and costs accrue over time, both are likewise discounted to take into account the time value of money.

Benefit/costs are finally expressed as BC ratios, internal rates of return (IRR) or net present values (NPV).

In order to deal with uncertainty, the analysis employs sensitivity tests to find out how critical are the changes in some values in the benefit cost relationship.

In addition, the technique has the ability to disaggregate the costs and benefits to producers and consumers using the producers/consumers surplus concept. The technique can estimate the distribution of benefits and costs to early vs late adopters of technology, between large vs small farmers, between rich and poor consumers, among regions and others.

Briefly benefit/cost analyses have the following advantages:

- Provide information on the potential magnitude of benefits and costs, their distribution among sectors through time.
- Express priorities in the language commonly understood by planning and finance ministries.
- Direct researchers' attention to the factors which have the greatest influence in the generation of benefits and costs.

The problems associated with the technique are:

- Lack of confidence by scientists and managers on the estimates due to unreliable statistics and excessive speculation on the variables used.
- Lack of expertise and resources, for less developed institutions.

Linear and Dynamic Programming. Linear programming techniques can be used to optimize the benefits from a given set of research activities given a set of constraints. However, linear programming imposes large information requirements which restrict its attractiveness. Since the benefit estimates are no more than guesses, the large uncertainty underlying the input estimates and the sophisticated rigor of the analysis suggest methodological overkill.

Dynamic programming corrects the inability of linear programming to deal with uncertainty. However the information input requirements are even more exacting than linear programming.

Simulation. Simulation has been suggested as another way of establishing priorities. As this has been done on other equally complex decision problems, there is no reason it cannot be applied to agricultural research. As one would expect the information requirements are enormous and considering the uncertainties involved, managers simply do not consider the effort worthwhile.

Summary

Current Practice and the State of the Art

Priority setting in agricultural research has traditionally been an intuitive, informal, and subjective process. As expenditures rise and as public clamor for accountability increase, research managers and leaders in the scientific community have come to realize that they need more objective, formal, open and systematic methods for assessing research needs and, eventually, allocating resources.

The practice varies widely and is evolving. The most recent organized experiences have the following key features:

1. *Context.* Priority setting has ceased to be an in-house

exercise which the scientists do by themselves. It has become more visible and is stage managed to coincide with major events which bind policymakers , major donors and supporters to the outcomes.

2. *Process and Participants.* Priority setting has been recognized for what it is – a joint scientific and political exercise. In order to be effective the priorities must be legitimized at all levels – from the policymakers down to the implementors and from among the clients and sponsors. Thus the emphasis on the process and the participants.

3. *More Systematic Use of Criteria and Relevance Indicators.* Decisions had always been based on relevant criteria and indicators or measures. But now both the criteria and relevant indicators are more explicit. Variations of scoring techniques are applied and their mechanics are increasingly made more transparent.

Limits to Current Practice and the State of the Art

The primary purposes of priority setting are to rationally assess priorities and to provide guidance in actual resource allocation. Research managers however have additional agenda in mind. The exercise is seen as a vehicle for justifying the use of existing resources and laying further claim to more, and rallying and mobilizing members of the organization to the attainment of institutional goals.

Against these four purposes, it would appear that present practice and state of the art fulfill the needs for the most part. However they have the following limitations:

- They provide little systematic guidance to resource allocation.
- They do not provide measures which can compare investments in research with alternative uses of resources.
- They are not able to respond to questions like to what extent they benefit vulnerable sectors, which are increasingly asked by governments.

New Approaches to Priority Setting

Techniques in other branches of science, principally economics and mathematics are now being modified and adopted to assist in the priority setting process. Among them are domestic resource cost ratios, benefit/cost analysis, mathematical programming, and simulation. Each technique has special information requirement, specific application, and limitation.

In assessing the utility of these techniques, the following should be kept in mind:

- These quantitative techniques are only as good as the quality of information fed into them. Where reliable statistics is not available or when the logical bases of the vectors are very shaky or speculative, they may not be worth the effort.
- The application of these techniques requires expertise and resources, in particular management time. They themselves are subject to benefit/cost considerations.
- Finally the techniques themselves are not meant to substitute for wisdom. They can account for only part of the factors that go into a decision. What they are meant to do is to inform the decision maker.

Among the techniques, the benefit/cost procedure appears to have the most application and appeal. Most natural scientists are able to follow its logic although the mechanics in the more complex applications can become obscure. As the analysis relies heavily on economic statistics and economic concepts like elasticities of supply and demand, producer/consumer surplus, etc. the technique is more readily applied in countries where there is a strong agricultural economics tradition.

As a method, benefit/cost analysis has been very well worked out. However, in its specific applications, the filling up of appropriate data and functions require expertise, time, and a lot of consultations among the analysts, the scientists who will provide the technical specifications, and the administrators who will use the information. In practice, therefore, very likely it will use the information. In practice, therefore, very likely it will be applied only on major problems after the entire portfolio of research areas have been sorted out initially with the traditional scoring techniques.

Moreover, excessive heavy reliance on benefit/cost ratios will certainly bias decisions against research areas where the techniques do not readily lend itself, such as, in basic research, resource management, disciplinary research, and social science research, including economics.

Search for a Formal Technique in Resource Allocation Continues

Finally there is yet to emerge a formal technique for actually allocating resources. Priorities merely rank research problem areas in relative order of importance.

In the queue of competing investments, the higher ranked entries get a first crack at resources and so on down the line. However, the benefit/cost ratio or the rate of return is not necessarily uniform over the whole range of magnitudes of investment in the same problem area. A point is reached when the rate of return equals or falls below the rate of return of the next entry in the queue.

Intuitively, scientists know this by saying that it is adequate enough for one scientist to handle a problem or two.

The DRC and benefit/cost ratios are too simple to capture this additional complexity. Unfortunately the answer may have to be in dynamic programming and simulation where resource constraints are given as one of the conditions for optimization. These techniques for the moment we find too complex and esoteric.

Monitoring and Evaluation in Philippine Research Management

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My paper covers monitoring and evaluation particularly their concepts and principles, types and levels of evaluation, applications at different levels, and experiences in the Philippines. To understand the need for evaluation, let us remind ourselves of the following key functions of an agricultural research system:

- directing activities toward the country's priorities, opportunities, and problem areas;
- mobilizing and effectively utilizing the needed financial resources;
- developing and maintaining a physical infrastructure that responds to the country's agroecological characteristics and economic potential;
- developing and maintaining a critical mass of well-qualified scientific personnel;
- assuring the flow of information between research and extension workers, farmers, policymakers, and the public; and
- monitoring and evaluating program implementation.

To perform these functions, management must evaluate or be provided with evaluation results.

Types of Evaluation

In the past, research evaluation was often organized and used mostly in relation to donor-funded projects. Indeed, evaluative activities should be included at various phases in the design, implementation, and completion of a project whether it is funded from external or local sources. Evaluative activities are usually organized at various phases in a project, namely:

- *Ex ante* or before implementation — to identify and define a potential project and appraise its likely results. This requires identification of a problem that the project will aim to alleviate or selection of an opportunity to be exploited, and an assessment of the environment within which the project will be implemented.

  For the Philippines, *ex ante* evaluation starts with the setting of priority areas; preparation of capsule and (then later) detailed proposals; and review of these proposals. Priorities are set among commodities and within commodities. Such priorities determine to a large extent the allocation of research funds, e.g. 80% for Priority I commodities; 10% for Priority II; 3% for Priority III; and 7% for a special macro group — Applied Rural Sociology and Macroeconomics — and emergency projects.

  The national commodity research teams determine the research areas within a commodity. Then, the Directors' Council, and the Technical Advisory Committee (TAC) review the suggested research priorities. The Governing Council (GC) provides an intercommodity analysis and input political considerations.

  These priorities become the researchers' bases for preparing their proposals which are then reviewed and packaged by the commodity research teams. The National Research and Development Program later goes to the TAC and the GC before submitting it to the Department of Budget and Management (DBM)

- During implementation — to monitor project activities as they are being implemented, or at least to make periodic checks that implementarion is moving along as expected. Monitoring includes field evaluation, agency in-house reviews, and integrated reviews.

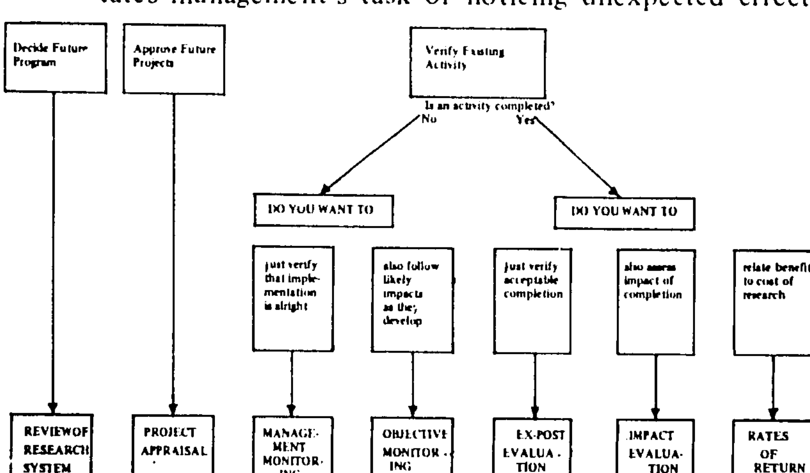
- *Ex-post* or after completion — to demonstrate that the objectives of the project have been achieved as planned or to verify whether the project led to the expected impact on the people who were to benefit from it.

While part of monitoring, the integrated review is also an *ex-post* evaluation since it includes completed projects. In addition, some workshops or policy conferences are designed to evaluate research findings.

Evaluation information collected at one level is needed for evaluation at another level; thus evaluation is more of a process than as a set of *ex-ante*, monitoring, or *ex-post* activities. The stages in Figure 1 are valid for any activity which is well defined and limited in focus, time, and resources. They are frequently referred to for donor-funded projects, but the same divisions can be used for research initiated and funded within a national research organization.

Monitoring and *ex-post* evaluation suppose that there is a clearly identifiable activity or set of activities, with specified expected results, a time frame, and measurable standards of accomplishment. These standards vary by commodity or project.

Monitoring an ongoing project confirms that activiities are being implemented as planned. Bottlenecks and problems are identified as they emerge, and are corrected before causing too much damage. It keeps the manager aware of what is being achieved and facilitates management's task of noticing unexpected effects



Source: ISNAR

Fig. 1. Stages in Project-Oriented Evaluative Activities.

and problems so that implementation plans can be revised. It is possible that changes have to be made during the implementation stage or after completion such as addition of an experiment, and addition of a pilot village or survey site.

Evaluating a completed project confirms whether the activities did or did not lead to the expected results. It also seeks to explain what, in the way the activity was designed and implemented, facilitated or hampered in reaching the desired result.

It is therefore necessary, as with monitoring, that the activity be clearly identifiable, with well-defined expected results against which actual results can be measured.

The evaluation of a completed research activity can go one step further, to demonstrate the impact of the results on the people who were expected to benefit from it. In this case, the evaluation goes beyond the activity as originally planned to see if the reasoning underlying the activity was correct, and to estimate the contribution of research to development.

Setting Evaluation Objectives

When planning a review or an evaluation, it is essential to clearly establish the users of the results and what the results will be used for. These determine a number of factors which influence data collection and analysis:

1. It determines appropriate recommendation domains and necessary data. Policy-makers do not need detailed technical aspects of research, but may need information on the production potentials of proposed research programs and their relative economic and social costs. On the other hand, the director of an institute needs to know this technical information, if research requires new staff or laboratory facilities.

2. The uses of the results and for what purpose determine the level of accuracy needed in data gathering. Precise data are not necessarily needed for rough approximations.

3. The way the data are to be used determines the time frame within which the evaluation activity must take place. It is useless to publish a report six months or one year after a decision had to be made.

Uses and Users

An effective evaluation process begins with the determination of the uses and the users of evaluation.

A large number of different users can benefit from improved information. Although some uses of information would be similar among users, no single type of evaluation can satisfy all potential users. There is a hierarchy of expectations from research with changing expectations as one moves from the individual scientist up to senior policymakers.

The policymakers and the public need to be informed about the practical benefits from research.

Research managers at various levels are the most important users of information. They need to know:

- if their priorities are right;
- if research is achieving its objectives;
- if human resources and physical facilities are adequate and appropriately utilized; and
- whether research results are being disseminated and used.

However, individual scientists benefit greatly from evaluation as it can provide important and needed feedback and encourage the development of their own critical faculties.

Monitoring also enables a researcher to determine whether the intermediary steps within the project are producing the expected results, or whether some new factors are becoming notice able in project objectives or design.

Different sets of users have varying data requirements. For example, in the *ex ante* evaluation, national coordinating councils and heads of institutions would need data on number of studies submitted (based on capsule proposals), number of studies recommended for processing, number of studies rejected, and reasons for rejection.

In a sample year, 52% of the proposals submitted and evaluated at PCARRD were recommended for the development of detailed proposal. Almost one-half was rejected for two main reasons: duplication and low priority. If these proposals were not evaluated, these could have been implemented even if they were duplicatory or of low priority. The amount of savings brought about by this evaluation can be provided to research managers and to the Department of Budget and Management (DBM) If such evaluation is done over time, then the trend could provide indicators of performance. An increasing percentage of rejection due to duplication and out-of-priority projects can indicate that a coordinating council has not been effective in disseminating information on the priority areas and completed researches. To the head of a station or an institution, this provides information on the batting average for approval of research proposal, the trend (whether increasing or decreasing), research funds generated, and increase over time.

Evaluation of the quality of research proposals as well as output can indicate the kind of training needed by researchers.

In *ex-post* evaluation, the extent to which technology is generated, verified, and finally adopted by producers and other clientele is an important indicator.

Limitations

The resources available for use are limited; hence, possible benefits from increased information must be assessed critically. The direct and indirect costs on staff time and resentment ("harassment factor") can be high. Scientists often react negatively to evaluation because it is misconstrued for "inspection" or "auditing" purposes.

Some also perceive evaluation as focusing only on the negative and as a nonproductive interruption to research. These attitudes will change if evaluation procedures are seen to contribute constructively to the research process.

Other limitations include:

- Priorities in research are not unequivocally set even by the best *ex-ante* analysis. Cultural factors, risk, scientific capabilities, and political factors must also be considered.
- Monitoring reports may lack evaluative content and

information is often not synthesized as it flows up through each level of management.

- Weaknesses in methodology and quality of analysis and poor dissemination and follow-up procedures limit the value of many *ex-post* evaluation.

These limitations require research managers to weigh carefully the costs of evaluation activities in relation to the benefits to be derived.

Level of Evaluation

Information is needed on scientific activity at different levels from the individual scientist through the project/program, institutional and national system levels. In addition to assessing research by level, there may be a need for management to assess the composition of research manpower in terms of B.S., M.S./M.A., Ph.D. degree holders. The proportion of time devoted to research must also be examined, as well as short-term trainings attended by researchers in research methodology, statistical analysis, operation and repair of research equipment, financial management, and others.

Evaluation requirements at each of these levels will vary by intensity, with the frequency of evaluation declining as one goes from the micro to macro level. Individual projects need to be reviewed by project and study leaders more often than that required for a research program. Institutional reviews are done less frequently.

Implementing Evaluations

One issue that should be resolved by national programs is the mechanism by which evaluation findings are reviewed and explicitly accepted or rejected. Establishing a formal review committee composed of senior managers ensures that results are at least formally addressed. A highly sensitive issue occurs when evaluators recommend to terminate a project during the integrated review. This decision should be reviewed by a higher authority or committee. Meanwhile, any change in methodology, e.g. addition of an experiment or additional survey site needs additional funds that have to be decided upon by management.

Impact Studies

Impact studies also are a kind of evaluation. They measure effects of a new technology on producers' income levels, employment, and other development objectives.

More macro studies such as estimation of economic returns to research investment have to be made. At PCARRD, two studies on rates of return, one on corn and another on sugarcane have been completed. Other commodities are in the pipeline so with aggregate investment for the agriculture and natural resources sectors.

The two studies indicated that the internal rates of return (IRR) for research investment in corn and sugarcane are 29% to 48% and 52% to 71%, respectively. For corn, higher rates were estimated during the last ten years than during 1956 to 1972 implying that the accumulation of knowledge over time has enhanced the results of research in previous years.

On the average, it takes ten years before sustained and highly significant results are obtained from research investment. This implies a need for intensive extension efforts to encourage adoption of the technologies developed to minimize the time lag between investment and attainment of benefits.

The high IRR for sugarcane implies that the government has realized substantial returns in investing in sugarcane research and that the potential contribution of sugarcane research in improving productivity is high. The high IRR could also reflect the level of order investment in sugarcane research.

It should be noted that economic rates of return are only one of the many criteria for research allocation. Income distribution and nutritional or foreign exchange requirements may dictate directing more resources to areas that appear to offer a lower research payoff.

External Evaluation

External involvement in conducting evaluations can be significant. External input can take two forms:

- either evaluations commissioned by other agencies independent of the research institutions; or
- internal evaluations in which scientists unaffiliated with the institution are invited to take part.

External evaluators in *ex-post* evaluations provide additional expertise, objectivity, and independence in the process. Outside experts enhance the credibility of evaluation reports, both to the researchers in the organization and to interested nonresearch agencies. There can be some disadvantages, however, such as their lack of knowledge about the research system, which can generally be overcome by associating external evaluators with others more familiar with the system.

The scale of donor-agency activities in evaluation is large in the Philippines and other developing countries. In some cases, donors are required by legislation to conduct evaluations. There can be practical benefits to the national program of the recipient country from such externally commissioned evaluations, such as the political support and credibility these reviews may provide. They can also educate donor agencies about the constraints that exist in national programs and provide grounds for giving additional external support.

The interests of external agencies can be different from those of national programs. Donor evaluations often focus on a particular project and do not account for the broader- and longer-term objectives of the program that the project is designed to support. Recommendations to facilitate the progress of one specific activity may be incompatible with the overall program thrusts and infrastructural characteristics of the national organization.

Independent evaluations by central and donor agencies can absorb a large proportion of management and research time.

Alternate approaches could be defined that would be beneficial to both national programs and external agencies. This approach allows national programs to improve their own systems while strengthening their partnership with external development agencies. The primary objectives of external agencies are presumably to ensure that appropriate evaluations of activities that they support are carried out, rather than to carry out the evaluation themselves. Discussing and determining donor-agency evaluation requirements with national program leaders and building these into a continuing evaluation process would strengthen the collaborative relationship between national and external agencies. Fortunately, the evaluation capabilities of many developing countries like the Philippines are growing and opportunities for donor agencies to rely more on national program evaluations are increasing.

Where external agencies wish to carry out their own evalutions, there are ways to make the efforts more collaborative. National programs should have some input into defining the terms of reference of such evaluations. Program managers who are familiar with the objectives of the review should have an opportunity to comment on the draft report before it is finalized. In addition, national managers, should also suggest additional team members, including possibly a member of their own staff. Closer consultation between program managers and donor agencies would allow for better scheduling and reduce overlapping evaluations.

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Human Resource Management

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Introduction

A research organization can achieve its objectives primarily through the human resources. Thus, careful planning for and management of researchers and support staff are required to make the agriculture and natural resources research systems productive. This paper reviews the tasks required for managing human resources for research activities.

The policies and practices required for managing human resources of agricultural research institutions differ in important respects from those of the other types of public and private institutions. One major difference is that agricultural research requires highly skill-intensive training. Therefore, recruitment and exposure of specialists to continuous professional development are a must.

Agricultural researchers have unique occupational needs and characteristics which have important implications for management. As potentially creative individuals, researchers have especially high expectations for job fulfillment. They need considerable autonomy in planning and carrying out their research activities. Therefore, **an important responsibility of agricultural research managers is to insure that the organization has, and effectively utilizes, human resources with the specific skills, attitudes, and motivations which will allow the organizational objectives to be attained as efficiently as possible.** To accomplish this, the research manager must be concerned with the following: planning, staffing, development, compensation, and performance evaluation of human resources.

Planning involves the determination of types, amounts, and availability of human resource skills required to carry out predetermined program objectives and tasks over a specified time period in the most cost-effective manner.

Staffing involves the development of job descriptions and the practices that relate to recruitment, selection, assimilation, and deployment of personnel.

Development involves the continuous improvement of the capacities of research personnel through formal education, specialized and on-the-job training, and participation in professional conferences.

Compensation relates to the structure of grades, promotion policies, and salary and nonsalary rewards which influence the motivation and performance of researchers and support staff.

Evaluation includes performance planning, appraisal, and counseling which are critical to the effective management of human resources.

Understanding the Human Resource System

The human resource subsystem within a national agricultural research system (NARS) consists of the organizational framework which governs its behavior in relation to the larger agricultural research organization.

Two diagrams help to explain the structure of the human resource subsystem. The causal loop diagram identifies the major cause-and-effect relationships that define the way the system responds to outside influences and human resource management process.

The causal loop diagram (Figure 1) describes the relationships among the major elements in the human resources system that may change in response to the changes in other system elements. The human resource system is assumed to start at equilibrium. When something happens to disturb the steady state of the system, such as an increase in output desired, the system reacts, as shown in the diagram.

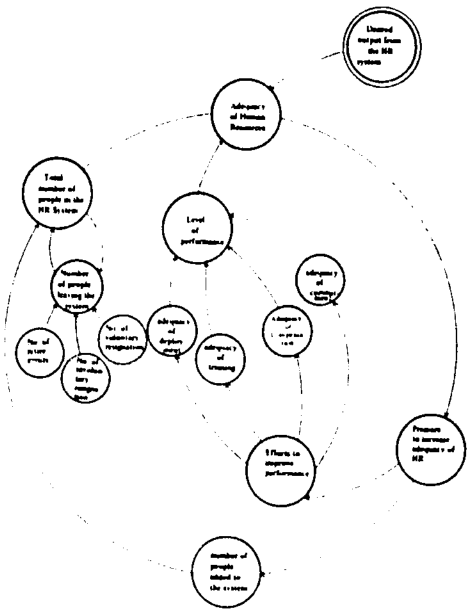

Fig. 1. Causal Relationships in Human Resource System.

"Output" is defined as something that the system is expected to produce. Desired output is decided outside of the human resources system, in the organization's program plans, for example. As the quantity or quality of desired output rises, the actual output of the existing system becomes less adequate. Assuming that the goal of the system is to meet the expectations placed on it from outside, the discrepancy between desired output and actual output creates a pressure on the system to raise the actual output.

Two basic options can be used to bring the actual level of output up to the desired level. New people can be added to the system, or changes can be made to the existing system to increase the average factor of performance. When new people are added, the total number of people in the system increases and, therefore, the adequacy of human resource increases. The total number of people in the system also depends on the number of people leaving the system due to voluntary resignations, retirements, and involuntary terminations. Changes to human resources in the existing system include: re-deploying people within the system to better use their skills, changing the level of skills in individuals through training, changing compensation policies, and/or improving the commitment of human resources through efforts to improve motivation.

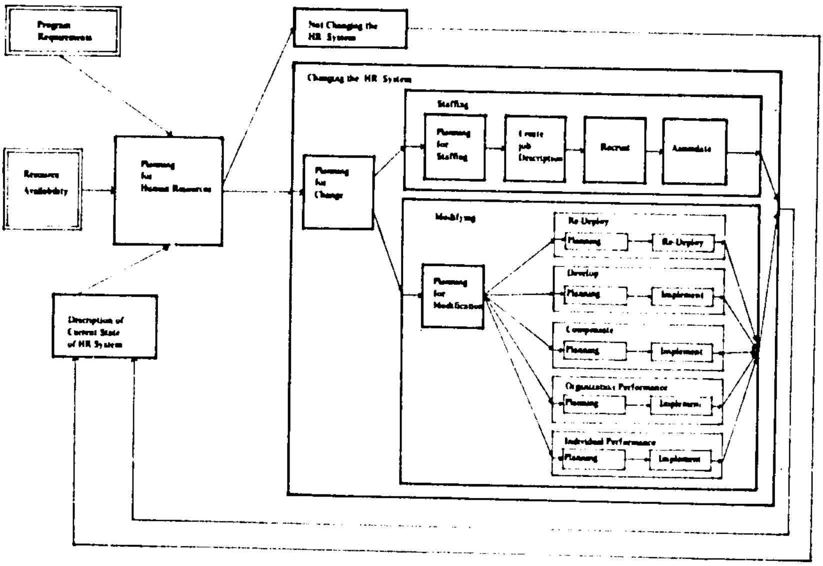

Fig. 2. Human Resources Management Process.

Figure 2 illustrates the management process within the human resource system. The process is an iterative one that begins each cycle with thiee main inputs to an initial planning stage. The three inputs are: details of program requirements, a description of resource constraints, and an understanding of the current state of the human resource system. At each planning stage in the process, the manager decides how much effort to devote to each of the options. At the first planning stage, the manager can decide to maintain the status quo or change the system in some way.

The system can be changed in two ways, as discussed in Figure 1: new staff can be added to the system or the existing system can be modified. To add new staff, needs are defined, job descriptions are developed and approved, recruitment is initiated, and new staff are assimilated into the human resource system. To modify the system, plans are made and actions taken to re-deploy the staff, train them for new tasks, alter compensation packages, and otherwise motivate and improve research staff performance.

At the end of a management cycle, the new system becomes the current system, new program requirements and resource constraints are received as inputs to the human resource system, and the management process begins again.

Planning

New and rapidly growing NARS has not been rigorously active in human resource planning. Several factors contribute to this lack of comprehensive human resource planning such as: (1) low level of overall program planning for the NARS, (2) lack of control over personnel recruitment, (3) excessive program and personnel fragmentation due to the nature of the system or to heavy reliance on donor projects, (2) rigid civil service regulations which reduce options for personnel deployment and rewards, (5) limited human resource planning expertise, (6) an inadequate human resource information system, and (7) a heavy reliance on donor funding for staff development.

The primary reference points for human resource planning and utilization are organizational goals and objectives and research program plans and priorities. Research managers must be able to relate information on current and future staff to current and future commodity, regional and/or discipline-oriented research programs. In other words, **human resource planning is integral to the overall program planning process.** This link provides the basis for an effective and comprehensive program that relates resources to national agricultural development goals.

The human-resource planning process includes three interrelated activities:

- Analysis of human resource requirements (demand).
- Assessment of the availability of human resources (supply).
- Matching requirements to availability.

Analysis of Human Resource Requirements

As the research institution grows and develops, it becomes more important to analyze and define tasks which need to be performed by the four basic personnel levels: researcher, administrator, technical support staff, and nontechnical support staff. **Task and job analysis allows the institution to: (1) periodically review and redefine positions in relation to program; (2) develop career-oriented classification systems; (3) establish specific recruitment targets; (4) establish appropriate conditions of service; and (5) evaluate performance against established criteria.**

An emerging and important group of research staff are those involved in the technology transfer process. These may include on-farm research technicians, subject matter specialists and research-extension liaison staff. In many cases, these staff are affiliated with extension institutions.

However, NARS is increasingly recognizing the value of such staff and new positions are being defined within NARS to facilitate the technology transfer process. The numbers, placement and position classifications of such staff are important issues for planners who determine the future manpower requirements of a NARS.

Assessment of Availability of Human Resources

Assessment of available human resources should start with a quantitative and qualitative inventory of currently available agricultural research manpower in the NARS. This inventory provides information on the characteristics of the current staff of a research organization in terms of (1) qualifications including highest degree obtained, special training undertaken, and professional work experience; (2) allocation of staff in terms of crop, research program, discipline, function, and position; and (3) location of staff in terms of research center, on-farm/on-station, and region of the country.

An analysis of the human resource inventory, particularly over time, permits the diagnosis of manpower strengths and weaknesses of the research organization. It assists in projecting future availability and provides a basis for staff development planning with educational institutions and donors.

The future availability of researchers to a NARS depends on three primary factors: (1) the possibilities for upgrading and redeploying existing personnel, (2) opportunities for the recruitment of new personnel, and (3) attrition for voluntary and involuntary reasons.

Matching Requirements to Availability

The final stage of the human-resource planning process involves matching the estimates of skill requirements with probable skill availabilities from both internal and external sources. At this stage, current and future capacity of the research organization to effectively absorb, utilize, and manage projected levels of staff should be assessed.

The following are some of the factors that affect the utilization and productivity of agricultural researchers. These factors will likely modify the projections of requirements discussed above:

- **Training capacity** within the organization for young researchers who must be trained on the job by experienced and competent researchers.
- **Opportunities for degree training** for young, qualified staff on whom the organization depends for future program leadership. Of particular importance is the continued development and availability of basic research skills in addition to disciplinary expertise.
- **Management capacity** for staff direction, supervision, and monitoring at the station, division/department, and program levels.
- **Support assistance** from technical and other support personnel. The number and quality of these personnel influence the number of researchers who can be employed effectively. Needs vary by discipline.
- **Funds for operational expenditures.** The availability of operational funds is a major determinant of the number and kind of researchers who can be employed effectively. Funds for operations and support personnel represent the total recurrent resources available per researcher.
- **Adequate facilities.** Many agricultural research programs/projects require specialized laboratories or other facilities. Coordination of staff recruitment and facilities development are essential.

Staffing

The planning activities described above result in estimates of number of staff required and available for the research program as projected into some future period. The process of staffing builds upon the information generated in the planning process on specific tasks to be performed and the specific positions required. Once planning has been accomplished, the research manager can develop specific **job descriptions** and define **recruitment targets** for various staff categories.

Broadly conceived, the recruitment process includes the attraction, selection, and assimilation of new staff into the institution. A final staffing concern for research managers is the placement or **deployment of staff** within the organization in relation to location, linkages with other staff, and program priorities.

Defining Positions

Job descriptions usually identify the job in the organization, describe its purpose and activities, summarize responsibilities and performance standards, and list minimum and desirable qualifications for the job. The responsibilities of an agricultural researcher would normally include the following (adapted from Arnon):

- Show initiative in recognizing new research opportunities and in proposing and preparing research projects.
- Undertake to solve problems suggested by program leaders, extension workers, and farmers.
- Cooperate in research teams where researcher competence is needed.
- Keep up with professional literature and maintain interest in broader scientific subjects.
- Develop methods and designs or help design research equipment.
- Plan, design, conduct experiments, and collect background information.
- Analyze results, decide on their significance, and draw conclusions.
- Present the research in a timely fashion in the form of a report or paper for publication.
- Communicate the results to other scientists, extension workers, and farmers using the most appropriate media.

Job description and classification systems (titles and grades) usually differ for administrators, researchers, technical staff, and support staff. For example, career ladders, incentive systems, and task expectations are much different and should be clearly reflected in the job descriptions. **Researcher classification systems normally provide for continued opportunities for advancement and recognize education, experience, and performance.** Job descriptions are relatively flexible to allow for the creativity and initiative expected of professional researchers.

Recruiting Staff

The recruitment process depends on the development of job descriptions, assurances of position approvals, and financial support from appropriate authorities (often outside the research institution). The process is likely to be influenced or entirely controlled by civil service organizations and regulations. In some cases, civil service organizations have recognized the special nature of research and provided separate conditions and recruitment regulations for scientists. In other cases, it is possible to obtain exemptions from normal regulations in order to facilitate the hiring of appropriate staff.

Ideally, a research organization can control the number and type of personnel who are recruited. The recruitment process, then, is an outcome of the planning process which involves the matching of carefully formulated research programs with available and required number of qualified researchers and support staff. A rational recruitment plan must be related to the organization's capacity to provide effective training and supervision of new staff.

Experience and research have shown that it is possible to develop a profile of a productive researcher. Characteristic include: (1) highly qualified for the job, (2) highly motivated, (3) positive orientation to the job, (4) demonstrated maturity, and (5) effective interaction with others (adapted from Hughes). Many of these characteristics are intrinsic to the individual and best handled in the recruitment process.

Management interventions such as training, improve productivity of those identified as having high potential in terms of creativity, originality, initiative, and technique. This profile approach to recruitment implies that quality input has a high degree of predictive value in determining quality and valuable output.

The assimilation or introduction of recruit staff into the research institutions is an important and often neglected part of staffing. The productivity and efficiency of the staff is improved at a faster pace if the institution recognizes the need of new staff for information about (1) specific and detailed job expectations, (2) criteria and procedures for performance evaluation, (3) purpose and program of the unit in which the staff is placed, (4) the culture and doctrine of the institution, and (5) relationships and linkages with other relevant organizations (like extension). Deployment of new staff in teams with mature researchers can facilitate the process of assimilation into the institution.

Deploying Staff

The manner in which researchers and technical staff are deployed influences the productivity of a NARS. The need to develop and maintain "critical masses" of researchers in terms of specialization, program size, and geographic location is particularly important. This permits effective inter- and intra-disciplinary interaction among the professional research staff. **With increasing decentralization of some research systems, staff interactions and collaboration associated with "critical mass" become increasingly important.** Strategies for deploying on-farm research team is of particular concern to many NARS.

It is essential that young researchers are deployed in such a manner that they receive close supervision. When there is a shortage of appropriately skilled and experienced researchers to perform this role, trainee researchers may need to be deployed in groups for more formalized in-service training. Supervisors and experienced staff may need to be trained to facilitate the early development of new staff.

It is important to deploy staff in relation to research program objectives. Thus, data on number and disciplines of full-time-equivalent staff should be maintained by priority programs, whether defined by commodity, region, or other program-related focus. **If research priorities define select target client groups, it is important to deploy staff accordingly.** The mix of researchers in terms of discipline will be determined over time by the specific problems encountered and the ability to "borrow" technology.

Development

A productive agricultural researcher requires a relatively prolonged period of both structured and unstructured training. Agricultural research activities are, by their very nature, highly skill intensive; and many of these skills are initially acquired by formal degree training.

However, **if agricultural research personnel are to maintain**

up-to-date knowledge and skills in their area of specialization and, thereby, be able to continue to undertake high-quality research throughout their careers, they must receive training on a periodic basis throughout their working lives.

This apprentice/professional research career model is characterized by rather specific training needs at various stages of a researcher's career. Three modes of training for agricultural researchers can be identified: (1) apprenticeship, (2) formal degree training, and (3) professional development.

Apprenticeship

As an apprentice, a new agricultural researcher ideally would receive structured, intensive on-the-job training under the specialized supervision of an experienced researcher. During this period, the apprentice acquires and adopts relevant skills and knowledge to the program needs of the institution. Equally important, he should form appropriate attitudes and commitment for a productive career in agricultural research. The apprentice attends short, intensive training courses to improve knowledge and skills.

Since many NARS are small in size, apprenticeship courses need to be organized on a regional basis involving both national and international research institutions. The period may last from two to three years, after which the trainee acquires professional status as an agricultural researcher.

Formal Postgraduate Training

NARS must have a substantial core of staff with postgraduate degree training in research. If not acquired before entry into the agricultural research institution, opportunities for postgraduate studies may be made available to young researchers early in their careers, but after a period of apprenticeship.

While postgraduate degree training is essential for most trainee researchers, it is not a substitute for on-the-job training. Researchers acquire the necessary skills and attitudes needed for collaboration with farmers by working intensively with farmers themselves. On-the-job training prior to postgraduate study helps provide a relevant context for specialization in the degree program.

Professional Development

Appropriate training opportunities throughout the researcher's career are necessary to maintain technical and scientific competence, and to sustain motivation and productivity. Through these opportunities, researchers, especially those who work in small groups and are geographically isolated, are able to maintain essential contact with other researchers and with the international scientific community in general. Specially arranged contacts with other researchers become increasingly important as the researcher gains in experience and maturity.

This in-career training may vary from more formal and structured events, such as national and international short courses, conferences, seminars, workshops, and professional meetings to more informal activities such as study tours, special assignments, and contact visits to other research institutions. Each has its strengths and weaknesses, depending on the objectives and needs of the professional. Research managers should meet with researchers periodically to assess needs and plan in-career, professional activities to meet these needs through the most effective forms of training possible. Ideally, planning for professional development is part of an overall NARS plan and occurs during the performance planning and appraisal process.

Compensation

Compensation schemes (also referred to as conditions of service) relate to the structure of grades and positions, promotion policies, and salary and nonsalary rewards. **The retention, motivation, and performance of well-trained agricultural research staff depend, in part, on policies and procedures for their compensation.** While agricultural research managers cannot always significantly change policies and procedures for compensation of research staff, several options for improvement may be within the legal and policy framework of NARS

A number of common problems can be identified in relation to grading, promotion, and reward structures for agricultural researchers. These problems arise since most agricultural researchers are subject to the same terms and conditions of employment as all other professionals in the civil service. Public sector compensation policies and practices are of central importance to all governments, both economically and politically. Civil services and finance units are often reluctant to make even minor changes unless there are compelling arguments to treat agricultural researchers differently from other groups.

Human resources productivity in NARS may be improved if there are significant changes in compensation for researchers and key categories of support personnel. Salaries and other benefits need to be competitive with private sector, both for those in the early stages of their careers, and for experienced researchers.

Guidelines

To provide attractive career opportunities for agricultural researchers, a well-designed grade, promotion, and payment system would have the following characteristics:

- **Compensation policies** are simple in concept and design. Policies must be easily understood by all employees and be implemented by management in a straightforward manner.
- **Grades and salaries** are based on (1) detailed job analysis and evaluations to determine the "size of the job" according to skill, knowledge, and responsibility requirements; and (2) national salary and compensation surveys of similar jobs and occupations. Nonsalary benefits must also be evaluated for comparative purposes.
- **Job titles** allow both colleagues and outsiders to readily identify the seniority, position, and hopefully, competence of the individual. More importantly, they help the researcher to have a clear sense of career progression.
- **Promotion and financial incentives** are provided throughout the entire career of a researcher. This implies the existence of regular opportunities for promotion and significant percentage increases in compensation.
- **Promotion criteria and requirements** are well specified and primary emphasis are placed on demonstrated job performance. Where appropriate, adequate recognition is given to the attainment of job-relevant qualifications. Seniority criteria play a limited role, and promotions are not dependent on the availability of vacancies in any grade category or job level.

- **Accelerated advancement** possibilities are provided for specially competent and highly motivated researchers who have made exceptionally valuable contributions to research programs. Without this flexibility, **star performers,** who normally play important roles in scientific research, may leave for more attractive employment elsewhere.
- **The income growth curve** corresponds to the underlying relationship between the experience of researchers and the level and rate of growth of individual productivity. Normally, this curve will rise relatively slowly at the outset of the research career, more rapidly once the professional apprenticeship period is completed, and more slowly again during the latter career stages.
- **Dual career ladders** provide able scientists who wish to remain in mainstream research with the opportunity to attain the status and salary levels of senior management.
- **Teaching and consultancy assignments** are encouraged for mature scientists within a policy framework specifying amount of time and the relationship to normal responsibilities.

Implementation Possibilities

Since civil service systems can impose constraints on the development of desirable compensation schemes for agricultural researchers, NARS may consider the following alternative possibilities to improve the situation:

- **Autonomous institution.** In a few cases, NARS has been able to establish sufficient autonomy to devise its own personnel policies, including compensation schemes. In recent years, some have been formed as semi-autonomous foundations.
- **Scientist classification system.** In several countries, a special classification and compensation scheme has been established for all scientists, built around several of the above guidelines. This enables researchers to remain in regular government agencies while recognizing the

factors needed to retain and motivate them for research. The results of salary surveys of other professional and technical groups in public and private sectors are used as bases for across-the-board increases in salaries and benefits for researchers and support personnel.

- **Selective policy schemes.** Another approach is to make selective changes in existing grading, promotion, and salary policies, some of which would have only limited cost implications. This approach may include improvements in evaluation procedures, extended salary scales, dual-track career structures for researchers and research managers, improved salary and nonsalary allowances and fringe benefits, awards for exceptional performance, and a modified grading structure.

Nonsalary Compensation

In addition to salaries, NARS provides research staff with many other payments and nonmonetary benefits like per diem, transportation allowance, housing, education of children, etc. Also, government policies often directly provide health benefits, retirement (pension) plans, and life insurance. While these policies may be established for all civil service personnel, their application is often conditioned by the circumstances of the NARS and donor-funded projects.

Where salaries and normal benefits are not sufficient to attract and retain high-quality researchers, special forms of compensation are often devised or applied. These range from liberal interpretations of per diem policies to the provision of honoraria for involvement in research projects. These payments may be necessary and are useful where the civil service system emphasizes seniority instead of merit and/or as a selective means of encouraging and rewarding productivity. Under some circumstances, these payments have the potential for abuse and may encourage the proliferation of marginal, low-quality research activities. It is important that such policies be managed carefully and reviewed often in terms of impact on the quality of the research output.

Another mechanism, which both motivates staff and improves the quality of performance, is the introduction of a system of limited supplements, bonuses, or special awards based on exceptional performance alone. The system would entail specific performance criteria which would not discriminate against the staff in any discipline of function.

Evaluation

Effective human resource management requires periodic staff evaluation. This is normally accomplished through the establishment of an appropriate performance planning and appraisal system. In practice, evaluating the performance of technical and other support staff has been more common and acceptable than evaluations of researchers and administrators. There is a natural reluctance on the part of researchers to allow administrators or peers (particularly those from other disciplines) to pass judgement on qualitative or quantitative aspects of their work.

Measures of Performance

Because agricultural research is relatively nonrepetitive, requires creativity, and has unpredictable outcomes, the evaluation of researcher productivity is better suited to qualitative assessment. The beginning point for this is the program plan for the research unit and the corresponding plan of work for the researcher. It is important that personal goals be compatible with organizational goals. Once this is established, tasks can be defined and a reasonable time frame set for their completion. At annual performance reviews, research managers can review output in terms of time involved, relation to task requirements, use of effective research techniques, problems, errors, impact, etc. Over time, NARS managers can establish and communicate a set of expectations for researchers that will be understood throughout the organization.

Performance Planning and Appraisal

Performance planning for the researcher is analogous at the individual level to the organization's macrolevel program planning activities. Similarly, performance appraisal is a component of program monitoring and evaluation.

The process of **performance planning** involves: (1) a prior and periodic elaboration of individual goals in relation to program goals, and (2) the establishment of criteria by which specific aspects of researcher goal achievement can be measured.

Performance appraisal involves a periodic and mutual assessment of actual performance in relation to desired (planned) performance. It offers the opportunity to review researcher, management, and organizational factors which may influence staff performance.

Well-designed personnel performance planning and appraisal systems serve the needs of both the organization and individual employee. **From a management perspective, a personnel appraisal system provides essential information for planning the future use of human resources.** The system forms the basis for informed decisions about future training activities and about the allocation of financial and other rewards to employees. **For the individual employee, a well-designed and implemented personnel appraisal system is important in maintaining and improving motivation.** It provides regular feedback information on job performance, indicates how performance might be improved in the future, and generally creates a favorable environment in which individuals are able to discuss their personal growth and development in the organization.

The characteristics of effective performance planning and appraisal systems are:

- **Specific and accurate.** Effective performance planning and appraisal are based on clearly specified and measurable performance standards and indicators. Only those activities that are important for successful job performance are considered; and only the actual work done is to be evaluated, not the potential for work yet to be done. The management and the employee should mutually agree on the latter's job description and on the performance goals to be achieved. The different aspects of job performance are clearly delineated, separately assessed, and then combined using a common weighting system.
- **Reliable and consistent.** Once appraisal techniques and

methods are determined, effective appraisals produce consistent measurements of performance among individuals. Appraisals typically rely on both objective and subjective performance ratings.

- **Practical and simple.** Personnel appraisal systems should be practical and simple; otherwise, both management and employees face considerable difficulties in understanding the concepts and procedures involved, and the whole process becomes time consuming and prone to breakdowns.
- **Regular and routine.** Personnel appraisals conducted on regular scheduled basis, satisfy both management and individual needs. In practice, effective communication is unlikely to be maintained unless formal appraisals are completed at least once a year. For effective management, informal day-to-day contacts and interactions are also used for feedback on progress of staff towards individual and program goals.
- **Participatory and open.** Effective personnel planning and appraisal systems are based on a high level of direct participation by employees in the process. This involves appraisal interviews with superiors who have the best direct knowledge of the employees' past performance. Past performance is discussed in a frank and open manner; and goals for future work, as well as strategies for performance improvement, are established.
- **Integrated with rewards.** Personnel performance planning and appraisal systems are most effective when job performance is closely linked to individual rewards.
- **Relevant and responsive.** Performance planning, appraisal, and rewards for the individual must be directly related to program plans and objectives of the NARS. For example, if program goals require more client orientation, individual plans and evaluation criteria need to be responsive in terms of research activities, procedures, and locations. In such a case, publications should be encouraged for extension workers, and personnel policies should provide sufficient incentives for living and working in remote locations.

High levels of responsibility and commitment throughout the management hierarchy are necessary for an effective personnel planning and appraisal systems. In practice, many managers are reluctant to be critical of colleagues as subordinates in merit-based system. Consequently, strong tendencies exist toward excessive leniency in rating employees and/or excessive bunching of evaluation ratings within a narrow range of values.

Managers can be taught to evaluate personnel performance. Critical skills include the ability to (1) become an "active listener", (2) empathize and communicate effectively with subordinates, (3) be supportive rather than excessively critical, and (4) develop short- and long-term plans for individual improvement. In general, appraisal systems are most effective where managers have a basic understanding of researcher motivation and the socio-psychological aspects of job behavior and performance.

An effective performance planning and appraisal system requires a capacity for employee counseling. Continuous interaction between the researcher and program managers will facilitate performance consistent with program goals and norms within the institution. Where there are difficulties in reconciling program and individual goals and problems arise between researchers, counseling by someone other than a supervisor may be required. NARS is well-served to identify a senior person who can resolve conflicts and assist staff in achieving job satisfaction.

The Leader Factor in Organizational Excellence

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Presently, leadership is regarded as one of the most critical ingredients in the success of a top institutional leader. Any head of an organization or program worth the name is expected to lead his/her system to high level of achievement and excellence.

What leadership qualities should leaders of an agricultural research system possess to induce organizational excellence?

Peters and Austin, authors of *A Passion For Excellence: The Leadership Difference* found that common to the 75 excellent organizations they studied is a leader whose foremost concern is to make the organization excellent. If he knows any standard at all, it is excellence, nothing more, nothing less, nothing else. His passion for excellence drives him to constantly yearn and search for the best – never complacent, never satisfied. His motto: to make better best at high level of efficiency and effectiveness.

Excellence happens when high purpose and intense pragmatism meet, say Peters and Austin. Thus, to steer an organization to a successful course, a leader must be a visionary and a pragmatist. On one hand, he has a clear picture of where the organization should be. On the other hand, and more importantly, he translates his vision into action. Here, Peters and Austin suggested a leadership technology which works in almost all of the excellent organizations they knew of. It is called **management by wandering around (MBWA).**

MBWA is not just wandering per se. A leader should do these three activities:

- teaching, which means value-shaping (sharing the vision) and guiding or acting on a deep-down belief in the potential of every person to contribute;

- listening or being in touch, the objective is to find out what is going on and what is bugging people; and
- facilitating or directing help, solving problems on-the-spot. No voluminous reports on what happens to which place. It is acting fast and straightway.

MBWA is based on the premise that leading is primarily paying attention or letting people know that the leader is there to make excellence happens.

There are also values which a leader should hold on to champion or promote excellence: people-orientedness, innovative culture, and care for the clientele.

People-Orientedness

Distinction can be achieved not through prowess of the geniuses but the commitment to excellence by everyone "turn-on" people, equally passionate, and enthusiastic in making the organization excellent.

Three factors determine people's commitment: beliefs held about people; the people's view of themselves in relation to the organization; and how their accomplishments are appreciated.

What works? Respect (for the dignity of every member) not contempt; the people's view of themselves as in command and as listened to as a vital part of the group; and genuine appreciation of what they have accomplished.

People-orientedness is demonstrated by the story of a department administrator in a research hospital. "My approach was to tell people in the department, 'Do whatever you want to as long as it is legal and within the budget'." She said that she had provided virtually no guidelines beyond that. The results "I was astounded. Research productivity in the department, in terms of papers produced and accepted for publication, for instance, increased by a factor of six! And all within less than a year."

Innovative Culture

In this ever changing world, only those organizations which learn to adapt, to be flexible, and to be responsive survive and grow. Thus, organizations should not master obsolescence but rather give room for new ideas, experimentation, and even for failure.

Here are some of the ways, authors Peters and Austin listed, to nurture as innovative culture:

- o Inaction is not tolerated. The most common question is "what have you done in the last 24 to 48 hours?"
- o Failure is not only tolerated but lauded.
- o Invention with clientele is considered normal.
- o The physical layout (everywhere) encourages chance and informal communication, especially cross-functional communication. Teams are readily formed, then immediately given temporary (semi-isolated) team space. Numerous social and informal events are aimed, specifically at enhancing cross-functional and cross-divisional communication.
- o Spur-of-the-moment activity is seen as the normal problem-solving mode, as opposed to "Throw resources at it."
- o Senior (and middle) managers repeatedly show open disrespect for their own procedures and structures, regularly encouraging others to subvert the rules.
- o Well over half of top management (the top twenty-five) has one or more "painful innovative successes" in their background. That is, top management and innovation go together.

Innovation should be done regularly (at all levels, in all functions). When an organization stops innovating, it surrenders itself to mediocrity, for mediocrity knows nothing higher than itself, with Ernest Dowson.

Care for the Clientele

This can be expressed in several ways, as organizations obsessed with their clienteles do: through service, providing for what they need "within 24 hours"; through quality, giving you the best **always**; and through reliability, being there when they need you.

Also, excellent companies are better listeners. They actively seek feedback from their clientele through regular meetings, visiting them, or like what one agricultural research institute is doing – maintaining a full-time liaison person with every farmer association in their area. With this, people will continue to patronize the organization if they feel they are given sincere attention. Paying attention pays – the certainty that the organization will continue to exist because of the continuing support of the clientele.

Module II:
Planning for Research and Development in Agriculture and Natural Resources

The Philippine Development Planning Process

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Chronology of Activities

Listed below, with the corresponding date/s of completion, are the steps involved in the planning process for the Philippine Development Plan:

• Issuance of Memorandum Circular No. 4 directing the formulation of the Medium-Term Philippine Development Plan, 1987-1992	18 March 1986
• Preparation of background paper entitled "Economic Recovery and Long-run Growth: Agenda for Reforms"	24 May-30 April 1986
• Consultation Meeting on the Preparation of the Plan	15 April 1986
• Formulation of "Policy Agenda for People-Powered Development" based on the background paper	1-30 May 1986
• Convening of the Development Planning Steering Committee	5 May 1986

• Convening of the Coordinating Committee	8 May 1986
• Issuance of Memorandum Order No. 2-86 establishing the guidelines on the formulation of the Plan	13 May 1986
• Convening of Technical Subcommittees	1-5 June 1986
• Approval of the Policy Agenda by the Cabinet	4 June 1986
• Documentation Subcommittee Meetings/Coordinating Committee Meetings	June-August 1986
• Conduct of Public Hearing/Consultations	June-October 1986
• Submission of Agency/Sectoral Plans to NEDA	30 August 1986
• Submission of Draft Plan to Steering Committee	7 October 1986
• Cabinet Review of Draft Plan	5 Nov./19 Nov. 1986
• Finalization of the Plan	October-November 1986
• Approval and adoption of the Medium-Term Philippine Development Plan, 1987-1992	12 December 1986

New Dimensions of the Philippine Development Plan (1987-1992)

The new dimensions of the Philippine Development Plan are as follows:

- Clear policy guidelines
- Greater people's participation
- Inclusion of poverty reduction and income redistribution targets
- More specific social development indicators and targets
- Closer linkage between the development plan and annual budgets
- Greater emphasis on development plan implementation
- Strong political will

Planning for Research and Development in the Agriculture Sector

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Introduction

Research and development (R and D) efficiency depends to a great extent on the effectiveness of the planning process. This in turn hinges on how the R and D structure is linked with other research institutions. Cognizant of this, the Department of Agriculture (DA) strengthened its research service to become more effective and efficient in developing cost-effective and situation-specific technologies for farmers and fishermen. Strengthening of DA brought about decentralization to improve the management structure and develop the capability of the regional offices to plan, manage, and implement their own programs. Improvement of the R and D planning system was done through the creation of the Bureau of Agricultural Research (BAR), organization of the Research Advisory Committee, and the appointment of an Assistant Secretary for Research, Training and Extension. At the regional level, the position of an Assistant Regional Director for Research and regular plantilla positions for researchers were created.

BAR Organization

A Director heads the Bureau and is assisted by an Assistant

Director. Attached to the office of the Director is the Technical Core Staff which provides advice and technical assistance to other units within BAR, and the Administrative and Finance Staff (AFS) who renders the support services to the Bureau. BAR has three divisions, namely: Program Development Division (PDD), Research Coordination Division (RCD), and Information Systems Division (ISD).

The Program Development Division (PDD), prepares/integrates the agricultural research agenda, evaluartes project proposals, conducts impact assessment of research projects, and prepares project proposals for possible local and foreign funding, and institution building, among others.

The Research Coordination Division (RCD) coordinates and provides technical support to R and D programs/projects of the DA through their coordinators. RCD assists other Bureaus within DA, attached agencies, and the regional offices in preparing their research plans and programs. RCD also monitors and evaluates on-farm trials, and identifies promising technologies for piloting. In addition, it operationalizes established linkages with the DA units/agencies/bureaus, SCUs and the private sector involved in research.

The Information Systems Division (ISD) handles the database of BAR. Specifically, ISD establishes the management information system, such as data sourcing, integration, and delivery of information to specific users. In collaboration with the DA units with extension-research activities, ISD also packages and disseminates research result generated by the research system (Figure 1).

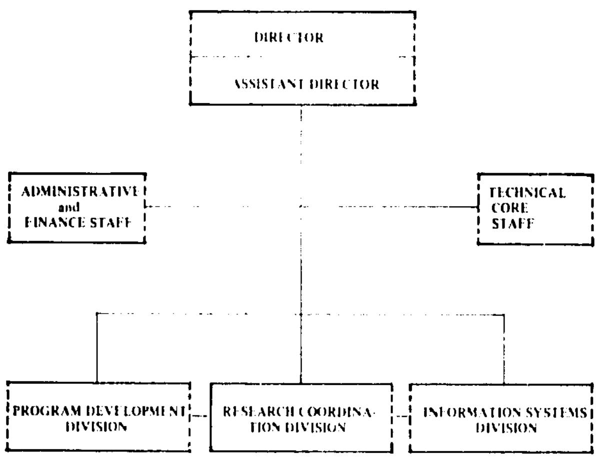


Fig. 1. Bureau of Agricultural Research Organizational Chart.

Research Advisory Committee

The Research Advisory Committee (RAC) is the policy-determining body for research in the DA. RAC is composed of the Assistant Secretary for Research, Training and Extension as Chairman; the BAR Director as Vice-Chairman; the BAR Assistant Director as ex-officio Secretary; the Directors of the different Bureaus and the Agricultural Training Institute (ATI); one representative from DA's attached agencies, one representative from the DA Regional Directors (on rotation basis), and six representatives from farmer organizations (Figure 2).

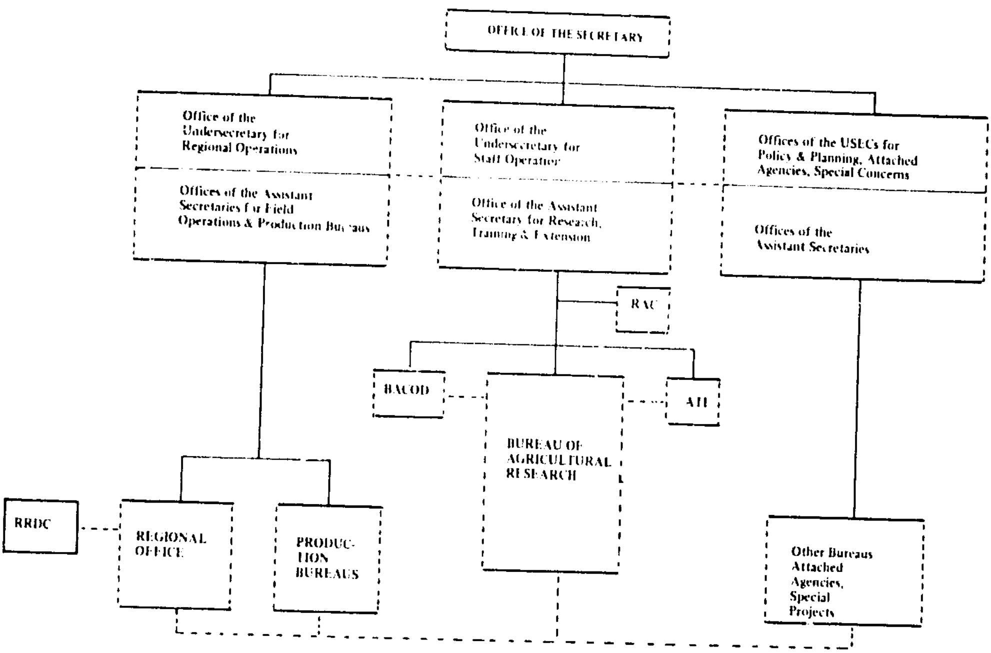


Fig. 2. Research Organizational Linkages within the DA.

The Committee identifies policies and guidelines for the overall administration and operation of the DA research program, identifies DA research priorities, and recommends R and D projects for approval by the Secretary of Agriculture.

The RAC's counterpart in the region is the Regional Research and Development Committee (RRDC) chaired by the Regional Director with the Assistant Regional Director for Research as Vice-Chairman. The members of RRDC are the Regional Research Coordinator (Res Cor), Research Station Superintendents, Provincial Agricultural Officers (PAOs), Chairman of the Regional Agricultural and Fishery Council (RAFC), and the RIARS Manager.

The DA, PCARRD, and SCUs now adopt the farming systems approach (FSA) in their R and E activities to allow greater farmer participation in decision making at all stages of the R and D continuum. This approach enables the farmers to make agronomic decisions within their management capabilities, existing resources, and constraints. Such approach which is aligned with DA's thrusts of promoting bottom-up planning aims to hasten technology transfer to farmers and align research priorities within farmers' real needs.

Planning for Research and Development

To guide DA and BAR researchers in preparing their research plans, BAR prepared a general timetable of major activities. The activities include: preparation of the National Agricultural Research and Extension Agenda (NAREA), the conduct of regional integrated R and D review, proposal preparation, screening and evaluation of proposals, and budget dialogue (Appendix A).

National Agricultural Research and Extension Agenda

BAR is continuously improving its procedures for setting research priorities. Along this line, the preparation of the Medium-Term National Agricultural Research and Extension Agenda (NAREA) was started in coordination with PCARRD. The NAREA embodies the priorities of the regions for the next five years as identified during the series of consultations held by BAR in 1987.

BAR used the diagnostic approach in identifying the R and D priorities of NAREA. The diagnostic approach which gives emphasis on zone-level research allowed DA to focus on key problems affecting many farmers, their causes and solutions. In this way, use of scarce funds and manpower in research is maximized.

Another salient feature of the diagnostic approach is the multisectoral and interdisciplinary participation of agencies. For instance, during the series of BAR-sponsored regional consultations, the participants included RIARS staff, Regional Directors, Assistant Regional Directors for Operations, Provincial Agricultural Officers, representatives of State Colleges and Universities (SCUs), and farmers/fishermen. The outputs of these consultations were consolidated to constitute the NAREA.

R and E activities under NAREA were prioritized in four levels: by development zones, by sector within each development zone, by commodities within a specific sector and by priority research problems/areas within commodity. The seven priority development zones identified in the agenda are the hillylands, upland plain, lowland rainfed, and lowland irrigated for land resources; and the marine areas, fresh waters, and brackish areas for the water resources. Priority research problems identified are poor production management practices, lack of adaptable varieties and seeds/fry stocks, inefficient marketing system, limited processing, utilization, handling and quality control techniques, high cost of production inputs, among others.

Regional Integrated R and D Review

PCARRD and DA-BAR jointly conduct the Regional Integrated R and D Review of ongoing R and D projects from April to July. The Review is participated in by agency heads, research directors, planning officers, and researchers within the region. Representatives from PCARRD, DA-BAR, DENR-ERDB, farmer-leaders, and extension workers also attend the review. Regional Planning workshops are subsequently conducted to prioritize and identify research activities for the coming year. Mature technologies for dissemination and potential technologies for verification and piloting identified during the Review were used in revising and updating the research agenda.

Screening and Evaluation of Proposals

Between August to November, BAR evaluates research proposals submitted by the regional offices, attached agencies and bureaus based on the prepared macro- and micro-criteria base list. The evaluated proposals are referred to the interdepartment R and D committees for further screening during the latter part of November until January. Proposals that do not conform with NAREA are returned to proponents during the evaluation period, while proponents of research proposals considered for funding are notified to submit detailed proposals for final evaluation by the RAC in early February.

Budget Dialogue

The BAR conducts two budget dialogues for the approval of the research and budget plan. Proposals usually take one year from submission to BAR until approval for funding.

Proposals approved by RAC are endorsed to the Secretary of Agriculture for approval. BAR consolidates the research plan and budget of all DA units for PCARRD's consideration. PCARRD in turn evaluates the consolidated proposals from DA-BAR, in accordance with the plans of the whole R and D network. BAR holds the Budget Dialogue Phase A with PCARRD in March to get feedback and to realign the plans and budget according to PCARRD's recommendations. PCARRD later on endorses the research plan and budget to the Department of Budget and Management (DBM) for final approval. Representing all DA units, BAR participates in the second budget dialogue in October with PCARRD and DBM to realign the plans and budget based on the approved appropriation from the Congress.

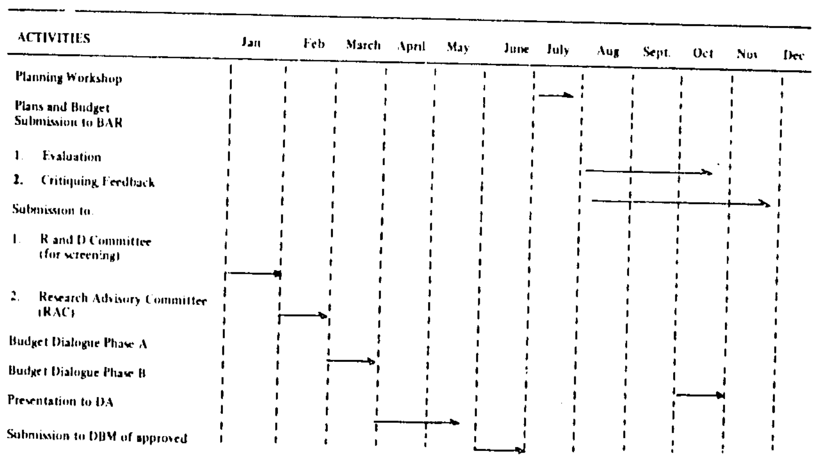
Meanwhile, ongoing research projects are monitored throughout the year. Quarterly reports are submitted to BAR regularly by the concerned project leaders. Completed projects are postevaluated from March to May so that these can be included in the next Regional Integrated R and D Review and Planning Workshops.

Conclusion

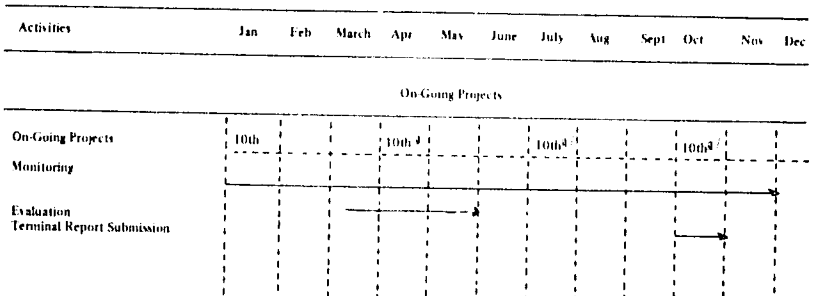
The foregoing discussion gave an overview of the planning process for R and D in the Department of Agriculture. Preparation of the R and D agenda is one part of the planning process. Other priority concerns of BAR include strengthening of the research-extension linkage, enhancing farmer participants in R and E activities, research utilization and improvement of data management system. With effective planning, limited physical and financial resources are maximized to realize DA's R and D priorities/thrusts.

APPENDIX A.

SYSTEMS AND PROCEDURES ON RESEARCH PLANNING, EVALUATION AND MONITORING 1988–1990



SYSTEMS AND PROCEDURES ON RESEARCH PLANNING, EVALUATION AND MONITORING 1988–1990.



a/Submission of monitoring report

Systems and procedures on research planning, evaluation and monitoring, 1988–1990.

A Systems Approach in Planning for Natural Resources Research and Development Projects

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Overview

In line with the new government's policy on equity and social justice, the Department of Environment and Natural Resources (DENR) has now focused its efforts in pursuing a more rational disposition and efficient utilization of the country's natural resources. The Department's thrusts are four-fold:

- sustainable development of natural resources with emphasis on the uplands;
- access and benefit-sharing in resources use;
- efficiency of natural resources-based industries; and
- integrated approach to environmental management and protection

Following the above thrusts, the policies of the government are now directed towards providing small farmers, agricultural workers, and forest occupants/upland farmers greater access to public lands suitable to agriculture and agroforestry. In fact, about

29 M ha of public lands have been classified as of year-end 1987.

To augment this move, DENR launched a more intensified campaign against illegal logging and log smuggling. A total of 88 timber licensees covering 2 M ha of concession areas have been cancelled. A complete log export ban, except on plantation species, has also been implemented.

Management of the country's protected areas and the conservation of its endangered wildlife species are also prime concerns of DENR. Some of the country's national parks are now prioritized for develo[illegible]nt. Utilization of wildlife is being regulated through the issuance of permits.

Despite the bleak situation of the country's natural resources, the mining industry registered a modest performance growth with a favorable 10.50% upsurge in total value from ₱18.4 B in 1986 to ₱20 B in 1987. Both the metallic and nonmetallic sectors of the industry showed a marked increased in their production.

Researches on various aspects of environmental degradation and rehabilitation were also initiated in 1987 including that on industrial waste exchange. A river revival program covering rivers in Metro Manila and Region 3 was also started. Control of industrial air and water pollution was also pursued. Legal actions against polluting industries were instituted, which include the imposition of penalties on 54 individual firms and closures of two distillery plants in Pampanga for continuously violating laws on pollution. Side by side with these researches, several technologies on natural resources production and utilization have already been generated.

This renewed vigor at DENR is aimed at improving its past performance to reverse the trend of destruction of our natural resources. Of the country's 30 M ha, there is now only 1 M ha of primary forest left due to illegal logging and squatting. Mine tailings are continuously being dumped into fertile seas, leaving only 5% of our corals in their prestine state. Soil erosion is a familiar sight everytime heavy rains pour resulting into sedimentation and siltation of our rivers. Unless we move now, our remaining natural resources will all be put into waste.

The Systems Approach in Planning R and D Projects

The continuous destruction of our natural resources could be attributed to our failure to properly plan our management strategies and research activities. During the past years, research projects relied heavily on the use of statistical methods for sampling and data analysis. We failed to consider valuable and important information which cannot be elicited by statistics but obtainable only through observations. This is where the fundamental difference between data and information becomes vital in planning and decision-making.

Information, of course, is also data, but it is more than that. Information is selected. It is supposed to arise from planned observation, guided by theory, which however, need not necessarily be tied to controlled experiments. Observations are deliberately designed, other data are merely obtained (Morgenstern, 1963).

The application, therefore, of systems approach in project planning becomes essential because through this, a more organized manner of problem identification, information gathering, and analysis are easily recognized.

There are three essential components of systems theory used in research planning, namely: elements, states, and relationships (Palo, 1971).

- **Element** may either be physical objects such as trees, minerals, animals, and people or abstract ones including processes, populations, societies, and others. Every element of a specific system can generally be viewed as a system by itself, being a subsystem of the primary one. On the other hand, the primary system maybe a subsystem of a system on a higher level. This way of thinking refers to the hierarchy of systems.
- The **states** are attributes or properties of the element. The state of the system can be observed by measuring or knowing the status of its elements. The states may be *weight* of man, *height* of a tree, *sex* of an animal, etc.
- **Relationships** are the notion of connectedness, interconnectedness, dependence, cause, correlation, etc. Relationships tie the elements together as a system. Accordingly, any element of a possible set that cannot be tied in with any of the others does not belong to the system.

Natural Resources as a System (Ecosystem)

As early as 1963, the value of using "the ecosystem as a conceptual tool in the management of natural resources" has already been stressed (Schultz, 1963). The natural resources ecosystem is composed of many components: the trees and other living things; the soil, air, water, mines and other mineral resources; the people of its community; and many others. These components are interrelated with each other. To understand the properties and characteristics of one component, the properties and characteristics of other components should also be known. Brewer (1979) presented a story depicting this interrelationship:

> "... a few years ago DDT was used in Borneo to kill mosquitoes around houses, which it did. However, small lizards called 'geckos' that lived in the houses and fed on the mosquitoes fell easy prey to house cats who also began to die. As the cat population dropped, rats began to infest the houses, and in this area rats were dangerous as potential plague carriers. Borneo began to import cats."

The above story exemplifies the fact that parts of an ecosystem are all interconnected so that when one part of the system is touched, eventually the rest are also affected.

Natural Resources as a Production – Consumption System

In planning R and D projects, researchers and policymakers should consider that our natural resources is a *production-consumption* component of the ecosystem. It is the source of goods and services which are manufactured, distributed, and consumed by the human component or other forms of organisms in the ecosystem. These goods and services may come in the form of food, trees, wildlife, forage, water, recreational facilities, habitat, etc. The production-consumption system can be considered as a chain process which when viewed from a holistic perspective is seen as an integrated whole.

Natural Resources as a Control System

We should also consider that our resources is not *inexhaus-*

tible. Once these resources are overused, we will come to a point where nothing will be left. Thus, a system of control must be imposed in the manner of utilizing our natural resources. In setting this control mechanism, the three essential components of a system, namely: element, state, and relationship must be considered.

A Model for Planning R and D Projects

The Planning Process

Planning is a process by which a system allocates its resources to internal and external conditions and to changes in them. The ultimate goal of planning is to create an integrated and efficient control system for the parent system (organization) involved (Palo, 1971).

The process starts in the goal setting unit (G) with an analysis of the information received from the outside of the system. The results of the goal-setting process are then communicated to the decision-making unit (D) which are later fed back to (G) either for confirmation or rejection of the proposed activity (Figure 1).

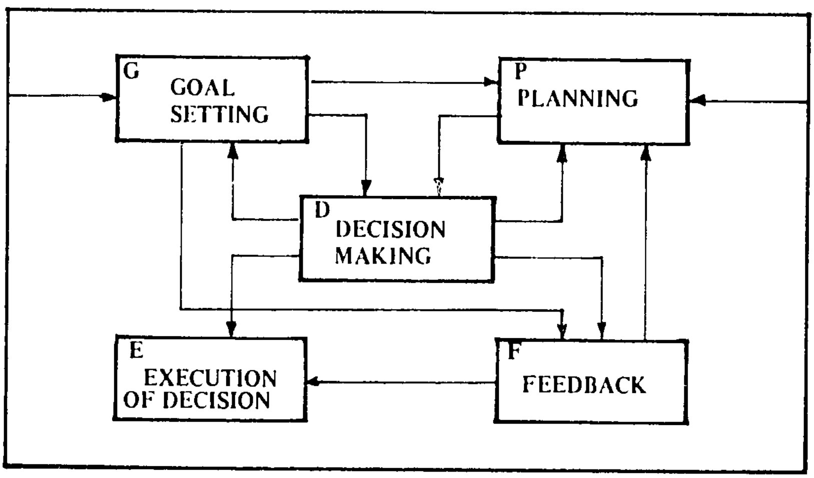

Fig. 1. A frame model of the planning/decision system (Adopted from Palo Model, 1971).

Some amendments are usually made before a proposal is finally approved.

The confirmed activity/target is then communicated to the planning unit (P) which, after analyzing the information coming from outside sources, designs the most promising alternative targets/plan. Then, it is sent to the decision-making unit (D) for a choice and for confirmation of the alternative means proposed. If not approved, the plan is fed back to the planning unit for amendments. Once a final solution is reached, then the plan is transferred to the execution unit (E) for the start of operation.

The confirmed target/plan from the goal-setting unit is also sent to the feedback unit (F) to ensure that the whole system operates in accordance with the target/plan, which later on is also transferred to the decision unit (D) for final approval (Palo, 1971).

A Frame Model for R and D Projects

A modified version of Palo's 1971 model for planning R and D projects in natural resources is shown in Figure 2.

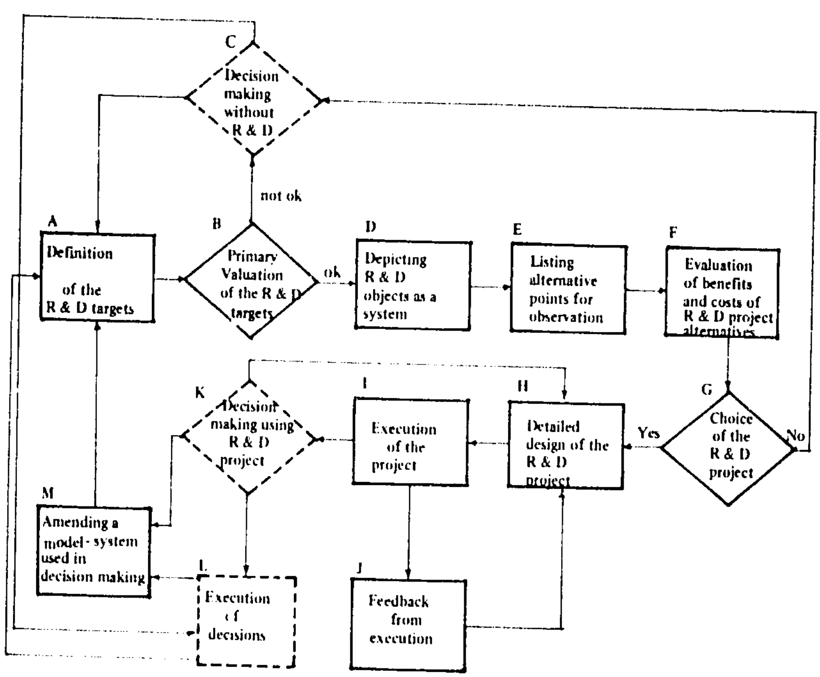

Fig. 2. A frame model for planning natural resources R & D projects (Adopted from Palo Model, 1971).

The first step is to define the R and D targets (A). The second step is the primary appraisal of the targets to check that no duplication occurs (B). This could lead to either one of the two outcomes: (1) cancelled (C) or, R and D targets will be initiated (D).

The next move is to formulate tentative R and D projects based on the alternative points of observation developed in box E. This will then be evaluated to determine the benefits and costs of such R and D undertakings (F).

In box G, an R and D project is chosen based on the evaluation process of box F. There are two possible outcomes: (1) preparation of the detailed R and D (H); or (2) disapproval of the proposed R and D (C).

In the preparation of the detailed design of the chosen R and D (H), the following will be discussed and presented: rationale, objective, methodology, budget, and expected output of the proposed undertaking.

A long-range plan and detailed target are the outputs of the design phase. Execution of this target (I) is seldom a straightforward activity. Due to uncertainties and risks involved in the proceeding design, the feedback function (J) must be planned to act efficiently. The normal case is that when executing R and D project, several feedback loops (I-J-H-I) must be ran. During each loop, some replanning must be done.

Redesigning of the R and D projects is sometimes necessary before a final result is reached. When this occurs, three possible outcomes may result: (1) a decision is made for project execution (L); (2) no decision is made for execution but a definition of new information (M) required is sent to box A; and (3) a decision is made for execution but at the same time a definition of new information (M) is sent to box A.

In cases (2) and (3), the whole process will be started again.

DENR R and D Targets

The above planning process must be followed to ensure that R and D projects will be in proper perspective. To give researchers and policymakers an idea of what DENR aims to attain in R and D, the targets for CY 1988-1992 are presented to serve as guides in the preparation and formulation of project proposals.

1. Complete the land classification program by 1989 with a

target of 881,298 ha of unclassified lands.

2. Increase the rate of public land disposition to an average of 223,000 patents/leases a year or a total of 1.1 M patents/leases covering an estimated area of 3.5 M ha of public lands for five years.
3. Minimize destruction of dipterocarp forest through closer supervision of logging operations.
4. Increase the coverage of Timber Stand Improvement up to 575,000 ha in five years or a target of 105,000 ha/year.
5. The target for reforestation shall remain at 1,000,000 ha/year, with the government sector accomplishing 50% of the target.
6. Rehabilitation of critical watersheds covering 55,575 ha.
7. Full implementation of the environmental management program to cover the entire country.
8. Intensification of the country's pollution control and abatement through smoke bleching campaigns.
9. Full implementation of Environmental Impact Assessment System in areas identified as environmentally critical.
10. Encouragement of manufacture of local anti-pollution devices.
11. Continuing effort in technology generation specially in the area of ecosystem management.
12. Continuing resource inventory and mapping in support of natural resources activities. High and low levels of aerial photography shall be prepared for a total area of 19,000,000 ha.
13. Establishment, implementation, and maintenance of a Geographic Information System (CIS) and Resource Data Base with the purpose of integrating all data for land evaluation, land-use planning, and land administration.
14. Revision and updating of two existing laws on wildlife conservation to pursue DENR's effort of conserving the protected areas and wildlife species.
15. Delimitation and establishment on the ground, the bound-

ary of 59 national parks and seven game refuge and wildlife sanctuaries.

16. Establishment of forest park for every barangay.
17. Resource inventory of 30 protected areas and studies on population trends and distribution of at least 20 economically important wildlife species.
18. Establishment of National Rescue Center for confiscated flora and fauna.
19. Rehabilitation of 6,000 ha of degraded portions of national parks.
20. Intensification of forest protection activities in 1.4 M ha of protected areas.

Conclusion

In an attempt to provide equity and social justice to majority of our people, DENR hopes to generate employment orportunities to millions of small farmers, kaingineros and landless laborers through the realization of the above targets. The issuance of some 1.8 M land patents/leases shall benefit an equivalent number of families. Stewardship contracts covering 965,000 ha of forest lands shall generate self-employment opportunities to about 233,500 forest occupant-families, while production utilization permits shall provide an additional 15,000 to 30,000 employment opportunities.

The mining industry contributes also its share in the generation of employment. Its small-scale mining operation alone benefits 406,000 small-scale miners, while another 200,000 miners are serviced by the medium-scale mining operations.

The natural resources sector promises greater participation in the government's development programs. This cannot be realized, however, unless the targets set forth are attained. Hence, planning for effective R and D programs is a must.

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Sectoral Council Planning for the Agriculture, Forestry and Natural Resources Research and Development

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Introduction

The Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) is one of the five sectoral planning councils of the Department of Science and Technology (DOST).

PCARRD was created in 1972 by virtue of Presidential Decree No. 48 as Philippine Council for Agricultural Research (PCAR). The creation of PCAR was a recommendation of a Presidential Executive Panel which described the sad state of research and development (R and D) in the Philippines as follows:

- lack of central planning and coordination;
- duplication of efforts and inability to create the desired impact despite substantial sums of money invested;
- fragmented research;
- inadequate facilities; and
- ineffective dissemination of research results.

Through the years, the mandate of PCAR as a national research coordinating agency was gradually broadened and strengthened to cover natural resources (PCARR) and eventually include the development function (PCARRD). This broadening of mandate by virtue of P.D. Nos. 461, 864, 1249, and 1502 and E.O. No. 784 was made to improve the responsiveness of the R and D sector to national development.

As a central planning body for R and D, the major tasks of PCARRD are as folows:

- formulate the national agriculture, forestry and natural resources research and development programs based on a multidisciplinary, interagency, and systems approach
- establish a system of priorities for crops, livestock, forestry, farming systems and socioeconomics research and development, and provide meaningful mechanisms for updating these priorities
- program the allocation of all government revenues ear marked for agriculture, forestry and natural resources research and development to implement a dynamic national research and development program.

Sectoral Council Planning Process

Identification of Development Problems/Issues/Opportunities

Research and development (R and D) planning is problem- or constraint-oriented to facilitate the identification of researchable areas/thrusts and the specific programs/projects which will translate such researchable areas/thrusts into operation and action.

The major problems/issues being addressed by the R and D sector include low productivity, poor access of farmers and other users of technologies to applicable and viable technologies and other support information, diversity in agroclimatic conditions in the countryside, instability of products of agriculture and natural resources in terms of prices and quality, and environmental degradation due to unjudicious use and overexploitation of natural resources, and others.

The generation of solutions to these critical problems could contribute substantially to major development goals of the government whicn include alleviation of poverty, provision of more jobs, and promotion of social equity, among others.

The Planning Process

It is widely perceived that success or failure of any development programs can be primarily caused by how well the problems are identified and defined as well as how effective these problems are articulated by the larger segment of our society, particularly those in areas where problems are greatly felt, the poorer regions and populace of the country.

Thus, PCARRD's developmental philosophy is anchored on this concept. In 1973, PCARRD conducted regional research congresses involving as many participants as possible from the government and nongovernment sectors to elicit the proper identification of development problems/issues which could be addressed by R and D. The initial outputs of these consultations were national R and D programs on various important commodity systems of the country. Using the same approach, the book entitled *Priority Research Areas for CY 1983-1987* was subsequently published to provide research centers and stations on the bounds within which research activities in each commodity system could be implemented. A complementary book, the *PCARRD CORPLAN 1984-1988* was also published to indicate the priorities among commodity systems such as wheat, water buffalo, aquaculture, citrus, marine fisheries, cotton, agroforestry, small-scale mining, farming systems, research-extension linkage, community organizations, maize, medicinal plants, and agricultural policy.

Because of the effectiveness of this approach, regional consultations were made an integral part of the total effort in planning R and D in agriculture, forestry, and natural resources.

This planning process which could be described as both top-down and bottom-up represents a viable mechanism for merging regional concerns with those of the national (Figure 1). It ensures that commodity systems with wider implications are attended to vis-a-vis the more specific regional concerns.

PCARRD used this process in coming up with an updated national R and D thrusts relative to the goals of line agencies such as the Department of Agriculture (DA), Department of Environment and Natural Resources (DENR) and Department of Science and Technology (DOST) in the Philippine Development Plan for the medium-term (1988-1992). These thrusts and the specific focus of these thrusts are listed in Appendix A.

The process starts with the formulation of the Regional R and D Framework Plan which is primarily based on the outcomes of the regular integrated R and D review and new researchable areas identified from the regional development plans of the NEDA, DENR, DA, and DOST as presented during the Planning Workshop. These regional plans incidentally are outcome of the various provincial plans of line agencies.

The Plan preparation is an integral part of the annual regional review attended by regional directors of line agencies, presidents or research directors of SCUs, managers of research stations, researchers, extension workers, applied communication specialists, planners, and farmer leaders.

The draft plan is summarized through the joint effort of PCARRD and the secretariat of the regional consortium.

National Development Goals (NEDA)

↓

Sectoral Goals

- **Agriculture (DA)**
- **Forestry and Natural Resources (DENR)**
- **Science and Technology (DOST)**

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National Research and Development Program
(NARRDS – PCARRD)

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Regional R & D Activities
(Members of the NARRDS)

↑

Provincial Plans

Fig. 1. Priority setting for R and D in agriculture, forestry and natural resources (1988-1992).

The policy making body of the consortium, the Regional Research and Development Coordinating Committee (RRDCC) then reviews the plan for endorsement to PCARRD. PCARRD develops/formulates major program thrusts based on the regional thrusts. A panel composed of directors and senior staff of the DA-Bureau of Agricultural Research (BAR) and the DENR-Ecosystems Research and Development Bureau (ERDB) then review the list of major program thrusts. Senior PCARRD officials and representatives from the SCUs and the private sector also participate in the review.

The ongoing and new projects are then classified according to these thrusts to determine the number of projects which fall under each thrusts, as well as the budgetary distribution among thrusts.

The final output is submitted to the various approving bodies of PCARRD, such as the Directors Council (DC), the Technical Advisory Committee (TAC), and finally to the Governing Council (GC). Upon approval, the output which appears as a budgetary proposal is submitted to the DOST and then to the DBM for budget review and appropriation.

Major Issues in Sectoral Planning

- In most developing countries, a major issue in planning is the large number and diversity of development problems, issues as well as opportunities that need to be addressed vis-a-vis available resources. Many capable programs and institutions compete for the scarce resources in the country. The challenge, therefore, to a planning agency like PCARRD is to evolve on a continuing basis a system of resource allocation that will not only distribute resources to capable programs and institutions but also harness these resources towards the generation of a critical level of results necessary to achieve the desired impact.

- Coordination between and among agencies with planning responsibilities at the national level is another major issue in sectoral planning. Concerned agencies must exert vigorous interagency coordination to synchronize/harmonize activities and programs towards common development goals, and thus, avoid duplicating activities as well as confusion.

- Another important concern is that plans are not usually translated into budget due to inadequate funds from the national government. Since agencies receive regular appropriations and occasionally external funding they can create a strategy or policy which would call for joint planning and funding of cooperative programs.

Appendix A

Research and Development Thrusts in Agriculture, Forestry and Natural Resources (1988-1992)

I. Profitable production and postproduction environment sensitive technologies

Focus

1. Development and improvement of existing productionsystems for crops, livestock, forestry, and fisheries
2. Development and improvement of postproduction and utilization techniques for crops, livestock, forestry, and fisheries
3. Development and improvement of tools, equipment, machineries, and structures
4. Utilization of indigenous plants with medicinal/pesticidal properties in crop and animal production systems
5. Economics of production

II. Development, rehabilitation, conservation, utilization, and management of resources and ecosystems

Focus

1. Design and construction of structures which will control soil erosion and conserve water
2. Management of problem soil
3. Techniques/methods for regulating harvesting and extraction of resources

4. Agroclimatic studies/data base on resources management utilization and conservation
5. Pollution and environmental quality
6. Management, conservation, utilization of fishery and forestry resources
7. Conservation and improvement of indigenous farm animals

III. Production, processing, storage, and distribution systems for seeds, stocks, and planting materials.

Focus

1. Hatchery management (fisheries)
2. Improvement of seeds and other planting materials for production, processing, storage, and distribution.

IV. Breeding and management systems for better production

Focus

1. Varietal improvement for high yield, stress tolerance, pests and disease resistance, adaptability and better quality (i.e. processing, shelf-life, handling tolerance)
2. Breeding and reproductive physiology studies

V. Biotechnology in production and postproduction systems

Focus

1. Biocontrol of insect pests using predator insects, microorganisms, etc.
2. Utilization of fertilizer supplement (rhizobia, mycorrhiza, trichoderma)
3. Alternative sources of energy
4. Tissue culture

VI. Integrated and community-based approaches towards better food production and nutrition and balanced ecosystems

Focus

1. Piloting mature technologies appropriate for the regions
2. Institutional development studies

VII. Effective and efficient technology transfer systems for producers and enterprises

1. Evaluation and development of technology delivery models
2. Dynamics and processes of technology transfer and adoption
3. Communication technologies for extension actvities
4. Cooperation, complementation and other linkages of various agencies in the planning and implementation and management of technology transfer strategies/problems

VIII. Effective marketing, distribution, and support systems

Focus

1. Marketing
2. Competitiveness and comparative advantage of Philippine products in international market
3. Studies on rural credit schemes
4. Rural institutions
5. Rural infrastructures

XI. Assessment of policies and formulation of policy recommendations

Focus

1. Policy research major development programs, e.g. agrarian reforms, extension-education, food and nutrition, rural credit, trade, resource allocation, agricultural diversification and infrastructure

3. Redistribute impact of social development programs/ policies in alleviating poverty
3. Impact of national policies on regional development
4. Data base studies whose results will have direct bearing on policies and programs

X. Support to emergency projects

Regional Research and Development Plan in Agriculture of the DA-Region VIII

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Introduction

In formulating programs with scarce resources available, the region's situation, problems, and development potentials must be thoroughly assessed. This is done so that these programs may suit with the prevailing agroclimatic, socio-cultural, economic and political conditions. Likewise, programs should be based on the premise that people are capable of improving their quality of life, and that they can overcome their problems through their own efforts, with the assistance and support of development agencies. This scheme emphasizes participation from every sector of society to develop agriculture for small farmers.

Planning Process

The regional offices of the Department of Agriculture (DA) involve research and extension administrators, researchers, extension workers, private sector representatives, state colleges and universities (SCUs), farmer leaders, clienteles, and others in formulating its Research and Development (R and D) plan. Bases for planning are priority needs, problems, and development potentials of the area. The steps in the planning process are as follows:

- Survey of research problems are conducted and issues from field technicians are submitted for discussion during conferences called by the provincial agricultural officers

(PAOs) in each province.

- Problems and issues identified during the conferences in each province are then submitted to the Regional Research and Development Committee (RRDC). The Committee evaluates and validates the submitted problems and issues based on established regional thrusts and priorities.
- Problems and issues identified, evaluated, and validated by RRDC are forwarded to a Subcommittee composed of Senior Research Staff to classify and rank problem areas according to discipline and commodity thrusts and priorities.
- From the Subcommittee, the list is submitted to the chairman of the RRDC for approval and endorsement to the Bureau of Agricultural Research (BAR). Provinces and stations within the region are furnished with copies of the list of research areas and priorities for their reference in making specific research proposals.
- Research proposals from provincial offices and stations are further reviewed by members of the Research subcommittee before these are submitted to BAR.
- The list of research thrusts and priorities is also presented and discussed by member-agencies of the Visayas Coordinated Agricultural Research Program (VICARP).
- Planning and Review of R and D Projects among VICARP member-agencies was modified in 1986 with the introduction of the Regional Integrated Research and Development Review and Planning Workshop (RIRDRPW). It maximized efficiency of participating agencies in the region in terms of time, effort, manpower, and financial resources. In addition, this approach improved the evaluation of completed and ongoing projects and the planning of R and D programs. Feedback mechanism from all sectors was greatly improved, since it involved research administrators, researchers, extension workers, private sector representatives, farmer leaders, and clientele in the review and planning of regional R and D programs and projects.

- In 1987, after consultation meetings were held among representatives from DA, Visayas State College of Agriculture (ViSCA), and farmer groups, an R and D framework was established. The framework which was later presented to the Regional Research and Development Coordinating Council (RRDCC) meetings for review, served as basis in preparing proposals. All research proposals to be submitted by DA and ViSCA to PCARRD for evaluation should fall within this R and D framework.
- In December 1987, a Regional Research Committee Workshop was convened to identify and develop Regional R and D plans based on the different development zones. The workshop was attended by provincial agricultural officers (PAOs), provincial research coordinators (PRCs), station superintendents, livestock farm managers, heads of research units, section chiefs, division chiefs, farmers, and fishermen. R and D plans were identified based on the different development zones (Table 1).

  The development zones are hillyland, uplands (unbunded), lowland rainfed, and coastal.

In every zone, the following information were identified:

- Problems and research gaps,
- Commodity,
- Research interventions,
- Priority,
- Classification of the technology, i.e., technology for generation (TG), technology for verification (TV), technology for adaptation (TA), and technology for dissemination (TD),
- Policies and issues, and
- Institutions to conduct/implement the research, extension, and other support services.

Results of the regional workshop were presented to the Director for Research and Extension of ViSCA, DA regional staff, BAR staff, and farmer representatives from all zones. After the two-day workshop, the revised output was presented to and approved by the representatives from BAR and PCARRD.

DA regional management called a one-day conference, presented and approved R and D plan before the PAOs, PRCs, heads of research units, division chiefs, section chiefs, and core staff of RIARS. During the conference, the participants agreed that all research proposals should be confined on the approved R and D program. The bottom-up approach in identifying researchable areas was emphasized.

Criteria Used

Regional plans and programs should be addressed to the felt needs of the clienteles in the different zones. These should conform to the thrust and policy of DA, development plans of NEDA, R and D Framework of VICARP, the five-year R and D agenda of DA, and others.

Technology to be generated should have the following requirements:

- Economic viability
- Social acceptability and environmental safety
- Good potential for acceptance by farmers and commercial producers
- Technical feasibility
- Minimum-input technology
- Contribution to improvement of existing farmers practices
- Development of cost-effective and location-specific technologies for farmers and fishermen
- Maximized utilization of indigenous farm resources

Information needed in developing the regional plans:

- Executive Order 116 Reorganizing the DA including its functions and organizational structure
- Five-year Medium-Term Action Agenda of DA
- NEDA's Five-Year Development Program
- PCARRD's R and D Framework
- VICARP's R and D Framework
- Priority R and D problems as identified by farmers, fishermen, researchers, extension workers, and private sector specific to the different development zones.

Problems met in developing regional plan:

- Lack of knowledge and skill among APTs, MAFOs, and PAOs on rapid rural appraisal and on the proper diagnosis of problems and issues.

- Lack of expertise in the identification of development zones.
- Problems and issues are not properly articulated by clienteles during workshops/consultations due to language educational barriers.
- Lack of operational mechanism in linkages between research and extension agencies.
- Limited knowledge of some researchers about farmers' practices and needs.
- Attendance of private sector representatives in research planning, research review, and conferences is limited due to COA rules and regulations.
- Inadequate participation of research and extension administrators and supervisors in R and D review and planning workshop.

Table 1. Research and extension program of DA – Region VIII, CY 1988-1992.

Development Zone Problems/Gaps	Sector/Commodity Research Interventions	Possible Interventions/Key Institutions						
		Priority	Classification	Institutions Involved	Extension Nonresearch	Institutions Involved	Policies/ Issues	Institutions Involved
I. Hilly -Low productivity attributed to:	Farming System Devt. of soil crop system with emphasis on soil conservation				Training on hillside farming:	Clientele: DA, ViSCA, UEP, ATI	Strict enforcement of forestry laws and regulations	Clientele DA-DENR-Local Government
*soil erosion cogonal area		1	TG	ViSCA	*Clientele *Technicians *Local Gov't. –Farmer to farmer cross visit		Utilization of mun. annual devt. for the establishment of nurseries	
*soil acidity *under-utilization of hillyland areas	Crop livestock integration system for small holder farmers		TG, TA, TV					
*Insufficient technology on soil crop system, crop livestock integration, resource management practices, farm tools and location-specific cropping pattern	Varietal improvement of potential hedgerows and cropping legumes/ corn crops	1	TG	DA	–Establishment of nursery/ seed banks			
	Reduction of crop losses through improved management practices			ViSCA, DA	– Demonstration Farm – Hillside farming pilot projects			

					–Print media materials		
Value System	–Abaca-based cropping system improvement	1	TG, TA, TV	ViSCA, DA, FIDA	Extension classes	DA, farmer clientele	Promotion of social agroforestry; increase support funds; hilly land development project
–Lack of credit and marketing facilities	–Development of simple farm tools and implements for minimum tillage in upland areas	II	TG, TV		Price monitoring of commodities through: –radio broadcast –billboards	DA, BAS NFA-Coop	
	–Soil and water conservation	II	TG, TA, TV	DENR ViSCA, DA			
	*Water impounding projects						
	–Socioeconomic analysis of technological inventions	II	TG	ViSCA, DA	–Credit support through cooperative development program		
	–Development of location-specific improved cropping patterns for the different agro-climatic zones in the region	III	TG, TV	ViSCA, DA			

Table 1. Continued.

Development Zone Problems/Gaps	Sector/Commodity Research Interventions	Possible Interventions/Key Institutions						
		Priority	Classification	Institutions Involved	Extension Nonresearch	Institutions Involved	Policies/ Issues	Institutions Involved
–Low productivity of animals and products due to:	Livestock and Poultry Increasing swine and poultry production at the village level through efficient feeding and management	I	TG, TV	ViSCA, DA	Expansion of auction markets	Clientele DA, ATI	–Strict implementation of carabao slaughter laws	Clientele, Local Government, DA
*Prevalence of pests and diseases	–Disease prevention and control; upgrading				Establishment of laboratory for:		Government to encourage establishment of ViSCA type: feed mills	
*Indiscriminate slaughter of carabaos	*Increasing livestock and poultry productivity at the village level through improved feeding and health management system				*Serum Vaccine *Biologics			
*Rampant cattle rustling					–Campaign for establishment of backyard forage and and pasture grasses			
*Insufficient feeding and management schemes	*Breeding strategies for improved village level poultry production		TG, TV	ViSCA, DA				

	chicken					
*Lack of improved forage and pasture						
*Insufficient medicines and veterinary products						
*High cost of feeds						
*Marketing of livestock and poultry products						
*Lack of process-ing facilities				ViSCA, UPLB, DA		
*Inadequate credit support	–Reducing caracalf and calf mortality through improved feeding and health management	II	TG, TV	ViSCA DA	Training of farmer recipients on animal management	DA-ATI
	–Anthelmintic effect of indi-genous medicinal plants for livestock		TG, TV	ViSCA DA	Establishment of forage and pasture grasses	DA, farmer clientele ViSCA, UPLB

Table 1. Continued.

Development Zone Problems/Gaps	Sector/Commodity Research Interventions	Possible Interventions/Key Institutions						
		Priority	Classification	Institutions Involved	Extension Nonresearch	Institutions Involved	Policies Issues	Institutions Involved
	–Epidemiological studies of common diseases of caracalf		TG, TV	ViSCA DA				
	–Village level sheep and goat development program	III	TG, TV	ViSCA DA				
	--Increasing milk production of caracows through improved feeding and upgrading	IV	TG, TV	ViSCA				
	*Legumes supplementation for gestating and lactating cows							
	–Livestock products and by-products processing/ utilization	V	TG/TV/ TA/TD	ViSCA	Field results demos	DA, clientele DOST, SCU's NGO's		

*Increasing cattle production at the village level through efficient schemes	VI	TG/TV/ TA/TD	ViSCA DA	Extension classes and meeting Farm and home visits	
*Development of appropriate technology on forage and pasture crops					
Establishment, management and utilization of pasture crops at village level			ViSCA	Monitoring and evaluation	DA
Evaluation of extension delivery system and support services		TV/TD/TA	ViSCA DA		
Evaluation and policy studies related to livestock production		TV/TD/TA	ViSCA DA		
Impact assessment of livestock and swine program					

Table 1. Continued

Development Zone Problems/Gaps	Sector/Commodity Research Interventions	Possible Interventions/Key Institutions						
		Priority	Classification	Institutions Involved	Extension Nonreseaich	Institutions Involved	Policies Issues	Institutions Involved
Kaingin (slash and burn farming)	Agroforestry		TV/TD/TA	DA, ViSCA NGO's	Educational campaign on awareness of forest conservation	Clientele DA, DECS, DENR, DLG, NGO	Evaluation/ review of the effectiveness of NRDC and ISF	
II. Plain Irrigated	Rice							
–Inefficient irrigation system and water management	–Appropriate cropping system	I	TG/TV/ TA/TD	Clientele DA, ViSCA NGO	Demo Farm Field Laws	Clientele DA, ViSCA ATI	–Strict enforcement of carabao slaughter ban	Clientele DA, DPWD BAI, NFA NGOs
–Lack of post harvest facilities	–Development, testing and improvement of of postharvest technologies	I	TG, TV		Farmer classes		–Strict compliance of of carabao dispersal guidelines	
–Fluctuating price of commodity	–Assessment and evaluation of marketing and credit support services	II	TG		Farmer to farmer cross visit			

–Lack of initial seed supply of HYV	–Development of sustained seed production scheme	I	TG/TA	Training of technicians, clientele and supervisors		–Strengthen interagency linkages
–High cost of production inputs	–Development and utilization of cost reduction technologies	II	TG/TA/TD			–Strengthen effective price monitoring network
–Lack of workable animals	–Development, testing and improvement of small tools and equipment	III	TG/TA/TV			
–Lack of credit support						
–Inadequate farm to market roads						
–Pest and disease management problems	–Development, evaluation and adaptation of IPM schemes	I	TG/TA/ TV/TD			
	–Impact assessment of carabao dispersal program					
–Flash flood and severe erosion due to indiscriminate logging				–Training of forest extension workers	–Clientele DA, DECS, DENR, DLG, NGO	–Total ban of log importation
–Extinction of some valuable forest species and wild life				–Watershed rehabilitation		–Establishment of coconut sawmill

Table 1. Continued

Development Zone Problems/Gaps	Sector/Commodity Research Interventions	Possible Interventions/Key Institutions						
		Priority	Classification	Institutions Involved	Extension Nonresearch	Institutions Involved	Policies Issues	Institutions Involved
–Destruction of watershed areas								
Rainfed Upland (Non-bunded)	**Crops**							
–Low productivity and income due to:	–Varietal improvement	I	TG/TA/ TV/TD	ViSCA, DA UEP/UPV	–Demonstration farm	Clientele DA, ViSCA, UEP, RACO	Increase budget for research and extension	Clientele of DA, SCU, DBM, NGO, VICARP, PCARRD
*value system of farmers	–Performance trial of different varieties/lines				–Promotion of appropriate technology			
*inadequate cultural management practices	–Cultural management	I	TG/TA/ TV/TD		–Communication management	–Bottom-up process of planning		
*slow acceptance of technology	*Cost reduction technology *Development of cropping system				–Monitoring and evaluation	–Institutionalization of linkage		
*variability of marketing and distribution system	–Fertilizer and pesticide verification trials							

*poor postharvest practices/ facilities	–Socioeconomic of credit/marketing opportunities and constraints	II		ViSCA, UPV, UEP
*expensive agri-cultural inputs	–Marketing, processing and international trade	II	TG	ViSCA, DA (MAC BAS)
*lack of strong and continuing education program	–Comparative advantage studies	II	TG	ViSCA, DA UEP, UPV
*insufficient support services	–Constraints in the use of new or improved tech-nology			
	–Dynamics of technology transfer process	II	TD	ViSCA, DA UEP, UPV
*pest manage-ment problems	–Evaluation of extension deli-very systems	II	TG, TD	ViSCA, DA UEP, UPV
*lack of quality seed	–System and support services for agriculture			
	–Development, testing, improve-ment of post-harvest technology	I	TG, TV	ViSCA, DA UEP, UPV

Table 1. Continued

Development Zone Problems/Gaps	Sector/Commodity Research Interventions	Possible Interventions/Key Institutions						
		Priority	Classification	Institutions Involved	Extension Nonresearch	Institutions Involved	Policies Issues	Institutions Involved
	–Crop modelling techniques	III	TG	ViSCA				
	–Alternative sources of fertilizer							
III. Coastal 1. Marine	Fisheries							
–Destruction of fish sanctuaries	Management and conservation of marine fishery resources	I			–Information campaign	DA, RACO	Strict implementation of fishery laws	DA, Deputized local officials
–Low catch, decline in productivity, overfishing	–Resource assessment		TG	DA, UPV ViSCA	–Piloting/ Demo	DA, Fishermen	Banning of below 3 t fish trawlers in municipal waters (within 7 km)	
	–Biology and ecology of important vertebrates and seaweeds		TG					
	–Improvement of fishing gears		TA/TV/TD	DA	–Promotion of artificial reef			

	–Development and improvement of postharvest, handling, processing and utilization		TA/TV/TD	DA				
	–Increased production of various fishery resources through development of appropriate coastal aquaculture technologies							
	–Development of appropriate coastal aquaculture technologies for an expanded mussel and oyster farming, Eucheuma and other seaweeds, finfishes and marine invertebrates		TG/TV/TA	DA, PIT ViSCA, UPV	–Information campaign *piloting/ demo farm	DA	Recommend zonification of coastal areas	DA
2. Inland Water/ Freshwater								
–Lack of inventory and classification of potential areas	–Utilization of inland water for fisheries activities	III	TG		Establishment of nurseries in strategic areas	DA, Local government fishermen	Ban electric fishing and other illegal practices	DA, farmer

Table 1. Continued.

Development Zone Problems/Gaps	Sector/Commodity Research Interventions	Possible Interventions/Key Institutions: Priority	Classification	Institutions Involved	Extension Nonresearch	Institutions Involved	Policies Issues	Institutions Involved
–Limited supply of fingerlings (tilapia, carp)	–Physical inventory and limnological studies of inland water		TG					
3. Brackishwater								
–Inadequate management practices of fishponds	–Cultural management techniques	III	TA/TV	DA	–Piloting/ Demo farms –Training *clientle *Fishery technicians --Monitoring and evaluation	DA, fishermen		

Research and Development Plan for DENR-Region VIII: An Interim Process

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The Regional DENR Organization

The Department of Environment and Natural Resources (DENR) was created under Executive Order No. 192 on 10 June 1987. The ecosystem research sector was one of the five sectors integrated into one regional department. The four others are forest management, land management, mines and geo-sciences, and environmental management. The research sectors when fully organized, will have two divisions – the ecosystems research and technology transfer divisions. There will be no field unit and research will be conducted in the field through the Provincial Environment and Natural Resources Office (PENRO) and the Community Environment and Natural Resources Office (CENRO), which are mainly implementors.

DENR-Region VIII is a member of the VICARP, based at ViSCA. ERDB's role relative to field research formulation and implementation is not yet clearly defined.

Research and Development Formulation

There are several considerations in R and D formulation which include the following:

- DENR's mandate, mission, objectives, and policy thrusts.

- Regional situations/profile, especially with respect to environment and natural resources.
- Priority programs
  - o Important projects under each program
  - o Scope, objectives, status, and targets of each project
  - o Strategies, approaches, methodologies, and techniques used
  - o Important problems/issues confronting each project

- Analyses of problems/issues
  - o Workshops
  - o Field verification
  - o Participation of other sectors/agencies

- Identification of alternative solutions
- Scanning/evaluation of available technology, possible adoption, verification, modification, etc.
  - o Indigenous
  - o Research results
  - o Imported technology

- Identification of technological gaps for technology generation
- Prioritization
  - o Urgency of problem
  - o Manpower capability
  - o Financial resources/requirement
  - o Equipment availability

- Preparation and packaging of research proposals
- Review and final approval

Recommendations

There is a need to clearly define problems and conditions. Research results, technologies generated, and other related information should be made available to researchers. There is, likewise, the need to synthesize research results on important subject/concerns.

Greater collaboration among researchers/institutions can be realized through exchange of information and facilities, identification of common concerns, and joint formulation and conduct of research. Implementors should be actively involved in problem identification, and conduct of experiments. We should make deliberate effort to include research as an important component of major development projects.

DENR's Strategy for Strengthening Regional R and D Program Planning and Implementation

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Introduction

With the change in national leadership in 1986, the Department of Environment and Natural Resources (then Ministry of Natural Resources) vowed to improve the delivery of essential services to the people. Along this line, the DENR management embarked on a broad assessment of its mandate, performance, and concern.

Firstly, DENR reexamined its mandate and the law and the policy executed in the past. Committees were set up to review the relevance or nonrelevance of the existing policies in natural resources direction. Consultations with agencies covering several supportive and allied sectors of the ministry were made.

Secondly, past performances were assessed to obtain the benchmark information needed for the new policy directions supportive to the new thrust and focus. The aim is to inventory existing projects and determine the pitfalls and explore opportunities in setting up targets and goals in the ensuing work that will be carried out.

Thirdly, efforts are being exerted towards a new reorientation in natural resources disposition and utilization, and the redirection or realignment of research focus among new research areas.

I feel it is most appropriate and timely to share with you DENR's concerns and objectives, based from the draft of the

DENR plan. This may be useful in your research and development activities.

The Department of Environment and Natural Resources Plan

1. The natural resources sector supports the current thrusts of the government toward the national policy:
   - To create jobs;
   - To increase rural incomes and achieve equitable distribution of benefits from development;
   - To attain environmental stability and natural resources conservation for sustained socioeconomic development.

2. The objectives of the sector are:
   - To promote the efficient and judicious use of natural resources. This shall involve the generation of updated and accurate information on the status and potential of available resources. This also involves the formulation of more definitive policies and guidelines or standards in using resources. Moreover, development of an effective control and enforcement mechanism for various natural resources policies, rules and regulations is also envisioned.
   - To ensure the sustainable productive capacity of natural resources. The programmed exploitation of natural resources shall be complemented with the systematic renewal of replenishment of the same to ensure the resource requirements of future generations. Likewise, the use of appropriate and indigenous technologies for improving productivity with the least harmful effects on the environment shall be promoted.
   - To expand the implementation of community-based natural resources management and conservation. As beneficiaries or recipients of the effects of all resources development and conservation activities, the active participation of the local communities in the decision-making process concerning natural resources management shall be further encouraged.

- To achieve a more equitable sharing of the benefits derived from the development and utilization of resources. Greater access of the rural poor to forest and mineral resources via the social forestry and small-scale mining development programs shall be enhanced. The system of public land disposition shall also be amended and streamlined in ways consistent with the policy of equity and social justice, while at the same time, reducing the administrative burdens imposed on the common man.
- To increase the sector's contribution to the national efforts directed towards poverty alleviation and enhanced welfare of small farmers and landless workers. The primary aim of all efforts of the natural resources and environmental management is to improve the socioeconomic standing of the masses. The sector shall, therefore, strive to produce more tangible results from its various programs and projects. Their impact on the lives of program beneficiaries and the national economy in general shall be assessed. Corollary to this, the mining and wood industries shall be revitalized in view of their immense potential for generating employment and income for the country.
- To promote and maintain ecological balance. The socio-economic goals of increasing productivity and income shall be pursued within the context of environmental management to ensure sustained growth. A policy of "balancing economic development and environmental management" and the formulation of an integrated approach to environmental management shall be addressed.

3. Targets of the natural resources sector

- Land classification, surveys, and disposition. The completion of the classification of the remaining 1.32 M ha of unclassified lands by the end of 1987 is the main target of this activity. The completed program is projected to release 50% of the total land area of 15 M ha as alienable and disposable, while the remaining 50% shall be maintained as forest lands.

- Forest production and renewal. Total log production from the old growth and young forests, tree plantations as well as lesser-used species is envisioned to increase at an average rate of 8.1% annually or a total production of 8.58 M cubic meters in 1987 to 12.66 M cubic meters in 1992.
- Mineral production. With optimum government support for the ailing mining industry, production of major mineral commodities is targeted to generate an annual average value of ₱25.92 B or a total of ₱155.51 B for the six-year planning period at the average 1985 commodity price level.
- Sectoral contribution to employment generation, increased income, and social equity. Greater access to the use of natural resources through the intensified issuance of land patents/leases, stewardship contracts and utilization licenses/permits is expected to generate self-employment opportunities to millions of small farmers, forest occupants, and landless laborers. The target is to issue 1.8 M land patents/leases.
- Resource and environmental assessment and monitoring. A resource and environmental information system network will be established and made fully operational by 1991 to fully service the requirements of all levels and types of resource and environmetal data users.

4. DENR strategies

- Community-based approach in resource management. This requires the development of plans that will include environmental, physical, livelihood, health, and general uplifting of the well-being of the upland communities.
- Integration of the community in planning and implementation of natural resources project.
- The local communities shall play the pivotal rule, with the government's participation being limited to the development and implementation of programs to provide the incentive and technical know-how to manage these

resources properly. This includes introduction of appropriate technology or development of existing indigenous ones and training activities.

- Intensified information campaign designed to inculcate conservation values.
- Interphase and rationalize capital and labor intensive projects.
- Least cost solution to project development.

5. Administrative development

This includes restructuring to make the organization more responsive and dynamic; streamlining systems and procedures for processing various natural resources applications; delegating authorities and powers to the field levels based on local administrative capabilities; improving the performance evaluation system; upgrading the technical skill of field personnel; strengthening linkages with other government agencies; and improving the management information system.

6. Research and technology application

Research and development activities shall be enhanced to provide appropriate technology for resource development and utilization. The concern is not only to attain optimum production but to safeguard the environment as well.

Strengthening Regional R and D Program

From the general strategy developed by the Department, the regional R and D program planning and implementation can be established. Hence, the community-based approach requires the development of R and D plans that should respond to it. Consequently, restructuring of regional units should be seen in the light of the new thrust and strategies. The need to strengthen regional manpower through training, delegation of authority and powers should, therefore, be considered.

In the reorganization plan of the Department, the focus of operations shall be the creation of regional and provincial natural resource offices. This is aimed at bringing the decision base in natural resources closer to the people or clientele. Moreover, it aims at promoting an integrated and fast delivery of services and coordinated implementation of development programs. The creation of a Natural Resources Research Center (NRRCC) has also been proposed to integrate all basic and applied research functions in the development, production, harvesting, processing, and use of natural resources. Four institutions are envisioned to be created under the NRRCC, one each for forestry, mines and energy, aquatic resources, and land management.

With these proposed changes, we expect to produce more coordinated and responsive research outputs. We can also expect the immediate transfer of technology to DENR's clienteles.

Conclusion

The plans and programs developed within DENR for its agencies entail continuation and expansion or refocusing of priorities. Some of the expanded or refocused programs are cadastral surveys, reforestation, integrated social forestry, small-scale mining development, subclassification of forest and public lands, natural resources research and the utilization of remote sensing and modern data processing system for resource inventory and monitoring. New programs include upland productivity, national environmental plan, environmental information network, and research and development on priority mineral commodities.

I am aware that the research thrust developed in PCARRD is attuned to the plans and program needs of the administering agencies such as DENR. DENR's overall policies and strategies and regional needs can be an index in the development of PCARRD's research plan to support regional program thrust. I believe if we can interact effectively, and act collectively, our capability in solving our natural resource problems can be enhanced.

Planning for R and D in an Institutional Setting: The ViSCA Experience

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Introduction

The Visayas State College of Agriculture (ViSCA), which started as a provincial agricultural college on 19 June 1924, became a state college of agriculture on 24 May 1974 in line with the program of the Philippine government to develop three agricultural universities to serve each major zones of the country: Luzon, Visayas, and Mindanao. As a state college of agriculture, ViSCA has been mandated to pursue the three-fold functions of instruction, research, and extension and to take a leadership role in regional agricultural and rural development.

The growth of ViSCA's program on research and development has been phenomenal. Over the last decade, the budget allocation has increased by about 830% from a modest ₱1.75M in 1978 to about ₱16.3M in 1988, representing about 37% of the total College budget, excluding capital outlay and equipment. Today, the College takes national responsibility of two commodities – rootcrops and abaca. Its regional responsibilities total to 14 commodities. Directly involved in the implementation of R and D projects are 14 academic departments and four research and training centers and institutions. In 1987, 481 professional staff members were involved in R and D, 38% of whom were project-based.

Over the last decade, ViSCA's R and D program has increasingly been recognized, as shown by the amount of financial support it continues to receive from external agencies, the number of national and international fora held in the campus, and the various awards it has received from national organizations. In 1988, for example, it was recipient of the "Gintong Ani Award" from the Department of Agriculture. The award was given for ViSCA's outstanding contributions in agricultural R and D for the benefit of the small farmers.

Laying the Foundation for Greater Effectiveness and Sustained Growth

The sustained growth, as well as the increasing effectiveness of ViSCA's research programs, can be traced to five basic principles and strategies which the College has religiously observed in its R and D planning operation since its founding as a state college of agriculture. These include:

Well-defined Clientele

The development of the Visayan farmers and their families, with emphasis to small farmers, is the ultimate goal of the total R and D program of the College. The identification of a well-defined clientele has provided its R and D program clear focus as well as direction in its various activities.

Interdisciplinary and Multidisciplinary Approach to R and D

Conscious of the fact that problems of small-scale farmers are complex which require the collaborative efforts of scientists from various disciplines, ViSCA has adopted the interdisciplinary approach to agricultural and rural development. This is operationalized in various ways such as the community-based projects implemented by the Farm and Resource Management Institute (FRMI) and the Center of Social Research (CSR).

Trilogy of Functions

Conscious of its mandate to perform the trilogy of functions of instruction, research and extension, and the nurturing effect of each of the function to one another, the College has, as a matter of policy, encouraged staff to perform at least two of its three mandate functions. Thus, researchers who qualify to be at least assistant professors in academic rank are given one teaching load per semester in the appropriate departments. Since research and extension are inherent functions of all academic departments, faculty members are also given opportunities and incentives to perform at least two functions. This policy has resulted to the integration of the three-fold functions in unit and close collaborative efforts across different academic units of the college.

Developing Distinctive Areas of Competence.

ViSCA's choice of critical problems or commodities through which it can develop distinctive competence, such as in rootcrops and abaca, has been based on two major considerations: (1) the critical importance of the community to the region or nation, especially to the small farmers, (2) and the need for regional and national expertise with principal focus on the critical commodities under consideration. This decision facilitated the sourcing of external support and enabled the College to focus its effort on a relatively small area; thus, producing immediate impact in a short period of time.

Aggressive Staff Development

ViSCA's administration has recognized early that the quality of its staff is the most important limiting factor in its quest for excellence and relevance in research and extension. As a consequence, it has pursued an aggressive staff development program for advanced degrees and specialized nondegree training, both in the Philippines and abroad. ViSCA's staff with PhD degrees increased from 13 in 1976 to 55 in 1987, or an increase of 323% in spite of the transfer of the PhDs to other universities. Holders of MS degree increased by 2 % over the same period. Currently, BS degree holders make up only 31% of its regular professional staff versus 70% 11 years ago.

Strong External Linkage

As a matter of policy, the College has developed and maintained strong linkage with other government and nongovernmental agencies to increase its effectiveness, particularly in research and to draw substantial external resources to help finance its programs. In fact, the original composition of ViSCA's board of trustees included the provincial agriculturist, the national director of the Bureau of Agricultural Economics (BAEcon), the dean of the University of the Philippines at Los Baños (UPLB), and the director of Leyte Sab-a Basin Development Authority (LSBDA). However, this was revised when the Department of Education, Culture and Sports (DECS) adopted a uniform composition of board of trustees for all state colleges and universities by virtue of P.D. 1437. In terms of funding, external support accounts for about 20% of the total direct cost of R and D. Eight international organizations and three foreign universities maintain active relationship with the college.

Decentralization

Since bureaucracy and red tape stifle scientific creativity and productivity, ViSCA has pursued a decentralization scheme that gives a good degree of autonomy to academic departments in planning and implementation of R and D programs.

Structure of R and D Planning

Four years ago, the offices of the directors for research and extension were fused into the Office of the Director for Research and Extension (ODREX). ODREX is responsible for planning, coordination, monitoring, and evaluation of all research and extension activities of the college (Fig. 1). Implementation of R and D projects, however, remains a major responsibility of the different specialized centers/institutes and the technical and social science departments.

Two separate bodies directly assist ODREX in planning. At the departmental or center level, the Research and Extension Committee (REC) plans, coordinates, monitors, and evaluates all research and extension activities of the unit. The unit head usually acts as the chairperson of this committee. At the director's level, the Research and Extension Advisory Council (REAC), composed of all academic unit heads, has the major responsibility, among others, of assisting the director in planning the overall R and D of the College. In addition, the College organized local commodity teams which help plan the college commodity programs. At the college level, a planning committee (chaired by the President and operationalized by the Office of Planning and Management) reviews and integrates the total college plan for approval by the board of trustees, upon the recommendations of the College President.

The R and D Planning Process

ViSCA's long-term R and D plans are contained in a rolling five-year plan which are further refined in its annual development plan following the bottom-up approach in planning. However, while ViSCA's long-term plan provides general direction and guidance, it has not been as effective as the bi-annual and annual plans in terms of setting up realistic expected outputs due to the uncertainties in getting financial support from various funding agencies. Figures contained in the long-term plans do not usually represent realistic estimates. The only exceptions are special projects with foreign counterpart funding.

Seeing the Priority

In developing its R and D priorities, the College considers the information and feedbacks from various agencies and sources such as:

- **National agencies.** The national priorities set by PCARRD and other agencies (DA, DENR, and others) are furnished by ODREX to different units of the College.

- **Regional agencies.** Regional priorities in agriculture and rural development are articulated by the Regional Agriculture and Fishery Council (RAFC), Regional Development Council (RDC), Regional Research and Development Coordinating Council (RRDCC), and other regional agencies of the government, such as DA, DENR, and NEDA. ODREX compiles policy statements and R and D recommendations from these bodies, and supplies these to the different units of the college as reference in the planning process.

- **Provincial and municipal government.** Despite its national and regional mandate, the College is becoming more sensitive to the priorities set by the different provinces in the region, as well as the needs of the surrounding towns as articulated by the provincial and municipal development councils.

- **Funding agencies.** The College maintains close contact or communication with various national and international funding agencies to determine their priorities.

Various information, whether from formal or informal sources, are relayed by the administration to appropriate units of the College. The units' views and recommendations are taken up by the different commodity teams and REAC and, through consensus, the regional and national R and D priorities of the College are determined. Then an agreement is made in terms of corresponding obligations/assignments of the different units in translating the priorities into specific programs and proposals.

Translating Priorities into Action Plans and Proposals

Once the priorities are set, the task of translating them into action programs follows. Based on the guidelines set by ODREX, each department or center prepares an action plan which is submitted by the unit head upon recommendation of the unit R and D committee. This is then presented to REAC for reactions and comments. Once viewed, the ODREX director integrates them into the College R and D plan and submits it to the President, who in turn endorses the plan to the College Board for approval.

Preparation of proposals generally follow after priority setting. Once the priorities are set and unit assignments are made, researchers are notified so that they can prepare the necessary proposal. After review by the unit heads, the proposals are then endorsed to the appropriate committee, usually the local commodity teams, for review. Those endorsed by the review teams are then forwarded by the ODREX director to the appropriate funding agencies and/or to PCARRD if it is for government funding.

Conclusion

In planning for its R and D program, ViSCA hopes to achieve two major objectives: at the institutional level -- greater relevance and effectiveness of its R and D programs to the small Visayan farmers; and greater staff efficiency and productivity. Certain indicators show that the College has moved toward the achievement of these objectives. A major contributory factor is better planning. This does not mean, however, that ViSCA does not face problems in its planning process. The College does.

The R and D planning in ViSCA is basically an administrative function and staff members involved are academicians who have no formal training in planning. Thus, wide range of quality among the plans of the different academic units exists. The problem is further compounded by the fact that academic administrators have multiple responsibilities and find little time for intensive planning.

A critical problem in R and D planning is the increasing negative attitude of some researchers to planning. Because of the increasing problem of securing funds from the government to finance well-designed plans and proposals, some departments/

units have attempted to recycle old plans. Planning, therefore, becomes just a matter of compliance. This trend will likely continue unless the government through PCARRD can give assurance of funding.

R and D Planning at the Institutional Level: The PhilRice Experience

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Problems of the Philippine Rice Industry

Rice stands out as the most vital agricultural commodity in the country. As the staple food, it feeds over 80% of the Philippine population. About 70% of the Filipinos depend on rice cultivation and marketing for their livelihood. However, rice cultivation occupies, a small area, about 3.2 M ha only. Much more, this area has been gradually decreasing during the last 25 years, and half of it is even classified as problem soils.

Compounding this issue is the rapid growth of the Philippine population. With the projected population growth in the next two decades, we need to increase our yields per hectare to cope with the demand for food. Thus, from the present 3 t/ha in irrigated lowland fields, we need to boost it to 3.5 t/ha in 1990 and 4.5 t/ha in the year 2000.

In line with the above objective, the country has already made substantial progress in improving yields in irrigated lowland rice, but productivity in the upland and in unfavorable rainfed lowland areas remains low. There is also the continuous emergence of biological and socioeconomic problems in rice production. For example, new strains/biotypes of pests have emerged and costs of farm inputs have increased. There is also uneven institutional support services for rice production. Thus, rice producers are very poor. The estimated 18 M small Filipino rice farmers earn only an average monthly income of ₱1,335.00, way below the poverty line for the rural areas.

To solve the above problems, the Philippine Rice Research Institute (PhilRice) is directed to lay out plans on better rice production. In executing these plans, we also hope to build PhilRice as a durable R and D institution in the country.

The Establishment of PhilRice: A Backgrounder

The move to establish a national coordinating agency for rice research was made official in March 1985, when Sen. Edgardo J. Angara, then President of the University of the Philippines System, convened a committee to brainstorm on the possibility of establishing a national rice research institute for the country. Members of the committee were composed of Dr. Domingo M. Lantican, Vice Chancellor for Administration, UPLB; Dr. Ricardo M. Lantican (Committee Chairman), then Director for Research, UPLB; Hon. Domingo F. Panganiban, then Deputy Minister of Agriculture and Food; Dr. Ramon V. Valmayor, Executive Director, PCARRD; Dr. M.S. Swaminathan, then Director General, IRRI; Mr. Manny de Leon, representative from NEDA; and U.P. President Edgardo J. Angara.

As a result of this brainstorming, a technical interagency committee was established to draft a proposal for the establishment of PhilRice. The committee members were representatives from UPLB, MAF, PCARRD and NEDA. In May 1985, the Committee came up with a proposal which was submitted to then President Ferdinand E. Marcos through former MAF Minister Salvador H. Escudero III.

In June 1985, the first official mention of creating a national rice research institute was made during the recognition ceremony for outstanding farmers and the celebration of IRRI's 25th anniversary in Malacañang. This became the basis for establishing PhilRice. In September 1985, MAF Minister Escudero, MAF Deputy Minister Panganiban, UP President Angara, UPLB Director for Research Lantican, UPLB College of Agriculture Dean Ruben L. Villareal and representatives from PCARRD and NEDA, met to prepare the budget for PhilRice and discuss its role as a rice research coordinating center.

Finally, on 5 November 1985 the then Pres. Marcos issued Executive Order No. 1061 establishing PhilRice, a corporate body under the Ministry of Agriculture and Food. A year later, President Corazon C. Aquino issued E.O. No. 60 amending E.O. 1061.

The PhilRice Mandate

As the national research institute for rice, PhilRice is mandated to unify and strengthen the manpower and physical facilities of various institutions engaged in rice R and D. It aims to sustain the country's goal of self-sufficiency in rice production and to promote farmers' greater access to improved agricultural technology. PhilRice has the following major missions:

- To sustain and expand the country's gains in rice productivity;
- To increase the food and income of small farmers;
- To expand employment opportunities and stimulate economic growth in the rural areas through rice-based farming systems;
- To promote the general welfare of the people through self-sufficiency in rice production.

As the lead agency for rice R and D, PhilRice coordinates with and provides support to cooperating agencies for rice and rice-based programs. Likewise, PhilRice defines, prioritizes, monitors, and reviews regularly the national rice R and D programs. These functions are done with the support and cooperation of DA, PCARRD, SUCs, IRRI, and the private sector. PhilRice also unifies and strengthens R and D efforts to generate in-depth solutions to present and future problems in rice production.

Objectives

PhilRice seeks to further improve production technologies in each of the country's rice-growing regions. It also strengthens local capabilities in solving area-specific problems in growing rice. Through this, PhilRice hopes to help substantially improve the marginal condition of small rice farmers.

To achieve these goals, PhilRice has the following objectives:

- Plans, undertakes, coordinates, and funds national R and D on rice and rice-based farming systems;
- Develops and coordinates the national network of rice research stations in the different agroecological regions of the Philippines;
- Verifies, packages and transfers economically viable and socially acceptable technologies;
- Provides up-to-date data base for policy formulation that will stimulate and sustain rice production, marketing, and consumption; and
- Organizes, trains, and develops the rice industry's manpower.

R and D Planning at PhilRice

Basic Approach

The planning method of PhilRice is essentially problem-oriented, consultative, multisectoral and multidisciplinary in approach.

Our efforts are focused . solving iocation-specific problems in rice production, marketing, and consumption in the country. Hence, every plan and program at the Institute is directed to solving a specific problem area on rice.

In drawing-up our plans and programs, we consulted all concerned sectors in the rice industry, especially policymakers, scientists/academicians, extension workers/and farmer-leaders. The results of such consultations were eventually presented to the Board of Trustees, the highest policymaking body of PhilRice. Our Board is multisectoral for its members were appointed by virtue of the sector they represent. Thus, our plans and programs cut across the major disciplines in agriculture and social science research (Fig. 1).

Initial Steps

On 12 December 1985, the PhilRice Advisory Council held its organizational meeting at NFAC. Dr. Ricardo M. Lantican presided this meeting. During the meeting, an **ad interim** exe-

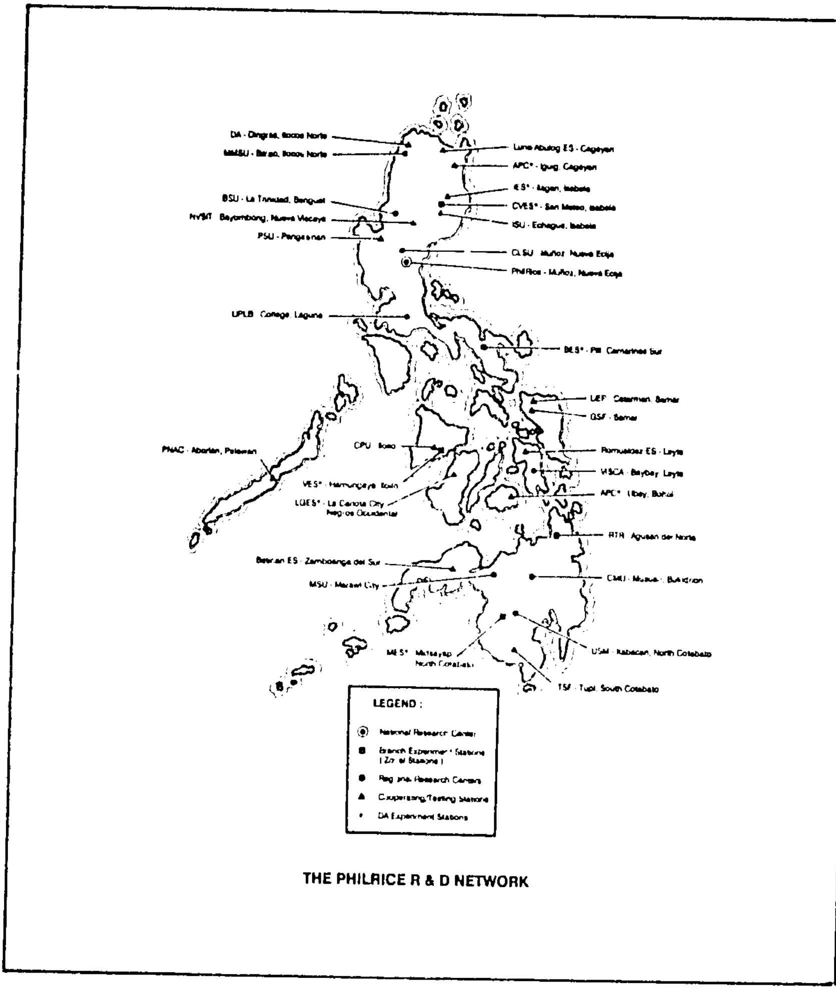

Figure 1. Shows the PhilRice R & D Network: Plans and programs are gleaned from all concerned sectors in the rice industry all over the Philippines.

cuting body was formed to plan the operations of PhilRice in the meantime that a Director has not yet been appointed.

Four days later, the PhilRice Advisory Council issued Memorandum No. 85-6. This memorandum contained the list of the Executing Committee members. The membership of this committee represented the major disciplines in agricultural and social science research.

On 17 February 1986, PCARRD Executive Director Ramon V. Valmayor sent a copy of PCARRD's Philippine Rice R and D program and mentioned in his letter that PhilRice may modify any program thrust which it thinks needs updating. This was quite helpful to the Executing Committee in drafting PhilRice's initial R and D plan.

On 7-8 March 1986, the Philippine Rice R and D Workshop was held at UPLB attended by regional planners and implementors (regional directors and research coordinators of the 12 MAF Regional Offices) and representatives from ACAP-member schools. The workshop was designed to collate and document all existing research and development efforts in rice; to identify research needs of the regions and review their existing capabilities; to package a national R and D thrust relevant to the needs of the various regions; and to strengthen existing institutional linkages among all agencies involved in rice R and D. The output was packaged and became the precursor of PhilRice's medium-term R and D plan.

Firming Up PhilRice's R and D Plan

Upon our assumption into office as Director in June 1987, we immediately accelerated the initial planning and organization work earlier done by the Executing Committee.

On 8-9 July 1987, PhilRice and PCARRD jointly conducted a Rice R and D Workshop, which aimed to refine and validate the medium-term R and D plan drafted by the Executing Committee. Through this activity, we firmed up eight R and D thrusts of PhilRice.

The PhilRice's seven thrusts included technology transfer where mature technologies are packaged and disseminated to all researchers, extension workers, farmers, consumers, and other sectors in rice research and production.

These thrusts require studies that will not only increase production levels per unit area but sustain and improve those levels without causing irreversible environmental degradation. We shall enhance the health of the soil; nurture the biological agents to reduce the damages caused by pests to our crops; and intensify cropping by selecting appropriate crops to be grown before or after rice to increase farmers' income and improve soil fertility.

Likewise, it is necessary that we increase and diversify the uses of rice by developing various food products out of it; develop and improve the various tools and machineries for rice production and postharvest activities; and plan and implement the proper uses of water and conservation of the environment. Farmers must be encouraged to ultimately use modern technologies to increase production. Transfer of mature technologies shall be done with the help of various sectors as well as the farmers themselves through their various organizations.

Re-Validation and Final Packaging of the PhilRice R and D Plan

In November 1987, the institute's program leaders validated and finally packaged the medium-term rice R and D plan of PhilRice. In its complete form, the plan has the following components:

- **Research programs** -- these are the medium-term research agenda of the different research thrusts earlier mentioned. On the whole, they chart the direction of Philippine rice R and D for the next five to ten years.
- **Technology transfer program** – this maps out strategies and projects aimed at moving technological information from research centers to the farms.
- **Manpower development program** – this spells out the training of Filipino rice scientists and development workers in the next five years.
- **Infrastructure development program** – this contains plans on the construction of buildings and acquisition of equipment for the Institute's central headquarters, branch experiment, stations, regional research centers, and cooperating stations.
- **Institutional linkage mechanisms** – this indicates the types and approaches of linking PhilRice with other organizations to speed up goal attainment and maximize resources in R and D.

Component I : Research Program

Rice Varietal Improvement Program

This program aims to improve and stabilize yields of important agroecological types of rice through breeding and facilitate production of basic seeds from released varieties. The dry-seeded rice improvement projects are as follows:

- Upland rice development
- Rainfed shallow, drought-prone lowland rice development
- National cooperative testing of dry-seeded rice
- Seed production of dry-seeded rice

On the other hand, the transplanted/wet-seeded rice improvement projects include the following:

- Germplasm collection, evaluation, and conservation
- Development of irrigated lowland rice cultivars adapted to reduce cost of technology
- Development of rice cultivars for drought-prone and flood-prone rainfed lowland environments
- Development of lowland rice cultivars adapted to adverse soil conditions
- Development of rice cultivars for cool, elevated areas
- National cooperative testing for transplanted/wet-seeded rice
- Development of tissue culture technologies for rice
- Basic seed production of transplanted/wet-seeded rice
- Development of hybrid rice

Planting and Fertilizer Management

This program aims to further improve and sustain the gains made in improving soil productivity using low-cost inputs. It also aims to develop efficient planting methods that can boost rice production. Planting and fertilizer management projects are:

- Soil and fertilizer management for sustained productivity of irrigated lowland rice
- Improvement of rainfed lowland and upland rice soils with micronutrient stress
- Integrated nutrient management for sustainable rice production under rainfed conditions
- Improvement of cultural practices to overcome yield constraints in rainfed rice

Integrated Pest Management

This program hopes to validate, demonstrate, and fine-tune appropriate location-specific IPM technologies to attain better production and at the same time maintain a reasonable level of environmental stability and public safety:

Integrated Pest Management Projects are as follows:

- Bridging the IPM technology gap in the Philippines
- Coordinated pesticide evaluation
- Systematic validation of new IPM component technology for lowland rice
- Field testing of useful biological control agents
- Development of botanical pesticides for rice pests
- Development of appropriate technology for weed management of various rice environments
- Development of IPM technology for rice-based farming systems
- Pest management studies for upland rice
- Monitoring pesticide residue and environmental safety
- Development of IPM strategy for vertebrate pests of rice
- Modelling rice crop-pest interactions and expert systems for integrated pest management
- Development of IPM strategy for insect pests in storage

Rice Engineering and Mechanization

This program shall contribute to the collective goal of increasing rice production through improved farm mechanization, better uses of land and water resources. and improved postharvest technologies for rice and rice by-products.

The collaborative program for rice mechanization in the Philippines are:

- Comprehensive evaluation of rice machinery in the Philippines
- Developing and improving rice production machinery
- Testing and evaluation of rice machinery and equipment
- Promotion and popularization of rice production machinery and equipment
- Promotion and popularization of rice postharvest machinery and equipment

Rice irrigation and drainage projects are:

- Establishment of small water impounding technology
- Underground water scouring and management
- Promotion and utilization of locally manufactured rice irrigation machinery and equipment
- Steam as an alternative source of power for rice milling
- Bulk handling of rice grains in the humid tropics

Rice Farming Systems

This program shall look into all the farm components and how these (cropping pattern, cultural management, and crop-livestock integration) can help increase farm productivity. The rice farming systems projects are:

- Upland rice farming systems
- Rainfed and irrigated upland farming systems
- Rice-livestock integration
- Rice biomass utilization
- Rice farming systems and village nutrition
- Simulation model for rainfed lowland and upland rice farming

Rice Chemistry and Food Science

This program will improve rice grain quality in support to the varietal improvement program, establish grain qualities preferred by various consumers, and maximize the use of rice and by-products.

The rice chemistry and food science projects include:

- Rice grain quality improvement
- Establishment of regional consumer preference for rice
- Rice food product development
- Finding new uses for old rice by-products
- International collaboration with Japan, Thailand, and IRRI
- Diversification of rice and rice flour
- Improvement of design and testing of processing equipment for rice-based food products

Social Science and Policy Research

This program will provide the much needed socioeconomic complement to the agricultural technology development and adoption process, strengthen the institutional support for rice production and improve the policy environment of the rice farmer.

Social Science and Policy Research Projects include the following:

- Socioeconomic taxonomy of rice farmers
- Socioeconomic dynamics of PhilRice technology: from on-farm adaptation to adoption
- Annotated bibliography of social science research on rice
- Inventory of economic researches on rice in the Philippines
- Regular monitoring of rice farming, distribution, credit and employment in lowland and upland rice farming systems
- Economic evaluation of alternative storage facilities and arrangements
- An analysis of seed production, distribution, and policy
- Study of the Philippine rice buffer stock policy in a regional context
- Marketing analysis of rice and corn food products and substitute: some policy implications
- Marketing infrastructure and strategies for rice farming systems
- Toward institutionalized strategies for rice crises situations
- Rice-related public issues

Component 2: Technology Transfer Program

This program will serve as a unitary intermediary system between rice technology generation and technology utilization.

National On-Farm Technology Adaptation. Verification, Demonstration, and Pilot Testing of Rice and Rice-Based Technology. This project will supplement and complement research station testing through on-farm testing project to obtain a better and wider data base for the evaluation of location-specific recommendations.

National Training Project for Rice and Rice-based Production and Related Social Technologies. This project aims to upgrade professional competence and heighten the motivation of the rice industry's manpower, particularly extensionists, farmer-leaders, subject matter specialists, middle-level managers, and researchers. It will also include the development, testing, and evaluation of integrated set of training materials supporting rice training programs in the country.

Integrated Communication Support Project for Rice and Rice-based Cropping Systems. This project hopes to develop, produce test, and evaluate an integrated set of communication approaches, strategies, and materials that will facilitate the maximum flow of information in the rice industry. It will also provide a systematic documentation of R and D activities on rice and rice-based cropping systems.

Component 3: Manpower Development Program

The program aims to:

- Provide high-quality training to a core of researchers and development specialists who will implement the programs of PhilRice;
- Serve as the major vehicle in developing the institutional capabilities of PhilRice and collaborating organizations like state colleges and universities (SUCs) and the Department of Agriculture (DA);
- Serve as an incentive in attracting and maintaining top-caliber personnel of the Institute and its collaborating organizations.

The four major components are: degree training, postdoctoral stints, fellowships, and study tours.

Degree Training

- PhD level. Training at the PhD level is aimed at developing high-quality manpower who will provide leadership in the Institute's programs.
- MS level. The MS level is basically aimed at sharpening the professional competence of recipients especially on the research process.
- BS level. Undergraduate scholarships will be offered to selected junior students who are on the top 3% of their class.

Postdoctoral Stints

This is aimed at updating the technical competence of recipients and at the same time providing opportunities for them to do advanced research and development activities along their areas of specialization.

The postdoctoral slots will be awarded mostly to senior researchers and faculty members of state colleges and universities with a duration of one year.

Fellowships

This component aims to attract research talents to the Institute by funding research projects and graduate theses which are in line with the Institute's programs. Research fellows will, therefore, be researchers/junior faculty members of SCUs and graduate students from recognized SCUs. Fellowships will have a duration of two years.

Study Tours

This component aims to expose the Institute and cooperating stations' staff to the latest trends in agricultural/social science research and technology transfer techniques abroad and facilities of scientific organizations outside the country. Study tours will be mainly for administrators, program/project leaders and deserving researchers. This component has a duration of 15 to 30 days.

Component 4: Institutional Linkage Mechanisms

Network Linkages

The PhilRice network is divided into four categories: the main station is PhilRice at Muñoz, Nueva Ecija; the four branch stations under the administrative management of PhilRice; six regional research centers which have broad research activities and are the seat of PCARRD's consortia network; and cooperating/testing stations which shall conduct verification, adaptation, and demonstration activities (Figure 2).

Central Experiment Station (PhilRice at Muñoz, Nueva Ecija) shall conduct basic and applied researches, development studies, training, and communication projects.

Branch Stations shall conduct researches on varietal improvement, planting and fertilizer management, and integrated pest management.

Regional Research Centers shall conduct a broad range of research and development studies applicable to regional needs. Except for the Regional Crop Protection Centers (RCPC), which undertake integrated pest management in the regions, these centers are state colleges and universities which have the capabilities to undertake research and technology transfer.

Cooperating Stations shall conduct verification, adaptation, and pilot/demonstration projects.

Other National Linkages

PhilRice also coordinates with PCARRD and DA-BAR in planning, monitoring, and reviewing its eight program thrusts. PhilRice also collaborates with SCUs in technology generation and with DA regional offices on technology adaptation, verification and dissemination. Moreover, PhilRice involves farmers/nongovernmental organizations in its planning and decision making.

International Linkages

PhilRice signed a collaborative agreement with IRRI, thereby linking PhilRice with six other international agencies, all based

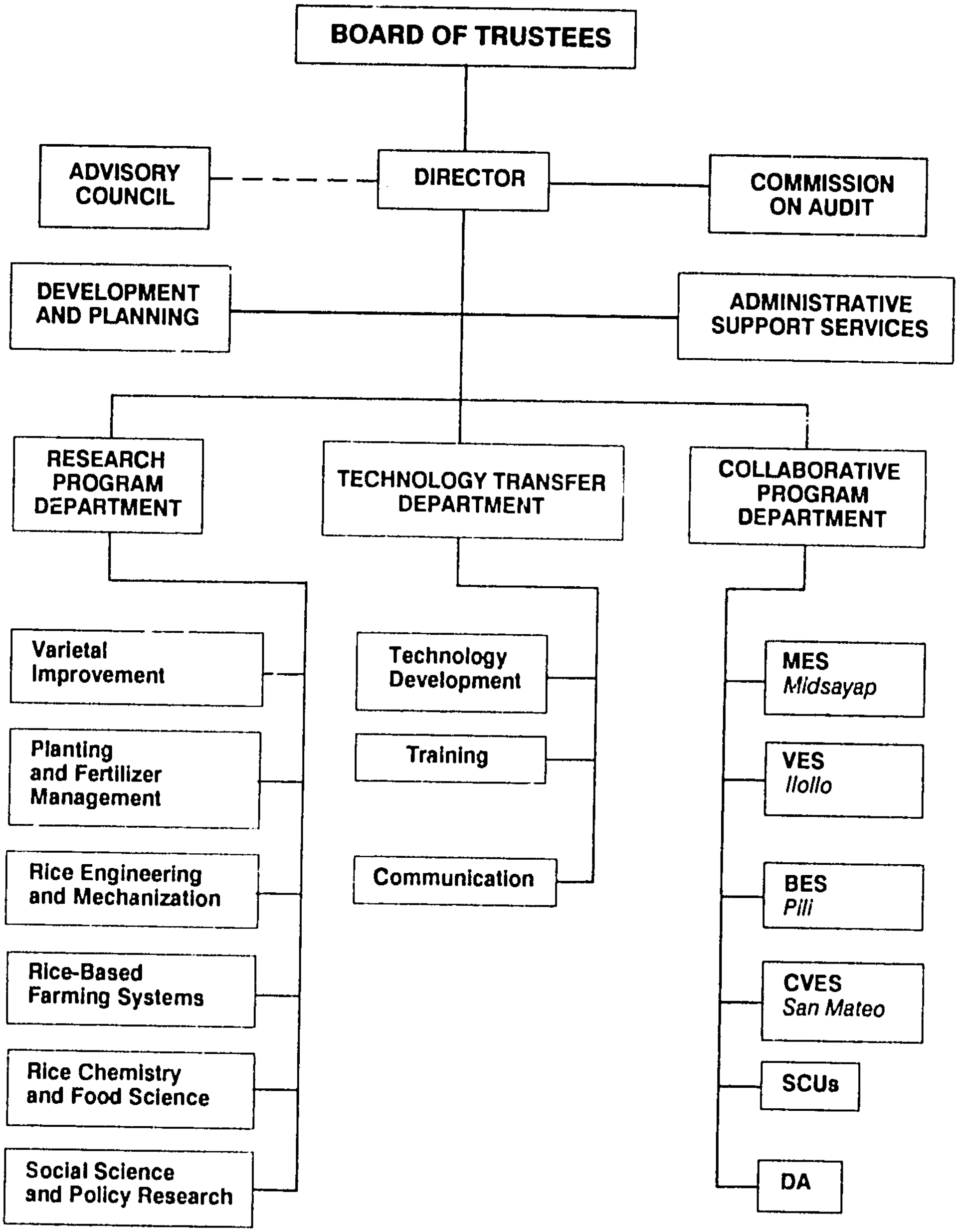

Figure 2. The PhilRice Organizational Structure.

at IRRI. These are:

1. International Rice Germplasm Center (IRGC);
2. International Rice Testing Program (IRTP);
3. International Network on Soils and Fertilizer Efficiency (INSFER);
4. Asian Cropping Systems Network (ACSN);
5. International Training Program (ITP); and
6. International Co-Publication Program (ICPP).

PhilRice and IRRI will actively collaborate on research, training, and technology transfer activities on rice and rice-based farming systems. IRRI will also assist PhilRice in the massive training and retraining of Filipino rice scientists and extensionists to update them on the latest information on rice research and development. Likewise, IRRI will make available seed materials and expand its mailing list of publications to Filipino rice scientists and researchers. Its library facilities will also be made available to PhilRice scientists.

Moreover, IRRI will continue to implement its programs and maintain its leadership in rice research at the international level. However, its activities which are considered national in nature will be carried on collaboratively and eventually transferred to PhilRice. In these activities, PhilRice assumes the leadership.

The collaboration between the two institutes will certainly unify and strengthen the existing national rice research and development network.

Component 5: Infrastructure Development Program

The proposed infrastructure development program consists of buidlings, greenhouse facilities, equipment and furniture, vehicles and farm facilities for the Institute's headquarters in Maligaya, Muñoz, Nueva Ecija.

Summary

In summary, we would like to emphasize the following:

- PhilRice was established to help solve location-specific problems of the Philippine rice industry. Thus, PhilRice's plans and programs are particularly addressed to the solution of these problems.

- R & D planning at PhilRice is essentially problem-oriented, consultative, multisectoral, and multidisciplinary. Our planning process involves all sectors of the rice industry especially decision makers, researchers, academicians, farmer-leaders and production specialists.
- The institution-building process at PhilRice has been activated with the implementation of our medium term R and D plan. As we execute our plans in helping solve the country's rice problems, we also aim to be transformed into a durable R and D institution.
- The problems confronting the Philippine rice industry are quite complex. However, we at PhilRice believe that with the right technology and strong institutional support our country can reassume its leadership in agricultural research and rice production in this continent.

Module III: Building and Managing the National Research System in Agriculture and Natural Resources

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Building the Philippine Research and Development System in Agriculture and Natural Resources

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Introduction

The Government continues to face an enormous challenge to maintain the momentum of development in the Philippine economy and make real progress in spreading the gains of development more equitably. Technological backstopping is needed for development to push forward.

Therefore, research will continue to contribute to find better and more productive ways to increase farmers' productivity and profitability. For research to be effective, focus must be made on the most urgent, high-priority areas. As the World Bank has stressed, the effectiveness of research programs during the 1980s will determine how well the 3.2 billion people who live in the developing countries will be fed in the coming years. We need to step-up our research and development (R and D) efforts to move the agriculture and natural resources sectors and the Philippine economy forward.

The Philippine Council for Agriculture, Forestry and Natural

Resources Research and Development (PCARRD), through the years, has geared the National Agriculture and Resources Research and Development System (NARRDS) by devoting necessary resources (manpower, infrastructure, and facilities), commitment to priority R and D programs, and by ensuring that research centers and stations have the capability and needed resources to conduct R and D projects.

This paper attempts to present, in a broad context, how the NARRDS – or the entire complex of institutions and agencies engaged in agriculture and natural resources R and D, and PCARRD work as an effective mechanism for making research an instrument of development.

Background and History of PCARRD

From PCAR to PCARRD

The establishment of the Philippine Council for Agricultural Research (PCAR) in November 1972, now known as Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), traces its beginning to the vision and commitment of the late Agriculture Minister, Arturo R. Tanco, Jr.

Upon his recommendations, then President Ferdinand E. Marcos, created a Presidential Executive Panel that reviewed the state of agricultural research in the country. The findings of the Executive Panel revealed a fragmented research set-up characterized by 1) duplication of efforts and inability to create the desired impact despite vast sums involved; 2) inefficiency and ineffectiveness in the programs of a number of research agencies; 3) lack of coordination and planning at the national level; and 4) fragmentary distribution of research resources. On the strong recommendation of the Executive Panel to develop a national agricultural research system, Presidential Decree (P.D.) No. 48 was signed in November 1972 creating the PCAR. PCAR was given the important task of upgrading the national research capability in agriculture through systematic planning, coordination, direction, and implementation of a national research program.

Subsequent presidential decrees testified to the growing, significant role of PCAR in national development. P.D. No. 461

attached PCAR to the National Science Development Board (NSDB) for better coordination of the science and technology programs in the country, under which agriculture and natural resources research was subsumed. Before this, PCAR was administratively under the Department of Agriculture and Natural Resources (now Department of Agriculture).

P.D. No. 864 expanded the functions of PCAR to include mines research, resulting in the modification of its name to Philippine Council for Agriculture and Resources Research (PCARR). In November 1977, P.D. 1249 was signed granting PCARR the authority to generate funds to support research activities. P.D. 1502 was signed in June 1978 providing for incentives and administrative reforms to promote productivity and efficiency in scientific and technological research.

These presidential decrees assigned major tasks to PCARR, namely:

- Define the goals, purposes, and scope of research in agriculture;
- Develop a national research program based on a multidisciplinary, interagency, and systems approach;
- Establish a system of priorities for agriculture and natural resources research and a means of updating priorities;
- Establish a system to generate funds for agricultural research;
- Program the allocation of all government revenues for agricultural and natural resources research;
- Provide a mechanism for updating the national research program;
- Establish, manage, and fully support a national network of centers for various commodity research programs;
- Identify, evaluate, and review agricultural research programs;
- Develop full communication among workers in research, extension, education, and national development;
- Initiate the establishment of a repository of research information in agriculture and natural resources;
- Provide for appropriate incentives to keep competent research scientists in the system;
- Enter into agreement of relationships with other similar ins-

titutions and organizations, both national and international, in furtherance of the above purposes; and

- Have the power and authority to call on any department, bureau, office, agency, state university or college, commodity institute, and other instrumentalities of the government for assistance in the form of personnel, facilities and other resources as the need arises in the discharge of its functions.

To enable it to discharge these functions, PCARR was clothed with two powers or authorities, thus:

- the power to review all research program proposals in agriculture and natural resources; and
- the power to pass upon and recommend research proposals to the Ministry of Budget for funding.

The second authority was bolstered by a policy statement of the then Ministry of Budget (now the Department of Budget and Management) that only research proposals recommended by PCARR shall be considered for funding by the government.

The reorganization of the NSDB into the National Science and Technology Authority (NSTA) in 1982 added a new dimension to PCARR's mandate. Executive Order No. 784 broadened the mandate of PCARR to include the development function, thus the name Philippine Council for Agriculture and Resources Research and Development (PCARRD). The addition of *development* to the mandate of PCARRD further strengthened the development orientation of the institution. It reaffirmed the institution's thrust of technology transfer and utilization – that research is not meaningful unless research results are accepted and utilized by farmers and other clientele groups.

The change in national leadership in 1986 effected similar changes and transitions in the government. The NSTA was reorganized with the signing of Executive Order No. 128 into the Department of Science and Technology (DOST).

The Philippine Council for Agriculture, Forestry and Natural Resources Research and Development was established in place of the old PCARRD. Following this reorganization, two research departments of PCARRD were transferred to other DOST councils with jurisdiction over their functions. The Fisheries Research Department of PCARRD served as the nucleus of the newly created Philippine Council for Aquatic and Marine Research and Development (PCAMRD), while the Mines Research Department was absorbed by the Philippine Council for Industry and Energy Research and Development (PCIERD).

PCARRD's Organizational Structure

The DOST provides the central direction, leadership, and coordination of scientific and technological research and development in the country. Five planning councils under the umbrella of DOST take care of various sectors: The Philippine Council for Advanced Science and Technology Research and Development (PCASTRD), Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), Philippine Council for Aquatic and Marine Research and Development (PCAMRD), Philippine Council for Health Research and Development (PCHRD), and the Philippine Council for Industry and Energy Research and Development (PCIERD).

Executive Order 128, issued in January 1987, mandates each of the Councils to be responsible in their respective sectors for the formulation of strategies, policies, plans and programs for science and technology development; for programming and allocation of government and external funds for research and development; for monitoring of research and development projects and for generation of external funds.

Two basic structures comprise the agriculture and natural resources sector, a planning and coordinating body which is PCARRD and a network of research centers and stations, the National Agriculture and Resources Research and Development Network (NARRDN). PCARRD has maintained its original structure since its inception in 1972. However, the composition of its original bodies has undergone some modification to keep pace with its changing thrusts and functions.

PCARRD has three main organizational components: the Governing Council, the Technical Advisory Committee (formerly known as the Technical Program Planning and Review Board), and the Secretariat. PCARRD involves a whole range of research, education, development-oriented and policy-making entities concerned with national and regional development. Moreover, it brings together government and private sectors and marshalls the expertise of policymakers, scientists, educators, technicians, extension workers, and operators/producers and private sector to find efficient solutions to the problems of the farmers and other end-users of technology, in particular, and the country, in general.

Governing Council. The Governing Council (GC) is PCARRD's policy-making body. The composition of the GC provides an interfacing between national development and science and technology goals. This linkage ensures continued relevance and responsiveness of the national research and development program to critical issues in agriculture, forestry, and natural resources. Furthermore, the membership of the private sector in the GC imbues PCARRD's policy-making body with the perspective, concerns, and problems of the nongovernmental sector.

Technical Advisory Committee. The Technical Advisory Committee (TAC) is advisory and assistive to the PCARRD Executive Director. The Committee advises him in matters of policy, procedures, formulation, and review of the national research and development programs in agriculture, forestry, and natural resources. TAC's wide ranging membership of research directors, policy-makers, and representatives from the private sector with diverse expertise cutting across disciplines and sectors provides a multidisciplinary and multiagency orientation in research planning, evaluation, and implementation.

The Secretariat. The Secretariat, located at Los Baños, Laguna, is composed of two major components: the core staff and a support group of scientists making up the national commodity research and development teams.

- *Core Staff.* The PCARRD Secretariat implements the policies and guidelines formulated by the Governing Council. The PCARRD Executive Director heads the Secretariat and is assisted by the Deputy Executive Director for Research and Development (DED-RD), the Deputy Executive Director for Institution Development and Financial Management (DED-IDFM), technical research directors, and service directors.

The Technical Research Divisions (TRDs) include: Crops Research, Farm Resources and Systems Research, Forestry Research, Livestock Research, Socio-Economics Research, and Technology Development and Regional Coordination. The service divisions are Applied Communication, Institution Development, Finance and Administration, Management and Information Services, and Planning and Development.

Each technical division director is assisted by a staff complement of subject matter specialists, program specialists research assistants, and administrative support staff to ensure that the commodity research and development programs which they monitor are properly implemented. The responsibility of processing, monitoring, and evaluation of individual R and D projects rest heavily on the technical divisions. In addition, other activities supportive of the mandates of PCARRD, such as manpower development, project development, workshop coordination, establishment of linkages, and others are also coordinated at the division level.

- *National Commodity Research and Development Teams.* The National Commodity Research and Development Teams (NCRDT), whose membership come from different government and private institutions and composed of scientists, recognized in their respective disciplines, development workers, and others assist the Secretariat in their activities.

Together with TRD Directors concerned, these teams plan, coordinate, evaluate, monitor, and update their respective national commodity research and development programs. Through these teams, the researchers and scientists themselves, in consultation with various groups particularly the farmers, and other end-users, periodically review the directions of research and development in the country.

Each commodity team is composed of a team leader, and about 8-12 members. Team members serve PCARRD and the National Agriculture and Resources Research and Development System (NARRDS) on an "on-call" arrangement: thus enabling PCARRD to maintain a minimum core of staffing, but at the same time, maximizing involvement of the best scientific talents in the country.

At present, there are 31 National R and D commodity teams for the various sectors as indicated below:

- **Crops**
  - o Coconut and Oil Palm
  - o Corn and Sorghum
  - o Fiber Crops
  - o Plantation Crops
  - o Rice, Wheat and Other Cereals
  - o Root Crops

- o Fruit Crops
- o Legumes
- o Ornamental and Medicinal Crops
- o Sugarcane
- o Tobacco
- o Vegetable Crops

- **Farm Resources and Systems**
  - o Agricultural Engineering
  - o Farming Systems
  - o Soil Resources
  - o Water Resources

- **Forestry**
  - o Agroforestry
  - o Bamboo, Rattan and Non-timber Forest Products
  - o Coastal Zone and Mangrove Forest
  - o Coniferous Forest
  - o Dipterocarp Forest
  - o Parks, Wildlife and Forest Range
  - o Tree Plantations

- **Livestock**
  - o Beef/Chevon
  - o Carabeef
  - o Dairy
  - o Forage, Pasture and Grasslands
  - o Pork
  - o Poultry

- **Socio-Economics**
  - o Applied Rural Sociology
  - o Macroeconomics

Establishing a National Agriculture and Resources Research and Development Network

Among its major tasks, PCARRD was mandated to establish, and manage the operation of a national network of research centers and stations in agriculture and natural resources. PCARRD saw in this opportunity to put into operation a mechanism where independent research agencies, educational institutions and department research stations could evolve into mutually reinforcing NARRDN. The establishment of the network is one of PCARRD's vital accomplishments.

The NARRDN is a strategy as well as a mechanism for promoting and coordinating cooperation among institutions and agencies in the agriculture, forestry, and natural resources sectors. It effectively links agencies and institutions, each with their respective R and D activities, into a strong and cohesive system. Member-agencies join forces in cooperative efforts, form linkages, and share experiences and available resources and information for their mutual benefits.

The NARRDN includes various agencies involved in R and D. These agencies are independent of PCARRD but their R and D activities on crops, livestock, forestry, farm resources and systems, and socio-economics are coordinated, monitored, and evaluated by PCARRD. Member-agencies in the NARRDN have been organized into national and regional centers and cooperating stations. They have well-defined functions, in terms of service area and commodity responsibilities.

Requisites for an Effective NARRDN

In developing the NARRDN, a group of agencies was identified and selected on the basis of: a) appropriate commodity-oriented environmental conditions; b) accessibility to commodity industry; c) availability of research expertise in the area; and d) other vital industry-related considerations.

To develop and strengthen the research capability of the R and D network, PCARRD embarked on massive upgrading of research manpower, infrastructure, and facilities of member-agencies since 1975. Through the Agricultural Research and Development Loans I and II, provided by the United States Agency for International Development and the Government of the Philippines, PCARRD was able to develop substantially the manpower, infrastructure, and research equipment and facilities of member-agencies of the network.

The NARRDN is still evolving and will continue to do so in the future. PCARRD believes that wholly productive research cannot be attained if one or more of the agencies in the network do not contribute to the collaborative efforts effectively. Therefore, PCARRD has a continuing program to strengthen the capabilities of the member-agencies, especially in support of the R and D efforts at the regional level.

Composition of the NARRDN

The NARRDN consists of various agencies involved in the generation, development and verification, transfer and dissemination of technologies for the agriculture, forestry and natural resources sectors. The present network is composed of four national multicommodity R and D centers, seven national single-commodity R and D centers, eight regional R and D centers, nine specialized agencies and various cooperating stations found all over the country. Figure 1 indicates the location of the national and regional centers.

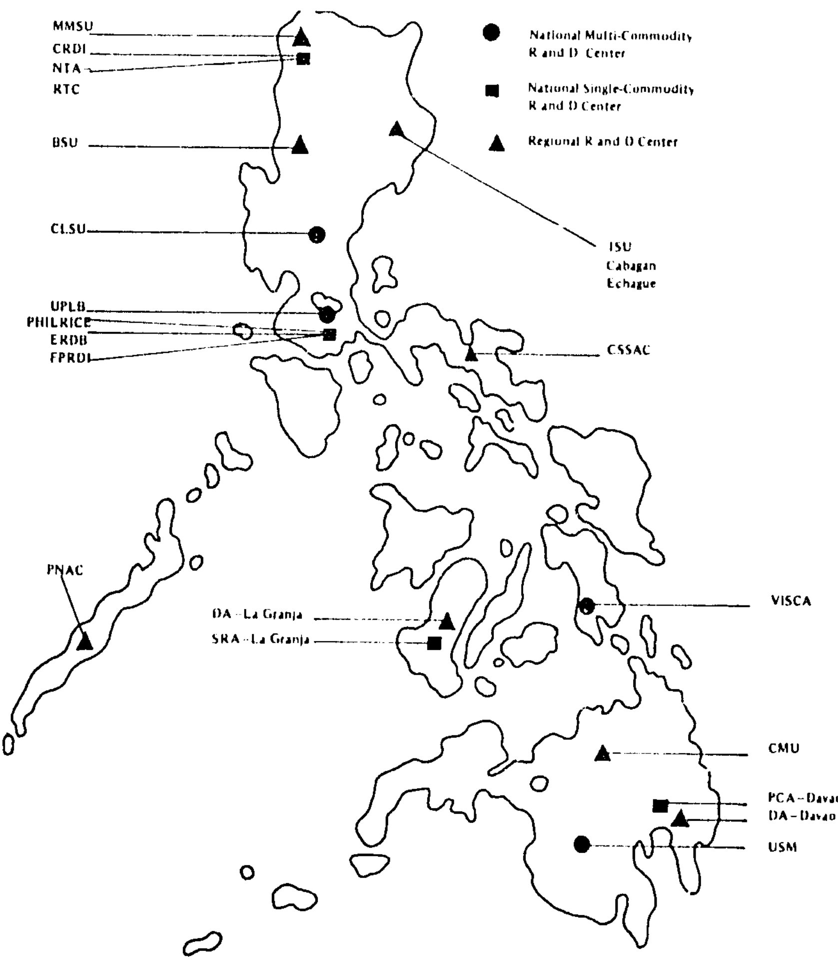

Fig. 1. National research and development network in agriculture and natural resources.

National R and D Centers. The National R and D Centers conduct basic, applied, and adaptive researches on one or more commodities. These centers have the capability to do research across a broad range of disciplines. In addition, these centers put together packages of appropriate technologies for different commodities and/or dominant production systems after successful verifications in the regional R and D centers and cooperating stations located in the different agro-ecological zones/ecosystems of the country.

The national R and D centers are of two kinds, namely: the national multicommodity R and D centers and the national single-commodity R and D centers.

a. *National Multicommodity R and D Centers*

The four national multicommodity R and D centers are based in academic institutions. They are tasked to generate the information, develop new technologies on assigned commodities that they are responsible for and disseminate these to end-users. At present, there are four national multicommodity R and D centers, namely: Central Luzon State University, University of the Philippines at Los Baños, Visayas State College of Agriculture, and the University of Southern Mindanao.

b. *National Single-Commodity R and D Centers*

There are seven single-commodity R and D centers. These type of centers concentrate in only one commodity by virtue of its national mandate. These can be based at academic institutions, such as the Cotton Research and Development Institute (CRDI) at the Mariano Marcos State University, or a government-owned corporation like the Davao Research Center of the Philippine Coconut Authority. To date, seven national single-commodity R and D centers serve the NARRDN in the following commodities: cotton, tobacco, coconut, rice, sugarcane, forest utilization, and forest production.

Regional R and D Centers. There are eight regional R and D centers in the NARRDN. A regional center conducts applied and adaptive research for commodities of major importance in the regions where the center is located. It verifies the technology developed/generated in the national research center and fine-tunes the packages of mature technologies to suit regional conditions.

The eight regional R and D centers are strategically located in places representing basic agroclimates. Most of these centers are based at state colleges or universities, such as Mariano Marcos State University in the Ilocos Region, Camarines Sur State Agricultural College in Bicol, or the Central Mindanao University in Central Mindanao. Two regional R and D centers are under the Department of Agriculture (DA), namely: the Davao Experiment Station and the La Granja Experiment Station.

Cooperating Stations. Cooperating Stations are selected stations of DA and the Department of Environment and Natural Resources (DENR), state colleges or universities or private research centers or progressive farms located in various parts of the country. They provide facilities and/or sites where adaptive trials or field experiments, such as on-farm trials are undertaken to take into account microenvironment differences. At present, there are various cooperating stations conducting R and D activities on crops, livestock, forestry, farm resources and systems, and socio-economics.

Specialized Agencies. These are institutions with responsibility for a specific commodity or commodity mixes under a given sector, whose involvement in the NARRDN are based on the laws and/or decrees that created them. An example is the DA-Bureau of Agricultural Statistics. Private agencies with research facilities specialized on specific commodity, such as the Twin Rivers Research Center for banana and cacao research are also included.

Regional R and D Complementation Scheme: The Consortia Concept

PCARRD, from the start, has advocated regionalization which involves transferring of authorities as well as laying the foundation for increased regional responsibilities in research management. The consortium arrangement within the NARRDS paved the way for building-up regional capability for research management. This arrangement, designed to optimize use of limited resources among research centers at the regional level, involves a series of satellite institutions around a lead agency. Regional leadership resides in institutions or agencies best qualified to operate the consortia considering their existing manpower, resoarces, and facilities.

The Regional Consortia. As early as 1975, the organization of regional centers and stations into consortia was instituted. That year saw the establishment of the La Granja Agricultural Research Center (LGARC). Three agencies occupying adjacent areas to each other signed a Memorandum of Understanding integrating their operations and agreeing to share their laboratories, farm equipment, and facilities with one another.

Later, other research centers and stations within a given region also entered into consortium arrangements. At present, there are 14 such regional consortia/centers all over the country (Table 1). PCARRD has given substantial support in terms of infrastructure, equipment and manpower build-up, research grants, and annual operational budget to these consortia; and continues to do it until the present time.

As envisioned, a consortium serves as a mechanism for joint planning, coordinating, monitoring, evaluating, and sharing of resources of member-agencies in conducting R and D activities at the regional level. It gives policymakers and researchers greater responsibility in charting the direction of their regional R and D program. With these consortia, the challenge of regional coordination rests heavily on institutions within the region.

Table 1. The 14 regional consortia, their respective base agencies, and the Secretariat.

Region	Consortia	Base Agency	Secretariat
I	Ilocos Agriculture and Resources Research and Development Consortium (ILARRC)	Mariano Marcos State University (MMSU)	MMSU, Batac, Ilocos Norte

Table 1. Continued

Region	Consortia	Base Agency	Secretariat
I	Highland Agriculture and Resources Research and Development Consortium (HARRDEC)	Benguet State University (BSU)	BSU, La Trinidad Benguet
II	Cagayan Valley Agriculture and Resources Research and Development (CVARRD)	Isabela State University (ISU)	ISU, Echague, Isabela
III	Central Luzon Agriculture and Resources Research and Development Consortium (CLARRDEC)	Central Luzon State University (CLSU)	CLSU, Muñoz Nueva Ecija
IV	Southern Tagalog Agriculture and Resources Research an Development Consortium (STARRDEC)	University of the Philippines at Los Baños (UPLB)	UPLB, College, Laguna
V	Bicol Consortium for Agriculture and Resources Research and Development (BICARRD)	Camarines Sur State Agricultural College (CSSAC)	CSSAC, Pili, Camarines Sur
VI	La Granja Agricultural Research Center (LGARC)	Sugar Regulatory Admistration (SRA) - La Granja	SRA, La Granja La Carlota City
VI	Western Visayas Agriculture and Resources Research and Development Consortium (WESVARRDEC)	Department of Agriculture (DA) - Region VI	DA-Region VI, Iloilo City

Table 1. Continued

Region	Consortia	Base Agency	Secretariat
VII	Central Visayas Consortium for Integrated Regional Research and Development (CVCIRRD)	Department of Agriculture - Region VII	Research Management Center, Da-Region VII, Cebu City
VIII	Visayas Coordinated Agricultural Research Program (VICARP)	Visayas State College of Agriculture (ViSCA)	ViSCA, Baybay, Leyte
IX	Western Mindanao Agriculture and Resources Research and Development Consortium (WESMARRDEC)	Department of Agriculture-Region IX	DA-Region IX, Zamboanga City
X	Northern Mindanao Consortium for Agriculture and Resources Research and Development (NOMCARRD)	Central Mindanao University (CMU)	CMU, Musuan, Bukidnon
XI	Southern Mindanao Agriculture and Resources Research and Development Consortium (SMARRDEC)	Department of Agriculture-Region XI	DA-Region XI Davao City
XII	Central Mindanao Agriculture and Resources Research and Development Consortium (CEMARRDEC)	University of Southern Mindanao (USM)	USMARC Kabacan, North Cotabato

Consortia Models. Through time, some consortia have achieved prominence in their own fields. A number of them have developed into self-sustaining, self-operating, and implementing entities that plan and coordinate regional R and D programs and related activities. Models have likewise emerged from the PCA-RRD experience in establishing consortia. These are the center-oriented consortium, program-oriented consortium, non-lead agency consortium, and the lead agency consortium models.

The consortium with a lead agency identifies one of its strongest member-agency to provide leadership, the secretariat, and operational budget. CLARRDEC and others follow this model and is the most common among the 14 existing consortia. The lead agency is the rallying point in establishing this planning and coordinative regional body.

The center-oriented consortium is where the member-agencies occupy adjacent areas as exemplified by LGARC. The physical proximity makes it easier for the consortium members to share their laboratories, farm equipment, and other facilities.

The program-oriented consortium is composed of member-agencies which are geographically scattered in neighboring islands as in the case of VICARP. Although this geographical position may not be conducive to the sharing of physical facilities, it has managed to form a consortium based on coordinated agricultural research and development program in the region.

Organization and Management. A Regional Research and Development Coordinating Committee (RRDCC) provides the leadership and establishes implementing guidelines and policies for mutual sharing of resources among member-agencies of a consortium. The RRDCC is composed of the heads of the member-agencies or their duly authorized representatives. The chairman is elected and in many consortia, the chairmanship is rotated among the members by election every two years.

The Regional Technical Working Group (RTWG), composed of Research Directors and Coordinators of the Consortium's member-agencies, reviews the regional R and D programs and budget for implementation or fund sourcing. The RTWG, headed by the Consortium Coordinator, assists the RRDCC by reviewing and/or recommending guidelines for the development and use of manpower, facilities, and funds related to R and D activities in the region.

The Consortium Coordinator manages the day to day affairs of the consortium and administers the implementation of the policies formulated by the RRDCC. He is assisted by a research management staff in planning and implementing the consortium's activities.

Setting Directions for Research and Development

Setting directions for research is one of PCARRD's primary functions. PCARRD must ensure the formulation of a well-defined national R and D program to be implemented by the national network of research centers and stations. This program serves as framework for all R and D activities in agriculture and natural resources in the Philippines. It spells out the general directions for the various integrated or commodity-oriented program and identifies the priority areas or gaps requiring attention. The program also guides various institutions in formulating activities that are problem and clientele-oriented and would contribute to the overall national as well as regional development goals.

The national R and D program has four major components, namely: a) national R and D goals, b) R and D thrusts of the particular commodity; c) priority areas defining these thrusts; and d) specific R and D projects operationalizing the identified priority areas.

National Research and Development Thrusts (1988-1992)

In formulating the National R and D thrusts for the medium term (1988-1992), PCARRD held consultations with the pertinent departments and other institutions including the private sector. Various sectoral goals and thrusts, as indicated in the national development plan published by NEDA served as basis in formulating the national R and D thrusts for the plan period as follows:

- Profitable production and postproduction environment-sensitive technologies;
- Development, rehabilitation, conservation, utilization, and management of resources and ecosystems;

- Production, processing, storage and distribution systems for seeds, stocks, and planting materials;
- Breeding for better production;
- Biotechnology in production and postproduction systems;
- Integrated and commodity-based approaches towards better food production, nutrition, and balanced ecosystems;
- Effective and efficient technology transfer systems for producers and entrepreneurs;
- Efficient marketing, distribution, and support systems;
- Assessment of policies and formulation of policy recommendation; and
- Support to contingency, high priority, and emergency projects.

These national R and D thrusts are translations of both the national and sectoral goals for agriculture, forestry, and natural resources. These will be further refined during the plan period because they must be dynamic, considering the changing needs of the NARRDN's various clientele groups.

Guides in Setting Priorities

Over the years, the NARRDS has come up/identified priority research areas needing immediate attention. The *Priority Research Areas for CY 1983-1987* was published by PCARRD to provide research centers and stations the information on the bounds within which research activities may be implemented to support national development. It was meant to guide research managers in their formulation of research programs from 1983 to 1987, so that all activities in the national R and D system are coordinated toward the same goals. It provided research administrators, researchers, donors and others with criteria against which to judge the relevance, timeliness, and worth of proposed research and development activities. These priority areas were based on 36 commodities covering the following sectors: crops, livestock, fisheries, forestry, mines, farm resources and systems, and socioeconomics.

The *PCARRD CORPLAN I for 1984-1988* indicated the 14 priority program areas for commodities, such as carabao, aquaculture, citrus, marine fisheries, cotton, agroforestry, small-scale mining, farming systems, research extension linkages, community organizations, maize, wheat, medicinal plants, and agricultural policies. This CORPLAN embodied commodity directional research plans, spelling out the thrusts, strategies, and resources to implement the plans.

The PCARRD CORPLAN II for 1988-1992 is being prepared and will be based on the thrusts as already discussed, the analysis of CORPLAN I for the first plan period and the result of various consultations already conducted.

Some Lessons Learned and Relevant Issues

Significant developments during the past 15 years have illustrated how the national R and D system has progressed. We have made remarkable strides in terms of improved infrastructures and facilities for research, well-trained researchers, and relevant R and D programs.

Moreover, the NARRDN on the whole has consistently worked to strike up smooth working relationship among themselves in order to complement each other's strengths.

However, limited funding for R and D projects and research-related activities has remained a persistent problem. Several studies have pointed out that the Philippines spends far less on agricultural research than other countries in Asia. Research expenditures had traditionally been pegged below 0.2% of the gross value added (GVA) in agriculture and natural resources. The usual reason is the scarcity of government resources and stiff competition with other government priority programs.

There is a need for increased funding in R and D in view of the high priority which the government gives to agriculture and natural resources, and the need to generate new and appropriate technologies to increase farm profitability and productivity. Underfunding of R and D places us in a situation where we cannot sustain the momentum which we already gained. Thus, external assistance for some priority programs have to be sought to ease budget pressures.

R and D is not the cure-all for all problems that impede agricultural and rural development in the Philippines, in the same way that agriculture alone cannot solve all the economic ills of the country. Other sectors (extension, credit, irrigation, marketing, and others) have to play their complementary roles. The effectiveness of other support services will greatly contribute in making the NARRDS a more efficient and effective instrument for national development.

One area where PCARRD has drawn valuable lessons is in regional research management. PCARRD has committed itself to regionalization by institutionalizing research management within the regional R and D consortia. Regional centers and consortia are given increasing responsibilities in exercising initiatives, making decisions, and taking actions as regards regional R and D activities. More importantly, they have been given a larger degree of flexibility in implementing R and D programs. Through consultations, researchers and scientists in the field who are in close consultation with farmers and other clientele groups have been involved in setting R and D priorities and plans.

PCARRD experience showed that by building the capacity of the regions to plan and implement R and D, the regionalization process can be greatly accelerated. By unifying and strengthening the regional centers and consortium, implementation of impact programs is assured. Thus, national goals in agriculture and natural resources can be attained with regional cooperation and initiatives, and increase in the capacity at the regional level to implement R and D programs.

PCARRD, as it looks to the future, is modest about its achievements, but it takes pride in the lessons learned. We do not claim that changes or improvements have taken place because of PCARRD but rather the NARRDS and PCARRD together, have charted the directions of agriculture and natural resources R and D in the Philippines. We also consider the lessons of past experiences important to guide us in drawing up guidelines for the future; and the future of agriculture and natural resources sectors will very much depend on the vitality, capacity, and leadership of present R and D leaders.

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Enhancing Research and Development in the Department of Agriculture

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Defining Research and Development Priorities in the DA

The national policies and priorities in agricultural research are determined by the PCARRD Governing Council, in which the Department of Agriculture (DA) is represented in by an Undersecretary. In the DA, on the other hand, these are formulated by the Research Advisory Committee (RAC) with the assistance of BAR which recommends these policies and priorities to the Secretary of Agriculture for approval.

The RAC is chaired by the Assistant Secretary for Research, Training and Extension, with the BAR Director as Vice Chairman and the BAR Assistant Director as the Ex-Officio Secretary. The members of the Committee are: the Bureau Directors, Director of the Agricultural Training Institute (ATI), one DA Regional Director (by rotation), one representative from the nongovernment organizations (NGO's), one representative from the attached agencies, and six representatives from farmers' organizations which may be drawn out from the pool of RAFC Chairmen.

Pre-RAC Research Priorities

The RAC is a newly created body and began to function only in 1988. Until 1982, most researches were on project, single-commodity basis, and more dominantly on basic research. With the advent of projects such as the Agricultural Support Services

Project (ASSP), the Farming System Development Project in Eastern Visayas, the Rainfed Agriculture Development Project (Iloilo), and the Rainfed Resources Development Project, researches shifted to the program-type. Research activities were pursued from generation to regional adaptation, verification and, eventually, dissemination.

Prioritization Scheme for 1983-1987

Research policy in the past up to 1982 generally followed broad policies in agriculture, but there were no specific guidelines as to how research resources were to be allocated. Rationalization, of the setting of priorities took form in 1983 to 1987 when research priorities were determined based on the major thrusts of the National Research Program in Agriculture and Natural Resources as developed by PCARRD. These were:

- Development of energy sources and alternatives;
- Self-sufficiency in food and better nutrition;
- Development of export products and import substitutes;
- Improvement of the social and economic well-being of the people; and
- Environmental and ecological conservation.

The research priorities which PCARRD came out with was by commodity. The research program for the crops sector included coconut; corn and sorghum; plantation crops (rubber, coffee, cacao, and oil plam); tobacco; sugarcane; fiber crops (abaca and cotton); ornamentals and medicinal crops; rootcrops; rice, wheat, and other cereal grains; fruit crops; and vegetable crops.

Seven priorities were listed for the livestock sector. These were: forage, pasture and grasslands; carabeef; beef/chevon; dairy; swine; and poultry.

Under the fisheries research program were three broad commodity priorities, namely: marine fisheries; aquaculture; and inland waters. Research on farm resources and systems included soil and water resources, development of marginal areas, and protection of the environment. Socioeconomic research cuts across all research commodity sectors and included rural sociology and macroeconomics.

The priority commodities were further stratified into priority research areas ranked into Priority I, Priority II, and so on. These priority areas were not necessarily the same for all of the commodities under particular sectors but, rather, were identified based on the urgency and the extent of problems needing attention.

Current Trends in DA Research Prioritization

Priority setting in the DA is still rather fluid as the DA, through RAC and BAR, is still in the process of finalizing the National Research and Extension Agenda (NAREA). This agenda, which will be the embodiment of research priorities for the next five years, will be used not only by the DA's Research System but also by the National Research System.

With the change of national leadership in 1986, most senior officials in the Department were replaced. This led to a major rethinking of past policies and priorities in DA activities including research. It was decided that DA should come up with a Five-Year Program of Action.

In mid-1986, a taskforce on Research and Extension was convened to provide the then Minister of Agriculture an assessment of research and extension situation and their recommendations. Based from their recommendations, the DA identified its research priorities in the medium term (1988-1992). Although these were formulated under the two major goals of the DA, which are equity and economic recovery, these research priorities kept close to the following R and D thrusts jointly established by PCARRD, DA-BAR, and the DENR-Ecosystems Research and Development Bureau (ERDB):

- Profitable production and postproduction environment sensitive technologies;
- Development, rehabilitation, conservation, utilization, and management of resources and ecosystem;
- Production, processing, storage, and distribution system for seeds, stocks, and planting materials;
- Breeding and management systems for better production;
- Biotechnology in production and postproduction systems;
- Integrated and commodity-based approaches towards

better food production and nutrition and balanced ecosystems;
- Efficient and effective technology transfer systems for producers;
- Efficient marketing, distribution, and support systems;
- Assessment of plans, programs and policies, and formulation of appropriate policy recommendations; and
- Support for emergency projects.

The medium-term research and extension priorities for agriculture recommended by the taskforce are as follows:

- Farmer-focused socioeconomic research;
- Better upland rice varieties, rice-based multiple cropping, and postharvest technologies;
- Use of open-pollinated corn varieties;
- Breeds suitable to tropical condition and backyard processing;
- High-yielding coconut varieties, production diversification, and on-farm processing;
- Product diversification for sugar.
- For fibers; sericulture technologies, pest-resistant cotton varieties, better varieties and processing technologies for ramie and abaca;
- Postharvest and processing technologies for fishery products; and
- For fruits: pest management, postharvest handling and processing technologies; export market research.

These priorities aim to generate technologies that would help sustain and improve the country's agricultural production base.

The characteristics and focus of the research agenda are expressed in the acronym "WELFARE".

W = Wise and efficient utilization and management of agricultural resources and systems.

E = Environmentally-sensitive and resource conservation-oriented farming system.

L = Low-cost but sustainable farming systems.

F = Farming-oriented problems, farmer participation, and community mobilization.

A = Areas of priority development which include rainfed lowlands, uplands, hillylands, coastal, and plains.

R = Resource-poor and subsistence farmers/fishermen as prime targets.

E = Economic returns or profitability for the farmer.

The National Research and Extension Agenda (NAREA)

One factor that limits research and extension is the inadequacy of resources for research programs and activities. Public investments in these areas are relatively low in proportion to the contribution of agriculture to the economy (0.2% of the Gross Value Added by agriculture). Compounding this is the inefficient use of the already scarce resources.

Through the coordination of BAR, DA has come up with the initial draft of Five-Year National Research and Extension Agenda which will guide research and extension workers in determining future directions and policies in research and extension (R and E).

The NAREA is not an exclusive DA output. It is the embodiment of research priorities for the next five years, as determined by researchers and by the intended users and beneficiaries of research results. It was arrived at through a series of consultations, which BAR carried out in all regions during the last quarter of 1987. The important feature of these consultations was the multisectoral and interdisciplinary nature of the participants. Thus, this corrected the earlier approach used in the identification of research and extension priorities by the Taskforce on R and E, which made recommendations without the involvement of farmers, extension workers, and DA line officials.

Essentially, the NAREA is a summary of regional priorities.

Priority Areas for Research and Development

Under the NAREA, R and D activities are prioritized at four levels:

- By development zone;

- By commodity sector within each development zone;
- By commodities within a specific sector; and
- By priority research problems within community.

These are further stratified according to the level of R and D activities that are to be done under each development zone. Prioritization is based also on the area and population of the development zones, marketability of products, and the available technologies in the development zones. However, this priority scheme has to be validated by the DA regional officers and then approved by the DA's Research Advisory Committee.

Priority Development Zone

Seven priority areas have been identified in the Agenda. For the land resources, the development zones, which ranked in descending order of importance, are the hillylands, upland plains, lowland rainfed, and lowland irrigated.

A hillyland is described as an area of at least 1 km^2 (100 ha), of which 70% of the land forms have more than 15^{o} slope gradient [or a maximum of 30% of the land forms have less than 15^{o} slope gradient and with no contiguous level ($\angle 15^{o}$) of more than 10 ha]. The upland zone refers to the *upland plain or a* contiguous level area with a maximum 30% of the land forms having more than 15^{o} slope. A lowland rainfed area is a contiguous level area with no source of irrigation water. The lowland irrigated, as the name implies, is a contiguous level area which is supplied with irrigation water.

For the water resources, the priority development zones which also ranked in descending order of importance, are the marine areas, freshwater areas, and brackish waters. The marine zone is composed of salt water areas or areas in the sea. Freshwater areas are bodies of water including water impoundments not connected to the sea with a zero salinity. The brackish water zone pertains to areas, the water of which is a mixture of salt and freshwater including the estuarines.

Priority Commodity Sectors

The NAREA in its final form will present priorities according to commodity sector under each development zone. The three top priority sectors are crops, livestock, and farm resources and systems in that order.

Priority Commodities by Commodity Sector

Under each priority commodity sector, particular commodities will be accorded priority status; however, this is still the subject of deliberations.

Priority Research Problems

The overriding problems of agricultural production are low productivity and depressed farm incomes. Their major causes have been identified in the NAREA as the following:

- Poor production management practices/limited production technology;
- Lack of adaptable varieties/breeds and seeds/fry stocks;
- Inefficient marketing system;
- Limited processing, utilization, handling, and quality control techniques;
- High cost of production inputs, tools, and equipment;
- Limited support services/facilities and infrastructure;
- Soil degradation resulting from soil erosion, excessive cropping, improper use of fertilizer;
- Inadequate crop and animal nutrition;
- Pests and diseases;
- Inadequate credit/capital; and
- Inability to utilize marine resources to their full capacity.

Research activities will cover Technology Generation (TG), Technology Adaptation (TA) and Technology Verification (TV). The major problem areas identified in the crop sector are: poor quality of the product; poor marketing system; lack of breeding stocks/materials; and lack of production capital.

For the livestock sector, attention will be focused on lack of adaptable breeds of animals; poor feeding management; inadequate funds; and high cost of feeds.

In the farm resources and systems sector, the problem on soils is of prime concern. Other researchable areas include socio-economics and postproduction activities.

Technology Dissemination (TD) in the R and E Agenda

The TD aspects of the agenda will largely cover mature technologies already being disseminated and those ready for inclusion into the extension program of the DA. The mature technologies identified for the land resources are those on crops, livestock, and farm resources and systems sectors (for the hillylands, uplands, and lowlands). For the water resources, some mature technologies identified for TD include: particular areas in production technology, formation of cooperatives, fish processing, artifi reef construction, and ecosystem management.

Allied Priority Concerns

Under the NAREA, priorities for R and E will be set to help the government and the DA, in particular, to truly provide for the needs of the small farmers. However, this can only be achieved if attention is also given to the other factors, such as:

- The adequacy of resources to support research programs;
- Improved planning and evaluation systems institutionalizing in DA the bottom-up approach;
- The degree of motivation, level of knowledge, and mobility of our researchers and extension workers;
- A farmer and community-based extension and research linkage (E-R);
- Participation of farmers and the private sector in the identification and prioritization of research needs;
- Reorientation of field personnel on farmer- and community-based approaches for DA activities such as the farming systems approach;
- The establishment of an accurate and timely feedback mechanism for research; and
- The enhancement of the utilization of research results/outputs;
- The putting up of a workable data management systems.

The Research and Development Network in the Department of Agriculture

Rationale for a DA Research Network

The utility of established research priorities are only as good as the research system which will translate these into real terms. This was the major consideration of DA in its decision to put up its own research system. While there exists an overall National Research System, this caters to the priorities established by PCARRD and not necessarily those of the DA.

The establishment of PCARRD has been a very positive factor in planning national research strategies, evolving priorities. and in coordinating research efforts of different agencies and institutions. Hence, PCARRD's main role has largely been in the area of priority setting, planning, research coordination, and in screening and supporting projects proposed by researchers PCARRD organized national network of research centers and regional consortia of experiment stations, all of which continue to be managed by their respective agencies.

However, since PCARRD does not conduct research, it could not be held responsible if the flow of technology is not adequate or a serious outbreak of a pest or disease occurs which requires emergency research attention. PCARRD, therefore, faces a serious limitation since it cannot respond to downstream research needs in the form of well-defined and integrated multidisciplinary research program at the field level.

The state of the National Research System must be also seen from another perspective. We should now take a longer term view of the system as it should evolve for the future. Under the system, the responsibility for most of the research work, more particularly for advanced research relating to technology generation was accorded to universities and colleges for agriculture, relegating adaptive and extension-type of research for the DA. In the next ten years or so, much of the technological support for the development of the country's agriculture will continue to come from state colleges and universities (SCUs). However, it is not safe to presume that an effective research system should continue to be built around them. Their mandate might change with time and the research station of the DA should be allowed to evolve as viable partners in the process of technology generation. It would be advantageous to the SCUs to move more and more into areas of strategic research while the major part of applied research or technology generation be assumed by the DA's research function. We should remember that DA is in charge of the country's extension efforts. Many of the problems in technology transfer would be easier to solve if the DA were directly involved in the process of technology generation.

Components of the Network

As its response to current and future research expectation, the DA has started establishing its own research system through Executive Order No. 116 and the favorable policies of the present DA administration.

The DA has a long history of research activities in agriculture, far longer than any other agency. Over this long period, the Department has built more than 50 experiment stations. These stations were formerly administered under particular bureaus but with DA's reorganization, majority of these are now under the DA regional office. It would be a waste of earlier investment if these stations should now lose the momentum of their work and fail to develop to their full potential. Their roles have to be clarified in the light of current changes in the DA.

Presently under the DA are a number of commodity institutes. The issuance of E.O. 116 placed under the DA umbrella attached agencies such as the PCA, SRA, NFA, PhilRice, NAPHIRE, FIDA, NIA, and the Philippine department of SEAFDEC. This development opens the opportunity to implement rationalized research programs running across commodities both those falling within and outside the DA's earlier commodity coverage.

The DA bureaus, although leaner will continue to perform important research tasks. Eventually, they are envisioned to have at least one station or more, each developed to the level of national research centers.

The Regional Integrated Agricultural Research System (RIARS) was established in every DA regional office during the first reorganization of the DA in 1982. Its main functions are the conduct of adaptation and verification trials for products of applied research considered promising in actual farmers' fields with at least one site per province. We now have a network of about 120 Provincial Technology Verification Teams.

Initial Assignments

The DA research offices/units of agencies previously mentioned have been organized along the lines of the flow of technology. Technology generation involves the bureaus' national or central research stations and attached agencies. The Bureau of Plant Industry currently has four, namely: Davao Experiment Station (Davao City) for fruit research, Baguio-Buguias Experiment Station (Benguet) for semi-temperate crops, La Granja Experiment Station (Negros Occidental) for field crops, and Economic Garden (Laguna) for vegetable and legume crops. The Bureau of Soils and Water Management will be operating its central soils laboratory in Buenavista, Bulacan and Tanay, Rizal where soils and water management and related studies are undertaken. The other bureaus, BFAR and BAI, are still identifying stations which will be upgraded into National Research Centers.

At the technology adaptation level, the bureaus will make contributions particularly to the regions/provinces where they are located. However, this will be taken up more by the research stations and research units of the DA regional offices, through the operations of the regional stations.

For technology verification, RIARS will assume the responsibility. This formerly *ad-hoc* creation is now being institutionalized in the DA regional offices. The RIARS covers both technology adaptation and verification in the regions, and serves as the nucleus of the regional research system with the regional research stations as its satellite units. Technology verification will continue to be implemented through the operations of PTVT's begun by ARO in 1982. The PTVT's capabilities will be strengthened with the establishment of more PTVT sites in the provinces and expansion of the team composition for PTVT workers.

The Research System's Growth Pains

We now have the rudimentary form of a research system and it will take some time to develop its full potential. Most of these components are still recovering from "transplanting shock," so to speak. The attached agencies have yet to learn how to function under DA's general administration; the regional offices have to cope with increasing research responsibilities. The bureaus, which have been deprived of their line functions in the field having been transformed into staff bureaus, must now strive for higher levels of research. The BAR itself is a revitalized and institutionalized ARO which used to be limited to the coordination of verificaton trials and extension-geared researches.

The components of the network have not been integrated as a unified body as yet. Areas of concern include the regional research structure and relations, with attached agencies particularly those which have developed different management systems and organizations. Attention should also be devoted on how BAR's coordinative function should be fully brought to line. In addition, the complimentation among the bureaus, the attached agencies, the regional offices, and other DA offices must be clarified to promote maximum DA efficiency in research activities. Hopefully, all these will be firmly established within the next few months.

DENR's Research and Development Programs, Thrust, and Priorities: A Response to the Government's People-Powered Development for Economic Recovery

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Introduction

Executive Order No. 192, otherwise known as the "Reorganization Act of the Department of Environment and Natural Resources" brought a radical shift in the Department's functions and structure. It has a new mission, "to conserve, manage, develop, and promote the judicious use of the country's natural resources; and to ensure the equitable sharing of the benefits to be derived therefrom, as well as to protect the environment and develop an effective environmental management system for the welfare of present and future generation of Filipinos."

The act brought about the regionalization of the Department so that it can respond better to the needs/problems of each region.

DENR has 13 regional offices, each composed of five sectors: forestry, lands, mines and geo-sciences, ecosystems research and development, and protected areas, and environmental management. The Department also has six staff bureaus, namely: Land Management Bureau (LMB), Forest Management Bureau (FMB); Bureau of Mines and Geo-physical Sciences (BMGS), Environmental Management Bureau (EMB), Protected Areas and Wildlife Bureau (PAWB); and the Ecosystems Research and Development Bureau (ERDB). The DENR R and D set-up is presented in Figure I.

Crucial Issues/Problems on Natural Resources and Environmental Management

DENR recognizes several natural resources problems and environmental issues which serve as bases in identifying the various priority thrusts and major concerns of the Department. These are as follows:

Resource/Environmental Degradation

It was estimated that presently, there are 6.5 million ha of open and denuded forest lands which need immediate rehabilitation and revegetation. The remaining old growth or virgin forest which is the source of commercial timber is only 1.2 million ha.

The average annual rate of reforestation based on the 1981-85 statistics barely reached 55,000 ha as compared to the average annual forest loss of 83,000 ha due to forest fire, kaingin, pest and diseases, and logging.

The inadequate reforestation and the fast rate of forest denudation resulted in accelerated soil erosion and siltation, adversely affecting agriculture and marine production. About 60% of alienable and disposable lands suffer severe erosion. Likewise, mine tailings (estimated at 72.3 DMT in 1985) cause damage to land and water resources.

Of the country's 1,075 bird and animal forms, there are at least 18 wildlife species that have been endangered due to overcapture and destruction of their wildlife habitat. These include the world-famous Philippine Eagle, tamaraw, dugong, Philippine crocodile, and monitor lizard.

In addition, there is presently a worsening problem of air

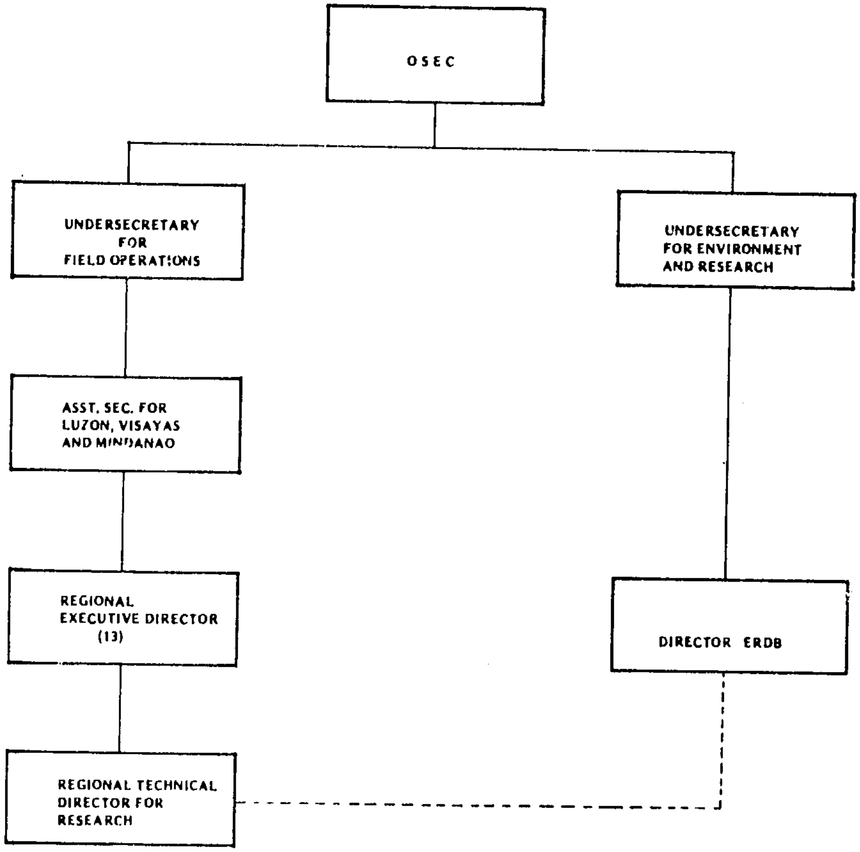

Fig. 1. DENR R and D set-up.

and water pollution due to the increasing presence of toxic and hazardous substances in the environment.

Poverty in the Uplands and Continuous Influx of Migrant from the Lowlands

There are about 14 to 16 million people living in the uplands. Of the estimated population, 3-5 million are occupying areas within the forest lands.

The increase in the upland population can be attributed to the higher population growth rate, estimated at 2.55% and the migration of lowlanders to the upland areas. Migrant population is estimated at 29% of total upland population.

The income of an average upland farmer is ₱3,000/annum. which is way below the poverty line.

Tenurial Problems

The dislocation of original settlers including tribal communities from their ancestral lands due to past releases of vast tracts of land for agro-industrial projects by private and multinational corporations including government projects has contributed to the social unrest in the countryside.

Relative to this problem are the limited coverage of the Integrated Social Forestry Program (ISFP), the slow process of providing tenure, and the refusal of some settlers including the minorities to accept stewardship contracts.

In mining, most small-scale miners especially the gold panners are illegal operators because most gold deposits are already covered by valid mineral, timber, and agricultural rights.

Rationalization of Forest-based Industries

The basic problems in rationalizing forest-based industries are a) the diminishing supply of raw materials, b) passe and uneconomic wood processing technology, c) high production costs, d) low quality of and limited markets for our processed wood products, and e) lack of government incentives for forest-based industries.

Efficiency, Effectiveness, and Honesty in Natural Resource and Environmental Administration

Reports of graft and corruption among its ranks, inefficiency in the delivery of its services and inability to enforce natural resources ordinances have greatly debased the Department of Environment and Natural Resources which in turn have demoralized committed and well-intentioned officials and employees.

DENR Priority Concerns

In response to the Natural Resources issues presented, the Department listed the following priorities:

- Upliftment of the socioeconomic condition of upland dwellers, small-scale miners, and other natural resource-dependent communities;

- Promotion of equitable access to natural resources;
- Promotion of sustainable natural resource development through conservation of existing resources and accelerated renewal and rehabilitation of degraded resources;
- Development of an effective environmental management system;
- Rationalization and development of natural resource-based industries;
- Acceleration of research and improvement of natural resource information generation and dissemination; and
- Improvement of efficiency, honesty, and integrity in public service.

DENR Research and Development Programs/Thrusts

DENR's major concerns are to accelerate research and develop the technology on managing the Philippine ecosystems and natural resources. In this regard and pursuant to Executive Order No. 192, the Ecosystems Research and Development Bureau (ERDB) was created with a mandate to backstop the development program of DENR through researches on conservation, regulation, and proper use of the country's ecosystem and natural resources, store all research outputs and promote the dissemination and utilization of research results to various clienteles; and coordinate all researches undertaken by DENR regional units.

Likewise, in the regions, the Ecosystems Research and Development Sector undertakes researches on specific and prioritized areas of investigation.

Under this new set-up, research on natural resources and environment is being realigned using the "ecosystems concept/approach" considering PCARRD's research and development thrust for 1988-1992, which is based on the National Economic and Development Authority's thrust (Appendix A). The ecosystems to be studied shall include forests, uplands, grasslands, degraded areas, coastal areas, and freshwater zones.

While an Integrated Research and Development framework is still in preparation based on the output of the Regional Research and Development Consultation Workshop, the R and D activities of ERDB shall focus on areas presented in Appendix B.

DENR Research and Development Network

The regionalization of the Department as per Executive Order No. 192 has brought a significant change in the R and D Network. The research centers of the former Forest Research Institute were integrated in the regional offices and named as Ecosystems Research and Development Sector of DENR Regional Office (Appendix C). This sector is headed by a Regional Technical Director for Research who is under the Regional Executive Director.

Coordinating the regional research activities is ERDB based at Los Baños which, as per E.O. No. 192, is considered both a staff and line bureau.

Status of the R and D Network

The implementation of the reorganization plan of the DENR is underway. Regional Technical Directors including that of the Ecosystems Research and Development Sector, have just been appointed. Next, the staffing of the regional office will be tackled. Afterwhich, infrastructure and facilities development will be attended to.

The ERDB will absorb the staff of the FORI at the Central Office. They will be joined by the personnel of the National Mangrove Committee. As of now, the ERDB has conducted three regional consultation workshops to formulate national integrated R and D activities. The workshops will be held in all regions.

It is with high hope that the new R and D network and ERDB organizational set-up can provide the DENR and the other target clienteles the necessary information and technology for rational use, development, and management of the Philippine ecosystems and natural resources.

APPENDIX A

Research and Development Thrusts in Agriculture Forestry and Natural Resources (1988-1992)*

I Profitable production and postproduction environment-sensitive technologies

Focus

1. Development and improvement of existing production systems for crops, livestock, forestry, and fisheries
2. Development and improvement of postproduction and utilization techniques for crops, livestock, forestry, and fisheries
3. Development and improvement of tools, equipment, machineries, and structures
4. Utilization of indigenous plants with medicinal/pesticidal properties in crop and animal production systems
5. Economics of production

II Development, rehabilitation, conservation, utilization, and management of resources and ecosystems

Focus

1. Design and construction of structures which will control soil erosion and conserve water
2. Management of problem soils
3. Techniques/methods for regulating harvesting and extraction of resources
4. Agroclimatic studies/data base on resource management, utilization, and conservation
5. Pollution and environmental quality

*Identified by PCARRD in consultation with sectoral bureaus/agencies; primarily based on NEDA's Thrusts.

6. Management, conservation, utilization of fishery and forestry resources
7. Conservation and improvement of indigenous farm animals

III. Production, processing, storage, and distribution systems for seeds, stocks, and planting materials

Focus

1. Hatchery management (fisheries)
2. Improvement of seeds and other planting materials for production, processing, storage, and distribution

IV. Breeding and management systems for better production

Focus

1. Varietal improvement for high yield, stress tolerance, pest and disease resistance, adaptability, and better quality
2. Breeding and reproductive physiology studies

V. Biotechnology in production and postproduction systems

Focus

1. Biocontrol of insect pests using predator insects, microorganisms, etc.
2. Utilization of fertilizer supplement (rhizobia, mycorrhizae, trichoderma)
3. Alternative sources of energy
4. Tissue culture

VI. Integrated and community-based approaches towards better food production and nutrition and balanced ecosystems

Focus

1. Piloting mature technologies appropriate for the regions

2. Institutional development studies

VII. Effective and efficient technology transfer systems for producers and entrepreneurs

Focus

1. Evaluation and development of technology delivery models
2. Dynamics and processes of technology transfer and adoption
3. Communication technologies for extension activities
4. Cooperation, complementation, and other linkages of various agencies in the planning and implementation and management of technology transfer strategies/programs

VIII Efficient marketing, distribution, and support systems

Focus

1. Marketing
2. Competitiveness and comparative advantage of Philippine products in international market
3. Studies on rural credit schemes
4. Rural institutions
5. Rural infrastructures

IX. Assessment of policies and formulation of policy recommendations

Focus

1. Policy research on major development programs, e.g. agrarian reforms, extension-education, food and nutrition, rural credit, trade, resource allocation,

agricultural diversification, and infrastructure

2. Redistributive impact of social development programs/policies in alleviating poverty
3. Impact of national policies on regional development
4. Results of data base studies which will have direct bearing on policies and programs

X. Support to emergency projects

Establishing a National Research and Development Network: The Case of VICARP

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Introduction

The Visayas Coordinated Agricultural Research Program (VICARP), located at the Visayas State College of Agriculture (ViSCA) constitutes one of the regional consortia of the Network of Research Centers in Agriculture and Natural Resources developed through the leadership of PCARRD. Like other regional consortia, it aims to develop regional leadership in agricultural research program planning and coordination.

VICARP recognizes that there exist various institutions and agencies governed by different administrative structures in Region VIII that are involved in agricultural and natural resources R and D. Linkage should be established among these different agencies through a consortium to optimally utilize their resources in response to the problems of the region.

VICARP was established in 1978 with the organization of the Research Consortium Coordinating Committee (RCCC), with the ViSCA President as chairman, PCARRD Deputy Director General for Programs and Operations as vice-chairman, and the directors of the Bureau of Plant Industry and Bureau of Animal Industry of Central and Eastern Visayas as members. With the reorganization of the Department of Agriculture (DA) in 1979, the composition of the committee included the DA regional directors. To ensure better coordination with newly-created offices in the region. especially during the mid-1980s, the RCCC of VICARP gained the membership of regional directors of NEDA, DOST, and DENR.

Functions of the VICARP RCCC

As with other RCCC's, the functions of the committee, as defined by PCARRD (Valmayor, 1985) include the following:

- Lays down broad policies, guidelines, and plans for the agriculture and resources research program of the region;
- Reviews and approves the research program of VICARP which is the basis for identifying research projects and specific studies to be undertaken by the consortium research staff;
- Reviews and approves budget for research program;
- Formulates policies and plans related to the dissemination of useful research information through publications, workshops, seminars, symposia and other means of communication; and
- Devises ways and means of improving research capability of the centers and cooperating stations of the region, through the acquisition of better equipment and infrastructure, staff development, and provisions for incentives.

Accomplishments and Problems

The RCCC meets every quarter of the year to assess the progress of agricultural and natural resources research in the region. Priorities are constantly updated as the need arises in the region. Research programs of member institutions are examined for relevance and possible duplications; and problems on research implementation are discussed to find ways of solving them. Since the major research activity in the region is carried out by ViSCA, it follows that the RCCC's review process focuses mainly on the program of the College and, to a lesser extent, that of DA and DENR.

Perhaps the most important activity of the RCCC is the annual integrated review which allows researchers to interact with farmers and PCARRD-appointed external evaluators regarding assessment of research projects. This activity has led to spin-off projects, in spite of limited funding from such regional offices as DOST. In addition, the consortium publishes VICARP News, a quarterly publication on the R and D activities of the region including significant research results.

Dr. E. A. Bernardo who headed the RCCC until 1984 commented: "Research projects in the region were still determined and funded by the Ministry of Agriculture in Manila." This clearly pointed to the futility of efforts toward coordination unless resources are, to some extent, within the control of the coordinating body. This lack of power by the RCCC to allocate funds for collaborative regional projects has been a source of frustrations among its members.

The committee also realized that RCCC faces structural problems. It has been given tremendous responsibility without corresponding authority, thus, its ability to achieve the goals set for the consortium is severely constrained.

Looking at the Future

The regional meetings of the RCCC have provided opportunities for the member agencies to understand each other's missions and obligations and to appreciate each other's constraints. The free flow of communication has led to good personal chemistry among the agency heads; thus, the search for creative ways to strengthen the capability and effectiveness of the network.

These include:

- Building institutional capability through staff interchange and training. The consortium is conscious of the tremendous pay-off of detailing highly competent university staff in either DA or DENR and bringing to the university outstanding DA-DENR extensionists/researchers to teach or undertake research.
- Strengthening of the Regional Applied Communication Unit (RACU), the communication arm of VICARP, to enable the consortium to produce regionally-focused

communication materials to speed up the dissemination and utilization of technologies generated in the region.

- Linking university research to DA/DENR extension work by building into the overall project support for downstream activities in R and E to be conducted by DA/DENR.

These activities will have to be initially funded from funds generated from external sources; thus, its long-term sustainability is in question. The hope of VICARP is that these activities be institutionalized and later serve as a model for other regions.

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Managing the National Agriculture and Resources Research and Development System

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Introduction

The Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) is mandated to coordinate and manage the activities of the National Agriculture and Resources Research and Development Systems (NARRDS). In line with this mandate, PCARRD exercises two vital powers, namely: 1) the authority to review all research proposals in agriculture, forestry and natural resources; and 2) the authority to recommend to the Department of Budget and Management (DBM) all proposals and ongoing projects that deserve funding. To operationalize these powers, PCARRD has evolved, through the years, a system for planning, monitoring, and evaluation of researches. It has developed fund generation strategies to support research and development (R and D) activities in the country. It has also formulated policies and procedures on research operations through constant consultations with researchers and research administiators. These policies and procedures are meant to safeguard investments in R and D and are updated periodically considering new developments in the environment as they affect research management in agriculture and natural resources.

Program Planning Cycle and the Budget Process

PCARRD's program planning cycle involves two major phases: Phase A or Program Formulation and Phase B or Program Implementation. Phase A begins with the preparation of the regional R and D plans and programs. It ends when PCARRD's Governing Council (GC) approves and endorses to the DBM for fund allocation the national and regional R and D programs for Agriculture, Forestry and Natural Resources. After this, Phase B activities start. Phase B ends when the projects are implemented.

The steps in the planning process are synchronized with the national budget cycle as prescribed by the DBM, so that all necessary budget recommendations for R and D are considered in the national budget. Relationships of these two processes shall be discussed later in this paper.

The following are the activities in the program planning cycle of PCARRD:

Phase A – Program Formulation

- **Studying the environment** R and D program planning starts with the analysis of factors in the environment relevant to the R and D programs. Important considerations are the laws, policies, and procedures of the government as well as the Philippine Development Plan, and sectoral plans of the Department of Agriculture (DA), Department of Environment and Natural Resources (DENR), Department of Science and Technology (DOST), and other line agencies related to agriculture, forestry and natural resources.

- **Setting priorities** – PCARRD's primary function is to set priorities for R and D. With established priorities, the limited resources of the NARRDS are directed towards R and D undertakings which are problem-oriented and geared towards the achievement of national as well as regional development goals. The factors considered in identifying these priorities include:

- o National development goals/thrusts as indicated in the Philippine Development Plan;

- o Sectoral goals/thrusts of DA, DENR, DOST, Department of Agrarian Reform (DAR), and Department of Education, Culture, and Sports (DECS);

- o Priority areas of commodities in agriculture, forestry, and natural resources; and

- o Output of regional and provincial consultations.

- **Defining objectives and plans** – PCARRD defines R and D program thrusts and agenda for the medium term based on national and regional consultations, analysis of the environment and the Philippine Development Plan which are further translated into sectoral goals and thrusts of DA, DENR, and DOST. The national R and D program thrusts identified for the medium term (1988-1992) which provide immediate support to R and D are indicated in PCARRD's CORPLAN II and cited on the previous paper on "Building the Philippine Research and Development System in Agriculture and Natural Resources."

- **Identifying R and D Projects for Implementation**

  - o **New Projects.** Within the framework of the national and regional R and D programs, member-agencies of the NARRDS prepare and submit to PCARRD capsulized research proposals for the first level evaluation. During this evaluation, proposals are reviewed in terms of: likely contribution and relevance to the national and regional R and D thrusts, priority of the research area, possible duplication with ongoing or completed researches, and soundness of methodology in attaining stated objectives and other technical aspects.

- **Ongoing Projects.** The results of the Agency In-house Reviews, field visits and review of progress reports are the bases in determining which ongoing projects deserve to be continued in the succeeding year. PCARRD endorses the next year's budget for these projects to DBM for fund allocation based on integrated programs that cut across sectors, disciplines, and agencies.

- **Inclusion of R and D Projects in the National and Regional R and D Plan and Budget.** Budgetary requirements of ongoing projects and those of approved proposals are included in the National and Regional Agriculture and Resources Research and Development Program (NRARRDP). The NRARRDP is packaged with the assistance from the National and Regional R and D Commodity Teams and reviewed by PCARRD's Directors' Council. It serves as the basic guideline for all research and development activities in agriculture and natural resources and represents the outcome of the evaluation of research proposals and regional review of ongoing projects.

- **Recommendation and Presentation to DBM.** PCARRD's Technical Advisory Committee (TAC) prior to approval of its Governing Council (GC) reviews the NRARRDP. If the GC approves it, the DOST Secretary endorses the program to DBM for fund allocation.

Phase B – Program Implementation

- **Technical Appraisal of Research and Development Proposals**

  - **New Projects.** Research leaders, through agency heads/research directors and consortium coordinators, submit detailed R and D proposals to PCARRD for final evaluation. Initial evaluation of these proposals is done by PCARRD's Technical Research Divisions assisted by the National Commodity R and D Teams. Detailed proposals are reviewed en-banc or by referral on the basis of the following:

    – non-duplication with completed or ongoing projects;

- adequacy, clarity, and attainability of objectives;
- soundness of methodology as it relates to objectives;
- workability of task schedules based on methodology;
- reasonability of budget estimates relative to scope of work; and
- availability and capability of researchers.

o **Ongoing Projects.** As in Phase A, progress of ongoing projects are reviewed during the Agency In-house Reviews and field visits. During these reviews, a panel of external experts evaluates the progress of the project and assists in identifying the status of technologies.

• **Reprogramming and Release of R and D Budget:** PCARRD conducts a tripartite budget dialogue with DBM and member-agencies of the NARRDS to re-align and reprogram the Phase A National R and D Program recommendation considering available funds as indicated in the Philippine Appropriations Acts and recommendations of DBM to the House of Representatives and Senate. During this dialogue, results of the technical evaluation of R and D proposals and review of ongoing projects are considered in determining which of the priority activities will receive preferential funding.

The output of the budget dialogue, which are the Agency Work and Financial Plans, are considered and endorsed to DBM as its basis for fund release directly to the implementing agencies. However, the grants-in-aid fund of PCARRD are released directly to PCARRD.

In summary, the planning activities produce the outputs which are translated into a program and thereafter into a budget. Thus, these activities are closely linked with the budgetary process which covers the following stages:

o Budget Preparation – involves the estimation of government revenues, the determination of budgetary priorities and activities, and the translation of these priorities and activities into budgetary estimates;

- o Budget authorization/legislation – refers to the legislative authorization of the budget upon review and approval by the legislative authorities;
- o Budget Execution – involves the appropriation and release of allotments to the various agencies and the incurrence of obligations by these agencies; and
- o Budget Accountability – the final step in the budget process wherein funds are released to the agencies. Reports of performance are prepared and submitted by the agencies to DBM for evaluation and monitoring. Indicated in Annex A are the major activities of the budgetary process and the planning cycle in congruence.

Monitoring and Evaluation

Monitoring of Ongoing R and D Projects

PCARRD's initial conduct of review and evaluation of ongoing projects was held in 1974 wherein 1,001 projects from different government agencies were evaluated using the national research program formulated during the First National Research System Congress as guide. The said evaluation resulted to: 1) integration of studies of similar scope; 2) termination of 171 studies that were not within the scope of national priorities or were not actually implemented; and 3) termination of studies for which results were already established. Since this initial attempt, PCARRD annually updates its list of ongoing projects and conducts annual field visits and project reviews. It has continued to search for better and more effective ways of monitoring projects. At present, PCARRD employs three mechanisms for monitoring the progress of ongoing projects, namely: field evaluation, inhouse reviews, and regional integrated R and D reviews and evaluation.

These mechanisms, while having their own specific objectives, are generally aimed at:

- Monitoring the status of projects to ensure that progress and outputs are in accordance with plans;
- Monitoring project resources to determine if these are being

used efficiently and are available at the right time in the required amounts;

- Promoting coordination among participating agencies by disseminating information on the scope, schedules and problems of ongoing projects;
- Providing necessary feedback in project control so that prompt corrective measures can be instituted when required; and
- Providing feedback necessary in planning and evaluation of projects.

Field Evaluation: Introduced in 1976, field evaluation consists of visits to experiment sites at specific dates. An evaluation team conducts these visits to discuss with the researchers the progress of project implementation. For seasonal crop commodities, field visits are made during specific cropping seasons, but for non-seasonal commodities, field evaluation schedules are synchronized with the regional integrated and agency in-house reviews. Field evaluation has the following objectives:

- To observe the actual conduct of the experiments, especially in terms of methodology;
- To verify information contained in technical and financial reports;
- To recommend alternative courses of action to improve project performance; and
- To consult with researchers on the possibility of undertaking other priority projects.

For the past 13 years, field evaluation proved to be very effective in ensuring that researchers follow the schedule of activities and approved methodologies. It provides the opportunity for both the researchers and evaluators to augment or emphasize certain issues with ocular proofs. More recently, pre-implementation on-site visits have been initiated to discuss project plans and visit identified experimental area before actual setting-up of the experiments.

Agency In-House Reviews: Until recently, a few member-agencies of the NARRDS conduct in-house reviews as part of their regular monitoring activity. This is used as dry-run for the regional integrated review. However, this type of review is now a regular activity in all agencies in the network to review projects in-depth. Its conduct is coordinated by the Regional R and D consortium. Researchers present the progress of their projects in an in-house forum attended by colleagues from the same agency. During this activity, evaluators usually consist of experts from within the agency and from the region.

Regional Integrated R and D Review and Evaluation Started in 1981, the Integrated R and D Review has become a regular activity of PCARRD and NARRDS. The review brings together the separate reviews and field visits which characterized PCARRD's past efforts to monitor R and D projects. This activity is conducted in a single visit by an external evaluation team and coordinated by the regional consortia in each of the 13 designated venues representing the 13 regions of the country. This set-up provides the proper mix for group interactions among researchers, research administrators, educators, policy-makers, extension workers, farmer-leaders, and representatives from the private sector and nongovernment organizations (NGO) within a region lending itself to a more systematic and participative approach to the objective review of researches.

Researchers make reports on the major highlights of the projects after which discussion follows. The researchers are also required to submit written technical reports of their accomplishments following a prescribed format. The major criteria used in evaluating the projects are:

- Attainment of the objectives;
- Adherence to the approved methodology;
- Adherence to the approved budget;
- Accomplishments including status of technology generated/verified; and
- Actions taken in response to previous year's comments.

The output of the annual regional review is published in the book *Highlights from the National Agriculture and Resources Research and Development System.*

There have been eight annual reviews conducted so far. The review for CY 1986 and onwards, however, has been expanded to cover the review of technology adaptation and verification programs, and development projects of various agencies especially of the Department of Agriculture. Also, an added feature is the holding of regional planning workshops immediately following each review primarily to formulate and later to update the regional R and D framework. This venue also serves as the basis for the identification of priority researches to be implemented in the region.

A modification incorporated in the 1988 activity is the conduct of agency in-house reviews to evaluate projects by the regional sectoral/commodity teams. This year, all agencies were encouraged to hold in-house reviews that only researches with significant findings/technologies generated are included in the regional review. A preplanning workshop is also conducted at the institution level to come up with the detailed implementation plan for the succeeding year for presentation and integration during the Regional Plan–ning, Workshop.

Evaluation of Completed R and D Projects

PCARRD is also actively engaged in the evaluation of completed R and D projects. During the Regional Integrated R and D Review, all completed projects undergo a more detailed evaluation. In certain occasions, significant results are presented in special workshops/symposia or regional and national fora that allow wider participation and closer analysis of the results. The validity and reliability of the results of these projects are assessed in terms of the methodology followed, level and types of analysis made, and status of technology generated. Specifically, the review of completed projects aims to:

- Identify generated technologies requiring further field testing and verification;
- Identify mature technologies ready for packaging, dissemination, and utilization; and
- Identify new researchable areas and significant findings for policy recommendations and development planning.

The criteria used in assessing whether the technology is ready for dissemination are:

- Technical feasibility – This is based on the replicability of results and adaptability to the specific soil, climate, and economic conditions of the area where the technology is to be applied.

- Economic viability – A technology may be considered economically viable if adoption warrants a reduction of economic choice errors. This can be achieved if the technology is "superior" to existing technologies in terms of a) increasing the allocative efficiency of the farmers, i.e., adoption of the technology reduces the per unit cost of production; and b) optimizing the use of scarce resources resulting in increased income and resource use efficiency.

- Social acceptability – A technology may be considered ready for dissemination if it reduces or has overcome moral and behavioral biases resulting in overall improvements in welfare and equity of the farmer/end-user, in particular, and the society/community, in general.

- Environmental safety – The technology can be considered ready for dissemination if it minimizes and/or does not pose environmental hazards to the community or country.

Technology generation researches are normally conducted under optimal environmental conditions existing in research laboratories and on-station experimental fields. Results of these researches need to be verified under different areas of the country and under actual field conditions using farmers' resources. The list of technologies for verification which are identified can be used by agencies mandated to do verification trials like the DA. DA also assists PCARRD in identifying the priority research areas which can be pursued in the future.

Regional Research and Development Management

PCARRD had advocated the regionalization of R and D management as early as 1975 when the first regional center, the La

Granja Agricultural Research Center (LGARC), was established in La Carlota City, Negros Occidental based on the consortium concept. The consortium serves as the mechanism for planning, monitoring, and evaluation of R and D projects at the regional level. At present, there are 14 operational regional R and D consortia all over the country, three of which were established in 1987 and three in 1988.

As the regional consortia gained greater maturity and as regionalization gained popular support, PCARRD has gradually and continuously extended some of the R and D management responsibilities to these consortia. Some of the major developments in regional R and D management are as follows:

Regional and Agency Reviews

PCARRD has gradually shifted the planning and coordination of the Annual Integrated R and D Review and Planning Workshop and Agency In-house Reviews to the regional consortia. Their responsibilities for the 1988 review were further extended to include the following: a) preparation, consolidation, and analysis of the various outputs of this activity; b) coordination of the in-house reviews and planning workshop of various agencies within their region of responsibility; and c) creation of regional commodity/sectoral team who serves as evaluators during both the in-house and regional reviews.

Technical Review of Proposals

In 1981, the national R and D centers were given the responsibility to conduct their own technical reviews of proposals in areas where they have achieved strong research capability. Hence, the research proposals coming from the national multicommodity and single-commodity centers are no longer technically reviewed at the national level but are only checked for possible duplication, relevance to national and development thrusts, and priority ranking.

In 1987, PCARRD extended this same responsibility to the regional R and D centers. It enabled these centers to ensure that quality R and D proposals which are relevant to regional needs are formulated and implemented. These centers/consortia have recently organized their respective commodity/sectoral teams and regional technical working groups. In addition to review of ongoing and completed projects, these groups are also responsible for the technical appraisal of proposals at the regional level. Research proposals will now be reviewed by the PCARRD Secretariat at the national level for possible duplication and reasonability of budget estimates.

Setting Regional Priorities

Recently, PCARRD gave the regional consortia the responsibility to spearhead the identification of priority R and D areas in their respective regions. When conflict between national and regional priorities occurs, the latter prevails.

All agencies in the NARRDS were allowed certain degree of flexibility in project implementation by instituting some changes in PCARRD's policies and procedures on research operations. The centers/consortia are encouraged to develop their own strategies in generating local and other resources to support R and D programs and related activities.

All agencies in the NARRDS were allowed certain degree of flexibility in project implementation by instituting some changes in PCARRD's policies and procedures on research operations. The centers/consortia are encouraged to develop their own strategies in generating local and other resources to support R and D programs and related activities.

To fully operationalize the regional R and D system, a new unit called the Technology Development and Regional Coordination Division (TDRCD) was established at PCARRD. This Division will liaise between the National Secretariat and the regional consortia and will spearhead the implementation of PCARRD's regionalization plans.

Although PCARRD envisions greater involvement of the regional R and D consortia and the NARRDS in R and D management, it will still continue to provide assistance and get involved in decision making to ensure that national development needs are met and research linkages with other centers at the national level and across regions are provided.

Policies and Procedures Regarding Research Operations

PCARRD institutes policies and procedures on R and D operations to safeguard investments in R and D in agriculture and natural resources. A clear understanding of these policies and procedures and requirements among researchers and research administrators within the NARRDS is necessary for effective coordination of their activities and for a more systematic planning, monitoring, and evaluation of projects and programs. This section focuses on guidelines and procedures on research proposal preparation and project implementation and monitoring.

Research Proposal Preparation

Prescribed DOST forms are accomplished for capsule and detailed proposals, respectively, and endorsed to PCARRD by the agency heads/research directors/consortium coordinators.

For detailed proposals: (1) the curriculum vitae of researchers are attached; (2) proposed budget should include a detailed breakdown of expense items by source of fund: a) Personal Services -- standard agency rates for salaries/wages will be followed and DOST rates for honoraria in case of proposals for possible PCARRD GIA funding; and b) Maintenance and Operating Expenses (MOE) – include detailed breakdown for each item except when amount per item of expense is ₱10,000.00 or less. For PCARRD GIA projects, up to a maximum of 14% of the project cost (excluding equipment and capital outlay) shall be earmarked for administrative services and 10% of the MOE (including Administrative Cost) for contingency. Agency-funded projects shall not provide administrative cost but shall include allotment for contingency.

Project Implementation and Monitoring

Fund Releases for PCARRD Grants-in-Aid Projects

- PCARRD simultaneously releases budget for the first and second quarters for the first year of implementation.

- Subsequent releases require Financial Reports (FR) signed by agency accountant following prescribed form. Audited Financial Report (AFR) is only required on a yearly basis covering all releases within the year.

- Terminal reports are prepared and submitted within two months after termination of the project. The last quarter of the last year's honorarium of the researcher is withheld until submission of the terminal report.

- Unexpended balance of the previous year is deducted from the second quarter release of the following year unless request is approved by PCARRD.
- Contingency fund may be released upon request.

Transfer of Funds

Effective June 1987, research leaders are allowed to transfer funds from one major item of expense to another without prior approval by PCARRD provided that the amount will not exceed ₱10,000/study per year and for as long as any budget reprogramming is approved by the agency head or Director of Research, except otherwise indicated by specific donors. PCARRD should be informed of any budget adjustment for monitoring purposes. The following limitations shall be observed.

- Applicable to projects funded through PCARRD regular GIA from DBM or other sources if no limitation has been imposed by the donor.
- Applicable to agency funded projects if indicated specifically on work and financial plan approved by DBM. In case the transfer of funds will require reprogramming, then such approval should be sought from DBM by the agency concerned.
- Items of expense shall apply only to those in the approved original proposal.
- Transfer can be effected in parts within the year.

Implementation of Recommended Changes

Research leaders can immediately implement minor changes in research methodology as recommended by the evaluation panel during the annual regional review and other reviews upon discussion with the Director of Research. However, PCARRD should be informed of these changes in writing for monitoring purposes. Any major modification such as, change in site, additional resources needed, and change in implementing structure (i.e. from program to project), and budgetary requirement should have prior approval by PCARRD.

For foreign-funded projects covered by Memorandum of Agreement and whereby R and D agencies negotiated directly with the donors, changes may be implemented immediately provided that no additional counterpart funds are required from PCARRD or the donor. PCARRD should be informed of such changes for monitoring purposes.

Research Personnel

Agency heads or their authorized representatives (i.e. Director of Research) issue appointments of research leaders. They shall approve changes in project leadership provided that the policy on workload of researchers is considered. PCARRD should be informed of any change in project leadership for purposes of monitoring.

Budgetary Breakdown

The researcher may not need to prepare the budgetary breakdown for items in MOE in the budgetary requirement if the amount is P10,000 or less per item of expense.

Honoraria and Incentives

The DOST Administrative Order No. 08 on granting of honoraria and incentive pay for researcher shall prevail in the absence of other agency policy regarding this matter. It stipulates that an individual may participate in any number of special assignments, programs, projects and/or studies over and above the established regular workload as researcher, research administrator, chairman, member, resource person and/or the like, provided that payment of his/her honorarium/incentive pay shall be limited to an equivalent of 10 units or 125% of the same annual basic salary, whichever is higher, for researchers and nonresearchers, except in extra meritorious cases. Also, the researcher is not allowed to receive honoraria in more than one study/projects within a project/program. In case he/she conducts more than one study/project, he/she receives the honorarium rate for highest level only.

The following rates for honoraria are in effect since January 1987:

Program Leader II	₱ 2,500/mo
Program Leader I	₱ 2,000/mo
Project Leader II	₱ 1,500/mo
Project Leader I	₱ 1,000/mo
Study Leader	₱ 700/mo

Requests for Project Extension

Request for project extension should be submitted to PCARRD at least one month before the expected completion period. Such request should be endorsed by the agency head. During project extension, researchers are not entitled to receive additional honoraria or compensation for conducting the project.

Fund Sourcing

One of PCARRD's mandates is to generate resources to support the capability development of the NARRDS and to support R and D projects. This fund generation function is explicit in Executive Order No. 128 (Reorganizing NSTA to DOST) which states that "Each of the Planning Councils shall be responsible in their respective sectors, for the formulation of strategies, policies, plans, programs and projects for S and T development; for programming and allocation of government and external funds for R and D; for monitoring of R and D projects; and for the generation of external funds."

Resource generation for R and D has become a necessary exercise for PCARRD because government funds for R and D has always been limited. For the past year, the ratio of Philippine expenditures for R and D in agriculture and resources to gross value added (GVA) in agriculture and natural resources is less than 0.2% and is declining in real terms. The ratio for other Asian economies is 0.4% to 0.6%, while among developed nations the ratio exceeds 1.5%. Thus, to stimulate and sustain increases in productivity in the agricultural and resources sector, PCARRD has been undertaking physical, manpower and R and D program development of the existing research centers and stations comprising the

NARRDS through its fund generating mechanism.

PCARRD's resource generation strategy is based on the premise that research capability development is an investment. It is the factor that draws resources to the NARRDS. Thus, PCARRD in 1976 to 1980 embarked on massive institutional development primarily in the national and regional research centers and to some extent possible in its cooperating stations through the Agricultural Research and Development Projects (ARDP) I and II which were the combined ventures of the United States Agency for International Development (USAID) and the Philippine Government. Together, these two projects generated for PCARRD a total of ₱329.4M for 10 years.

The investments are beginning to pay off in the form of grants for R and D for national and international funding institutions. The amount generated by PCARRD from these sources for the period 1977-1987 totaled to about ₱815 M. In 1988 alone, PCARRD generated about ₱100 M to support R and D projects and related activities which were implemented by the national network. Many of the donor agencies are indicated in Appendix B. To cite an example, the Australian Centre for International Agricultural Research (ACIAR) has granted through PCARRD a total amount of ₱27M for various projects concerning crops, livestock, farming systems, fisheries, socio-economics, workshops/conferences, and manpower development for the fast five years.

In summary, R and D funds being administered by PCARRD come from the following sources: Government fund allocation for PCARRD and the research agencies; loans from USAID and World Bank; grants from international funding institutions; and local grants from government agencies in the private sector.

International and National Linkages

PCARRD, realizing the value of sharing scientific information and technology and recognizing the importance of tapping international donor agencies for R and D funds, has for the past 15 years established and maintained collaborative linkages with international as well as national agencies outside the NARRDS. The major features of such collaborative undertakings include the following: exchange of germplasm, provisions of funds for R and D projects, manpower development and training, technical assistance, equipment support, and exchanges of technologies, researc findings, and methodologies.

Relationships with these agencies are formalized throug Memorandum of Agreement/Understanding. Appendix B lists th international and national agencies with whom PCARRD ha established linkages.

PCARRD also encourages the private sector to becon increasingly involved in agriculture and natural resources researc It has established linkages with Twin Rivers Research Cent (TRRC) in Davao, Philippine Institute of Pure and Applied Ch mistry (PIPAC), and Agricultural Investors, Inc. (AII), ANS Cattle and Crops Farms, Philippine Coconut Research and Dev lopment Foundation (PCRDF), and others. However, this is no enough. PCARRD realizes the need to strengthen the privat public sector relationship in R and D its active programs to pursu these linkages.

To enhance the sharing of R and D responsibilities of th public and private sectors, PCARRD proposes that the followin be considered in policy formulation: 1) the public agencies can se up laboratories/facilities for private sector's use but for correspon ing fee; 2) the private sector can be encouraged to co-finance spe cific R and D activities which would mutually benefit both side and 3) the private sector can be given tax holidays/incentives for given period of time while developing certain technologies of hig priority and making research results available to end-users (th public) and certified by DOST/PCARRD.

In conclusion, this paper demonstrates that the research an development activities in PCARRD and the NARRDS are con gruent. It emphasizes the conscious effort on the part of PCARR to increase involvement of the regional consortia in R and D management in line with its continuing thrust of regionalization PCARRD is optimistic that through this continued partnership the conduct of more coordinated R and D activities in agricultur and natural resources which are relevant to national and develop ment needs is ensured.

APPENDIX A

TIMETABLE OF MAJOR BUDGETING AND PLANNING ACTIVITIES OF PCARRD

Period Covered	Budgeting Activities	Planning Activities
		Phase A – Program Formulation
April-June CY-1		• Regional Planning Workshops – Preparation of initial R and D plans for CY + 1 by concerned sectors in the region
June-Sept., CY-1		• Development of R and D capsule proposals by researchers based on regional planning workshop output and evaluation of these proposals at the regional level by the Regional Review Team • Packaging of Regional R and D Proposals for CY + 1 by consortia secretariat and submission to PCARRD for further evaluation
October-November, CY-1		• Appraisal of capsule proposals for Cy + 1 by PCARRD at the national level
	A. Budget Preparation	
Nov., CY-1	• Receipt of budget call for CY + 1 • Issuance of internal guidelines re: budget preparation	
Dec., CY-1		• Packaging the National Agriculture and Resources R and D Program (NARRDP) CY + 1 Phase A by PCARRD
January, CY	• Preparation and submission of budget estimates for Foreign-Assisted Projects (FAPs), CY + 1 • Preparation and submission of year-end budget reports • Presentation of FAPs CY + 1 budget proposal in the FAPs annual consultation meeting	• Presentation of NARRDP CY + 1 Phase A recommendation to PCARRD Directors Council for review
February, CY	• Preparation and consolidation of PCARRD R and D secretariat operations budget proposals for CY + 1	• Review of NARRDP CY + 1 Phase A by PCARRD Technical Advisory Committee • Approval of NARRDP CY + 1 Phase A by PCARRD Governing Council

March 15, CY	• Submission of PCARRD R and D Secretariat Operations budget estimates, CY + 1 to DBM	• Submission of NARRDP CY + 1 Phase A Recommendation to DBM
		Phase B – Program Implementation
April-May, CY	• Technical budget hearing	• Regional Integrated R and D Review and Planning Workshop (RIRDRPW)
June-July, CY	• Assist DBM in justifying their budget recommendations during cabinet deliberations	continuation of RIRDRPW
July 25, CY	• Submission of CY + 1 budget to Congress by DBM	
	B. Budget Legislation	
July-Aug. CY	• Enactment of the Appropriations bill into law	
July-Oct., CY		• Evaluation of detailed R and D Proposals CY + 1
	C. Budget Execution	
Oct.-Dec., CY	• Preparation of Work and Financial Plan and submission to DBM	• Conduct of Budget Dialogue with member-agencies of the NARRDS • Indorsement to DBM of PCARRD's Budget Release Recommendation for Agriculture and Natural Resources based on budget dialogue output
Jan.-Dec., CY + 1	• Incurrence of obligations by the agencies	• Continuous monitoring and evaluation of R and D projects
	D. Budget Accountability	
Jan.-Dec. CY + 1	• Submission of accountability reports and other reporting requirements for external and management consumption	- do -

APPENDIX B

INTERNATIONAL AND NATIONAL LINKAGES

International Agricultural Research Centers

- Centro Internacional de Agricultura Tropical (CIAT), Colombia
- Centro Internacional de Mejoramiento de Maiz Y Trigo (CIMMYT), Mexico
- Centro Internacional de la Papa (CIP), Peru
- International Center for Research in Dryland Agriculture (ICARDA), Syria
- International Centre for Insect Physiology and Ecology (ICIPE), Kenya
- International Council for Research in Agroforestry (ICRAF), Kenya
- International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India
- International Food Policy Research Institute (IFPRI), Washington, D.C.
- International Irrigation Management Institute (IIMI), Sri Lanka
- International Livestock Center for Research on Animal Diseases (ILRAD), Kenya
- International Rice Research Institute (IRRI), Philippines
- International Service for National Agricultural Research (ISNAR), The Netherlands

International Programs

- International Board of Soil Research and Management (IBSRAM)
- International Soybean Program (INTSOY) with Illinois State University
- Nitrogen Fixation by Tropical Agricultural Legumes (NIFTAL)
- Peanut-Collaborative Research Support Program (P-CRSP) with the University of Georgia
- International Plant Biotechnology Network (IPBNET) with Colorado State University
- Sorghum-Millet Coordinated Research Support Program (INTSORMIL) with the University of Nebraska

Regional Research Centers/Regional Programs

- Asian Vegetable Research and Development Centre (AVRDC), Taiwan
- Coarse Grains, Pulses, Root and Tuber Crops Centre (CGPRTC), Indonesia
- Food and Fertilizer Technology Center for the Asian and Pacific Region (FFTC-ASPAC), Taiwan
- Regional Center of Tropical Biology (BIOTROP), Indonesia
- Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), Philippines
- Southeast Asian Program for Potato Research and Development (SAPPRAD), Philippines

- Plant Resources for South East Asia (PROSEA) with Wageningen Agricultural University

Donor and Lending Institutions

- Australian Center for International Agricultural Research (ACIAR)
- Asian Development Bank (ADB)
- Australian International Development Assistance Bureau (AIDAB), Australia
- Center de Cooperacion Internationale en Recherche (CIRAD), France
- Ford Foundation (FF)
- German Agency for Technical Cooperation (GTZ), Federal Republic of Germany
- Italian Government
- International Bank for Reconstruction and Development – World Bank (IBRD-WB)
- International Development Research Centre of Canada (IDRC), Canada
- International Foundation for Science (IFS), Sweden
- Japan International Cooperation Agency (JICA), Japan
- Overseas Development Administration (ODA), United Kingdom
- Rockefeller Foundation, United States
- United Nations Development Program – Food and Agriculture Organization (UNDP-FAO)
- United States Agency for International Development (USAID), United States

National Linkages

- Agricultural Investors, Inc. (AII)
- ANSA Cattle and Crop Farms
- National Council for Integrated Area Development (NACIAD)
- National Economic and Development Authority (NEDA)
- Philippine Coconut Research and Development Foundation (PCRDF)
- Philippine Institute of Pure and Applied Chemistry (PIPAC)
- Philippine Coconut Authority (PCA)

Experience on Research Program Planning, Fund Sourcing, and Allocation in DA-Region V

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I wish to extend my grateful appreciation to PCARRD for inviting me to attend this research management conference. It is a distinct honor for me to share with you our experiences on the subject at hand. My assignment, however, is a tall order considering that we have very modest accomplishment so far.

Research activities in the Bicol region are based on needs identified in the different development zones, giving high priority to the upland areas where almost 75% of our farming population lives. These areas have received the least attention in the past. However, at present, the Department of Agriculture has shifted its priority to upland farming. Lowland irrigated areas got the lowest priority since mature technologies on lowland irrigated crops, particularly rice, have already been generated by the International Rice Research Institute (IRRI), Bureau of Plant Industry (BPI), Maligaya Rice Research and Training Center (DA-MRRTC), and other different rice stations.

In planning for the upland areas, problems are first identified and then prioritized. Then researchable gaps are formulated. This is done with the participation of and in consultation with implementors and farmer representatives. The end result of these consultations are research proposals addressed to specific problem areas. These proposals are reviewed by the Bicol Consortium for Agriculture and Resources Research and Development (BICARRD), then forwarded to the DA-Bureau of Agricultural Research (BAR) for funding. BAR endorses the proposals to PCARRD for technical evaluation prior to project implementation.

I would like to share with you how the Farming Systems Research and Development Project (FSRDP) in the Bicol Region was implemented. The FSRDP supported by ASSP (World Bank) and RRDP (USAID) was implemented to help improve the livelihood of our upland rainfed farmers. As we all know, all proposals, whether funded locally or by foreign sources, pass through the Department of Budget and Management (DBM) which approves the allocation. Upon approval by DBM, funds are allocated according to the approved budget request and concerned agencies are advised of the availability of funds. Subsequent notices of approval are then sent to the region after which budget releases are made for the research activities through the agency implementor. Succeeding releases for specific project are based on periodic submission of financial report.

Research activities in DA-Region V are implemented by different station heads, RIARS Manager for On-Farm Research, and by the Project Manager for foreign-assisted project. Before, these different projects were coordinated by the Regional Research Coordinator (RESCOR), but presently, the Assistant Regional Director for Research and Development, assisted by the Chief of the Research Division coordinates the day-to-day research activities. The Research Division has its own monitoring and reporting staff, who in turn provide the Regional Planning and Management with status of completed researches.

Evaluation of the plans and progress of DA's research activities is one of the functions of the Research Coordinating Council (RCC) headed by the Regional Director. The RCC meets monthly for this purpose. There are two research reviews done yearly, the mid-year and the annual integrated research review, wherein evaluators from PCARRD, BAR and other line agencies review ongoing and completed researches. Research and development planning for the succeeding year is also carried out during the integrated research review. This system is an effective mechanism and useful tool for efficient management of financial resources as well as manpower. It has generally improved the regional approach to research planning and implementation.

Prior to planning and packaging farming system research and development projects, site selection is done based on the premise that technology developed at a well-selected site could be recommended over a wide area. In view of this, most project sites are located in coco-based areas which are predominant in Region V. Assessment of barangays was earlier done through the initial description process consisting of collection of secondary data site reconnaisance, use of key informant survey and group interviews. Later, this process was refined by combining key informant survey and group interviews which gave more emphasis on analysis and increased community participation. This rapid community appraisal for planning (RCAP) afforded greater chance for farmers to actually identify the potential and resources in the barangay. With RCAP, both the community and field operation teams (FOTs) were able to identify potential leaders and farmer cooperators. In this process, bottom-up planning and local farmer participation were given emphasis.

We identified problems in the implementation of our research activities, such as: (1) delayed budget release and (2) DA-Region V researchers (I am sure this problem is also shared by other regions) seldom get opportunities to pursue MS or PhD courses.

DENR Experience in Project Implementation, Planning, Monitoring, and Evaluation

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Introduction

The concept of Project Management or the "Projectized Approach to Management" is relatively an old concept/approach in the Department of Environment and Natural Resources (DENR) proper. The concept can be described as "the planning, scheduling, directing, and controlling of resources for short-term projects which have been established for the completion of specific goals and objectives." Over the past years, financing institutions have supported such management approach since it can immediately react to changes in the environment and adopt a systematic action to achieve its ultimate objectives. This approach, from the institution's perspective, ensures immediate returns in investments, reduces cost-overruns, and effectively allocates resources.

Project management is associated with the concept of foreign-assisted projects (FAPs), special projects, and specific research development (SRD). Foreign-assisted projects are financed by external sources whether as loans from the Asian Development Bank (ADB), International Bank for Rural Development (IBRD), or United States Agency for International Development (USAID) or grants from Japan, USA, New Zealand, Germany, and Australia, among others.

On the other hand, special projects may be interagency undertakings but are locally financed as initiated by the Office of the Secretary (OSEC). Specific research development comes as a contingent for research agencies that could not fully finance their researches. These projects, because of the urgency, are treated as special and financed by the Department. SRD also comes as a component in the overall project design of foreign-assisted projects. It may be viewed as part of the support measure that would complement to the attainment of project objectives. Likewise, SRD could provide remedial measures for FAPs without a research component. Further, specific research development can also be a single component resource research of FAPs. The project research activity in the DENR proper, therefore is on "need specific basis."

The following are some specific development projects implemented by the DENR:

- **Contingent Specific Research Development Projects**

Most of these are aimed at conservation and regeneration measures, such:

- o Development project for the stockfarming of Calamian Dear -- to generate technology and determine the economic feasibility of stock farming of Calamian Dear.
- o Production of rattan in established forest plantations – to develop, test, and demonstrate improved methods of rattan establishment in existing plantations of mahogany, agoho, and other species in Zambales and La Union.
- o Development of pilot-scale bamboo plantations in Rizal and Quezon provinces – to test and verify the applicability of existing technologies on bamboo production.
- o Pilot testing and hydrologic evaluation of the sloping agricultural land technology (SALT) project within the Marikina Watershed Lungsod Silangan – to establish a SALT-based "Model Farm" as a showcase for the upland farmers of the Marikina Watershed.
- o Tamaraw conservation program - to develop the tamaraw and its habitat as an economic resource of the country.

- **Specific Research and Development Component of FAPs**

Almost all foreign-assisted watershed projects have completed the physical, hydrologic, and socioeconomic characterization of the watershed area (Phase 1). Among these are: (1) Third Davao del Norte Irrigation Project – Soil Conservation Component (ADB LN 580 PHI) for the Libuganon Watershed in Kapalong, Davao del Norte; (2) Allah Valley Watershed Development Project (ADB LN 341/727 PHI) in South Cotabato: (3) Lake Bato Watershed Management and Rehabilitation Pilot Project (ADB LN 417 PHI) in Polangui, Albay; (4) Muleta-Manupali Watershed Development Project (ADB LN 406 PHI) in Bukidnon. Based on the results of Phase I, an implementation plan is prepared to guide the actual implementation of developmental undertaking (Phase II).

Some FAPs have a separate research component as part of the organizational structure of the project. The RP-Japan Crocodile Farming Institute in Palawan has a research unit involved in all aspects of the crocodile's physical, biological, and ecological manifestations. The Philippine Forestry Development Project in Ilocos Norte (ADB LN 677 PHI) has its research unit operations being financed by ADB. Research studies supportive of the Plantation and Social Forestry Components of the projects cover species and varietal trials, nursery studies, plantation establishment and management, pest and disease control in reforestation species, and social forestry. The Third Davao Project focuses on applied research. The research component of the ASEAN-New Zealand Afforestation Project was successful in demonstrating the cost-effectiveness of technologies generated through research. These technologies are now being applied not only in the Philippines but also in other ASEAN countries.

- **Specific Research Development as a Remedial Measure for FAPs**

Research development in FAPs has also been implemented to provide remedial measures to biological realities which have not been predicted to occur. A typical example was the World Bank-assisted Abra Pine Plantation Development Project (APP-DP) which aimed to develop 3,020 ha of *Pinus caribaea* plantation in Abra. On its third year of implementation, the pine plantation was attacked severely by two types of pine shoot moth. With such situation, top management was forced to hire the services of the Forest Research Institute (FORI) now the Ecosystems Research and Development Bureau (ERDB) for remedial measures, although it was found out later that it was too late to implement the control measures that were developed. The Mandala Agricultural Development Corporation (MANDALA) was also hired to study the production cost of mixed stands at APPDP as an alternative measure for the worsening infestation of the pines.

- **Research Development as a Single-Component, Single-Resource Research of FAPs**

Some foreign-assisted projects funded solely for a specific research are termed as a single-component, single-resource research. Among these is the ERDB-implemented and UNDP-FAO-assisted Bamboo Research and Development Project. The project aims to develop, through research in pilot-scale bamboo plantations, packages of technology that would develop bamboo as raw material for construction purposes, cottage industries, pulp and paper industries, as well as for food.

Problems experienced by DENR in the implementation of FAPs:

- **Uncoordinated Monitoring and Evaluation Bodies**

Prior to the creation of the Foreign-Assisted and Special Projects Office (FASPO) at DENR, planning, development, and management of special projects were parcelled out to the various divisions/units/Bureaus of the Department based on the nature of the projects. As these projects increased in number, difficulty in assigning responsibilities was experienced; thus, started DENR's "management strains." International funding institutions like the International Bank for Rural Development, Asian Development Bank, and United States Agency for International Development, and other national government agencies prescribed procedures which the project staff were not familiar with or were in conflict with existing procedures followed by the agency.

In addition, support services and professional advice on adherence to prescribed procedures were not easily available to field implementors, making project management incohesive and uncoordinated and administration, problematic.

With the increasing challenges posed by these projects, DENR management created the FASPO, a special unit to handle this task.

- **Slow Utilization of Loan Proceeds**

The small amount and slow rate of available loan proceeds can be traced to some external constraints, such as non-mastery of the FAPs' systems. This created delays in project implementation and imposed additional commitment charges for the government.

Delayed construction of programmed infrastructures and procurement of equipment/supplies became the bone of contention of supervising missions for financing institutions. Such delays inevitably caused adverse ripple effects on other major project activities, such as field planting. The problem was due mainly to the bureaucratic and rigid procedures in the implementation of infrastructure, procurement, and other bidding procedures specified by the financing agencies. Trained personnel to handle necessary transactions were also lacking.

Recognizing that this aspect has become a major impediment to the efficient implementation of FAPs, DENR set up the Project Accounts and Management Division under FASPO to manage the accounts of the projects effectively.

- **Tight Financial Controls**

Previous guidelines/procedures on financial disbursements and accounting for all FAPs (i.e., adoption of TCAA system) were efficient to some degree; however, tight controls such as the imposition of certain ceilings for procurement of supplies and materials beyond which department clearance should be secured.

Similarly, the projects encounter difficulties under the Treasury Funding Warrant Scheme. With the strict liquidation-release regulation being enforced, the project could not catch up with its liquidations to replenish project allotments. Recently, the Common Fund Scheme for all accounts is being developed. Hopefully, this scheme can cope with the financial problems of FAPs.

- **Faulty Field Management**

Our eight years experience in the implementation of FAPs have invariably shown the risks of our investments, associated with labor, capital, land availability, and most especially managerial and technical skills.

Most of the managerial failures and difficulties encountered in FAPs are traceable to shortage of managers who can match the challenges of various projects. While in some of these projects, the basic management approaches have partially relieved the problems of technical skills and experience, overall however, professional skills and credible leaderships are still wanting. A program for management training and continuing education for prospective and incumbent project managers will give impetus to this approach.

In November 1987, the Secretary of the Department of Budget and Management signed DBM Circular No. 87-10 creating the contractual positions of Project Manager and Assistant Project Manager at higher rates. With higher compensation, it is hoped that FAPs will be efficiently and effectively managed.

- **No Concern for Terminated Projects**

Under the previous working arrangements, FAPs whose external fund support has been concluded were considered "terminated." These were transferred to appropriate units for continuous implementation on regular project status. There is no policy or specific criterion for sustaining the life of these projects, although these have been absorbed by appropriate units and provided with regular funding. The investments poured during the period of external assistance has not been likewise ensured.

However, under the present set up a terminated project continues to be a special project under regular funding. Monitoring of its impact is continued.

- **Uncoordinated Organizational Structure in the Field**

The project manager is expected to have maximum control over the affairs and resources of the project; but during field implementation, lines of authority and control points are often the cause of misunderstanding among the Central Office Region-District-Project network. The servicing and operations of these FAPs are controlled and supervised by the Regional/District Offices. More often than not, the project managers have to decide which directives they will follow first, whether that of the Central Office or the Regional/District Office.

In some FAPs, financial transactions and activities are closely scrutinized by the Regional/District Office, resulting in delays/or unnecessary disbursements. Financing control has always been the scapegoat of Regional/District Offices that wanted to ensure efficiency of project implementation.

With the present set up, each DENR unit is given a definite function for implementing foreign-assisted projects.

The above were the major problems of DENR in project implementation. It is hoped that these experiences will guide us towards effective and efficient implementation of FAPs. Under the present reorganization, we hope, too, that such problems will no longer be encountered.

PCARRD and the National Research Network: Some Observations and Comments

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Introduction

PCARRD is the best that has come to the research system in the country in the last two decades. It has brought coherence, coordination and the semblance of integration where chaos and disorder used to prevail, direction and commitment where individual interest may have been more important than the welfare of the farmers and of the nation. In pursuing its objectives of relevance and excellence in the research system, PCARRD has nurtured a network of institutions and provided assistance in budget allocation, manpower development, and improvement of infrastructure facilities.

We have witnessed the dedication of the staff of PCARRD not only by its top administrators but also and equally by the lower level personnel and support staff. With their example of efficient and steadfast sacrifice, PCARRD staff naturally contaminate others who see them – during submission of research proposals, during workshops and annual reviews, as well as in casual meetings with them – creating a strong feeling of interest and commitment to the goals and objectives of the national R and D programs. In a way, it is probably this attitude toward work and commitment to the welfare of the Filipino farmers that PCARRD had made more impact in the network staff than all the funds and infrastructure that it provided them. As we review the system again, fully aware of what has made PCARRD successful, it is also vital that we point out what should or would make it more effective as a steward of the research network in the future.

Having given PCARRD the commendations that it deserves, let me now say what it needs to concentrate on to remain as a respected institution in the resarch community.

Issues

Managing the research network is a taxing job because it is complex with a variety of clientele. It is composed of highly diversified and dynamic single and multicommodity institutes, government bureaus, state colleges and universities, and private research corporations. Nevertheless, PCARRD has laid down the rules and systems that are generally acceptable to the network members. The dynamics of the network, however, require that with time these rules must be modified and improved. Let us now look at a few of these issues that may be given some considerations.

Program Planning

Building commodity institutes. There have been several commodity institutes established in the country with hardly any major involvement of PCARRD in their creations. If there were such involvements, these do not appear in the CORPLAN or in the minutes of the PCARRD Governing Council.

Therefore, PCARRD must have a study plan on a continuing basis to determine which commodities may be considered for elevation to the status of an institute, and to enable us to prepare in advance the manpower, financial and infrastructure requirements for their establishment. On the other hand, the study must also include reasons why certain commodities should not be elevated to an institute level. There should be studies on the problems of existing institutes and make recommendations for their 1) improvement, 2) abolition, or 3) integration with other institutes or bureaus.

Research proposals in the consortia. There is a clamor that the consortia be given more authority to "approve" research proposals of regional importance. In this connection, the role of the consortia in "processing" research proposals can be better implemented, if a PCARRD staff sits with the Consortia Evaluation Team to provide support or assistance. Since the documents will still be forwarded to PCARRD, BAR and ERDB, their respective directors can still make comments and recommendations to sharpen the thrusts of these regional researches.

Monitoring and Evaluation

The **annual regional integrated review** by consortium or region (although started rather late by PCARRD) is indeed better than just receiving the quarterly and annual reports of the researchers. However, only the studies which have major significant results are now being presented in the Review. All other ongoing researches are evaluated by the respective agencies/ institutions at the in-house level. The assumption, perhaps, is that institutions have already the competence to screen and select research studies to be included in the annual review proper. In this regard, it is suggested that PCARRD should conduct a quick study to determine which of the agencies/institutions have that capability to pass sound judgment on the "status" of their completed and ongoing researches, particularly on the objectives and methodologies used in their studies.

Detailing of PCARRD senior staff in the consortia. While it is agreed upon that the annual review is very vital to the maintenance of high-quality research, another complementary scheme should be implemented. This involves the detailing of a PCARRD senior research staff in each of the consortia, or physically close consortia, to facilitate coordination and financial transaction. He should also help in discussing research methodology and implementation procedur at the field and laboratory levels. It is emphasized that these staff should also make extensive visits to the various stations particularly during the fielding of experiments as well as in the collection of data. The progress as well as problems which need immediate or future attention should be noted and brought to the attention of top-level management for action.

Policies and Procedures

Honoraria system. The most difficult problem that has confronted the research network pertains to the **honoraria system.** Honorarium is granted to PCARRD-funded or externally-funded research; whereas agency supported research does not. I know of one staff who implemented only PCARRD-funded researches to avail of honoraria. With this arrangement, the researcher's income more than doubles that of the Dean of the College of Agriculture. The issue here is the possibility that researchers of the same work load will have unequal remuneration because of honoraria. This is a problem to administrators. Are the PCARRD guidelines sufficient? Is there attempt to further rationalize the honoraria system and to find out if it is really beneficial to the research system? One other result of the system is that very often, many of the research projects/studies have much more budget for personal services (60-70%) than for maintenance and operations (30-40%), which should be the other way around, to the detriment of the research work.

The position descriptions and corresponding salaries gained by PCARRD from its being one of the Councils under the Department of Science and Technology (DOST) have not filtered down to the network. This must now be brought to the members of the PCARRD network.

Administrators to assume technical positions. Provisions should be made to enable the Directors of Research or superintendents of experiment stations to assume technical positions after their terms. The technical positions should, in general, be equal in importance to the administrative positions. Assuring them of such positions will minimize their insecurities and their desire to do anything to keep themselves in office, even if they are no longer useful or effective as administrators.

Research managers – accreditation and administrative authority.

There is need to expose the research manager to more actual research activities or further training to improve his capability.

It is also necessary that his task includes visits to the station laboratories and field experiments so he can understand the needs of his researchers.

Furthermore, his technical responsibilities should be coupled with administrative authority to enable him to expedite transactions related to the implementation of research projects. Many research directors even in SCUs do not have signing authorities, even just to buy gasoline or fertilizer. They do not know their budgets as well.

Fund Sourcing and Allocation

Discussions at RDC/NEDA meetings concerning the institutions' budget are good exercises, but the decision of the Regional Budget Director or the analyst at the Central DBM will still prevail. Sometimes, budget allocated is less or more than what PCARRD recommends, depending on negotiations with the Regional Budget Director. Therefore, PCARRD must strengthen its linkage with all Regional Directors to "educate" them on the need for higher research budget.

External funds. The various institutions should be trained on how to prepare research proposals for external funding. PCARRD must conduct a workshop on project preparation in conformity with appro ed format and then evaluate these during the same workshop. This will allow the network members to learn and understand the mechanics of foreign-funded project preparations.

These are some random thoughts and observations that may serve as starting point of more detailed studies on how we can make PCARRD maintain its present position as a respected institution in the research community.

Experiences in the Utilization of Research Information

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Introduction

The last four decades of continuing endeavor in extension service with the defunct Bureau of Agricultural Extension (BAEx) and the two years experience with the Agricultural Training Institute (ATI) have been both rewarding and challenging.

Historically, the growth and development of extension service has been associated with reorganizations because the service is a major and critical component of agricultural and rural development programs.

The latest reorganization of the Department of Agriculture, by virtue of Executive Order No. 116 dated 30 January 1987, merged the Philippine Training Center for Rural Development (PTC-RD), Philippine Agricultural Training Council (PATC), and the Bureau of Agricultural Extension into the Agricultural Training Institute (ATI). This Executive Order mandated the ATI to conduct multi-level trainings for the Department of Agriculture field personnel and its clientele to ensure that research results are communicated with the farmers through appropriate training and extension activities.

Cognizant of the fact that research generates technology and extension disseminates mature and verified technology, ATI is aware of the importance of linkage between the extension and research systems.

Clearly, it was necessary to institutionalize the extension-research linkage and make concrete the policy of the Department of Agriculture on bottom-up planning of extension and research in specific localities.

DA-PCARRD Extension-Research Linkage

On 4 June 1986 a Memorandum of Agreement was signed between Minister Ramon V. Mitra of the Ministry of Agriculture and Food, and Director General Emil Q. Javier who represented the Philippine Council for Agriculture and Resources Research and Development (PCARRD) of the National Science and Technology Authority (NSTA).

The operationalization of the agreement focused on the institutionalization of the extension-research linkage by coordinating consultations, training workshops in all the regional PCARRD's network of Research Consortia/Centers and DA's Regional Integrated Agricultural Research Systems (RIARS) and Applied Communication staff. This was also participated in by Provincial Technology Verification Teams (PTVT's), representatives of state colleges and universities (SCU's) and farmers/end-users of research and extension services.

The consultation process proceeds by making an inventory of verified, mature technologies that are usable in farming systems or production mixes of farmers.

Prototypes of project messages comprehensively covering problematic areas in credit, production programming, postharvest activities, and support services, are formulated and pretested in the vernacular with representatives of farmers/end-users. After passing the pretesting stage, prototypes are mass-produced for the requirements of specific localities. This process provided a mechanism for ensuring the flow of knowledge and information from research and extension to end-users, in formats best understood by users.

Guidelines in Preparing Project Messages

The preparation of project messages based on the choice of production mixes follows a set of guidelines as indicated below:

- Definition of the "area development isolate" as an area that has the same soil type and agroclimatic conditions; therefore, has a more or less the same cropping pattern.
- Firming-up of the production mix for every area develop-

ment isolate through a process consultation with the farm family/community which will decide on the more profitable production mix; considering resources, capability, market forces, and values.

- Participative formulation of project messages should comprehensively include credit, production, postproduction technology, agribusiness (inputs and outputs marketing, processing), and other support services (infrastructure, irrigation, institution building, etc.) through research and extension agencies (PCARRD and the regional research network including state colleges and universities, DA-RIARS, nongovernment organizations and farmers' group. The latter validates the project messages through field-testing of prototypes written in the vernacular.
- The project messages should be written in simple and understandable language requiring judicious and cost-effective use of indigenous and commercial inputs.
- The messages should especially emphasize the agribusiness components (credit, marketing, processing, and postproduction technology).
- The messages should delimit their coverage to the defined area development isolate only.
- The project messages should have multiple uses: for farmers, homemakers, rural out-of-school youths, technicians, group training, radio farmcasting, demonstration of extension methods, and results of on-farm verification trials.
- The messages should be mass-produced in low-cost print materials for easy revision/updating.
- As much as feasible, the use of messages in training, methods and results demonstrations, farm broadcasting, etc. should be functionalized, i.e., these may be used before and during the conduct of the farm and home activities.
- Monitoring and impact evaluation using impact indicators should be a built-in component in the use of project messages to ensure their validity and usefulness.

PCARRD-BAR-ATI Linkage

A very recent improvement on the Memorandum of Agreement has been introduced with the creation of the Bureau of Agricultural Research (BAR) in the Department of Agriculture. BAR coordinates the research programs of DA and in turn coordinates with PCARRD on these concerns.

The Research Advisory Council (RAC) of BAR assists in the in-house review of the DA research programs in the regions, as well as in the staff bureaus at the national level. This in-house review complements the PCARRD Annual Integrated Research Review conducted at its regional research network.

Concluding Statements

The Department of Agriculture's policy on consultative/participative bottom-up planning process will necessarily require locality-specific extension and research services conducted in the farmers' fields.

Complimentary to this policy is the necessity of conducting education and training support services for the farming systems approach and its component strategies such as agribusiness that is farm family-focused, community-based, and farm and home management-oriented.

To simplify this seemingly complicated process, a simple system of applied development support communication has to be developed and operationalized for researchers, extensionists and farmers/end-users.

A Strategy for Reaching Out: PCARRD's Print Media and Scientific Literature Services

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Introduction

One of the most important aspects of any agriculture and resources research endeavor is to ensure that research results be disseminated and utilized by target clienteles.

PCARRD with its access to technologies and agricultural research information in the country has devised a strategy to reach out to its clienteles, such as research administrators and policymakers, researchers and scientists, development planners, communicators, extension workers, and the farmers.

This strategy involves the Print Media and the Scientific Literature Services being implemented by PCARRD through its Applied Communication Division (ACD). It is backstopped by the PCARRD-ADC's Regional Applied Communication Offices (RACOs) and the DA-PCARRD National Integrated Applied Communication Program (NIACP).

Print Media

This program consists of various publication lines for different clienteles, and it aims to: 1) keep the public informed of the latest developments in agriculture and resources research; and 2) translate research results into clear, accurate, and credible information packages for the different end-users.

The PCARRD's publication lines include the following:

- Philippines Recommends – It contains technology recommendations from production to utilization of important commodities. The primary targets of this series are extension workers and enterprising farmers.

- Research Highlights – It documents the results of the annual regional integrated R and D review and evaluation of ongoing and completed researches. It presents the technologies which are ready for verification, packaging, and dissemination.

- Information Bulletin Series – It contains information, guidelines, or procedures, that aid in the efficient operation of research and information dissemination activities. These are aimed for the general public, research managers, or for administrators who deal with government-funded research operations.

- Data Series – It provides statistics on commodities that serve as useful background information for researchers, policymakers, and agribusinessmen.

- State of the Art and Abstract Bibliography – It is a series of publications on the present status of research in specific commodity areas intended for researchers and decision makers, and abstracts of all researches undertaken in a specific commodity in the country.

- Technology Series – It contains an executive summary of a specific technology. Intended for policymakers and members of the Congress, the bulletin features a cost-and-return analysis for each technology.

- PCARRD Farm News – It is a monthly compilation of radio releases, in English and Tagalog, on agriculture and natural resources which PCARRD supplies to rural broadcasters nationwide.

- PCARRD Monitor – It is PCARRD's official monthly newsletter which highlights research information intended to keep researchers abreast with the developments in the national research and development system.

- Staff Paper Series – It contains the significant papers and speeches delivered by PCARRD staff that are considered valuable source of information on development trends and/or policies affecting the research community.

- Book Series – It includes the outputs of reviews and research information presented by experts in specific fields and disciplines; proceedings of technical meetings/conferences organized by PCARRD; and reports and research highlights sent to conference participants, libraries, researchers, and other interested parties.
- NRDS News – It is a quarterly newsletter which updates the member agencies of the National Research and Development Network of the noteworthy activities/issues in the regional centers/consortia and PCARRD
- Network – it is a semi-annual publication which highlights techniques and current research findings on applied communications. It is designed to upgrade skills of applied communicators in the regions.
- Instructional Materials Prototypes Series – These are communication materials prototypes such as posters, leaflets, and primers designed for technology users' needs in the regions.

Scientific Literature Services

What is Scientific Literature Services (SLS)

SLS as one of the four major units of PCARRD's Applied Communication Division, was set up in 1973 to serve the management information needs of research scientists and to promote the building of scientific literature collection in agricultural libraries at the national network of research centers and stations.

Generally, the SLS aims to: (1) strengthen the SLS center system based on existing infrastructure in 13 regional consortia with established cooperating units (These regional SLS offices are charged with coordinating information system and services, developing their areas of strength, identifying and correcting deficiencies in the services, filling gaps, and interacting productivity with the regional and international information system and programs pertinent to their service areas); (2) provide the agriculture and resources research community, development planners, industrialists, entrepreneurs, extension workers, mass media, farmers and other users with relevant, reliable, and timely information and data at a reasonable cost; (3) ensure that specialized and professional knowledge and expertise on agriculture and natural resources available elsewhere in the world will be effectively and efficiently used and shared for the attainment of national development goals; (4) establish and maintain at a national level, a documentation, dissemination and exchange of agriculture and natural resources research output, and other related topics including nonconventional literature materials; (5) strengthen the SLS Center information capabilities in information handling and transfer; (6) promote network development and initiate resource sharing of consortia with similar centers in the Southeast Asian region; and (7) publish and disseminate bibliographies relevant to the needs of the national research system.

Specifically, the SLS program is designed to: (1) strengthen the SLS structure facilities and services to provide a comprehensive, fast, effective information and data services to the information needs of policymakers, development planners, project leaders, researchers, PCARRD technical staff, and the Department of Science and Technology; (2) enable PCARRD to effectively perform its role as national planning, monitoring, and coordinating agency of agriculture and natural resources research; and (3) strengthen the SLS system in the 13 regional centers of the PCARRD research network.

As of 1988, the SLS at the PCARRD Secretariat alone, has a collection of 24,274 volumes of books, 1,310 journals and periodicals, 1,433 terminal reports (TRs) of completed researches, 58 reference materials which include dictionaries, encyclopedia, yearbooks, etc. In addition to its collections, PCARRD-SLS also makes use of the holdings of the libraries in the University of the Philippines at Los Baños (UPLB) Complex and the Scientific Clearing House Documentation Service Division (SCHDSD) of the Department of Science and Technology (DOST)

What SLS Does

The SLS retrieves and disseminates scientific literature within the national network of research centers and stations. It facilitates scientific information services particularly abstracting, indexing and cataloging. It also provides services in selective dissemination of information (SDI) and serves as repository of scientific literature. It performs related services such as microfilming, photocopying, and literature search.

The SLS relates with local and international information system and exchange centers. It maintains linkages with the Department of Science and Technology (DOST) Library Consortium which serves as a referral center for science and technology information; and the Regional Applied Communication Office-Scientific Literature Services (RACO-SLS) Consortium which consists of the libraries in various PCARRD consortia.

SLS also maintains information links with various international information systems which include the Rome-based Current Agricultural Research Information System (CARIS) and the International Information for Agricultural Science and Technology (AGRIS), the United Nations Educational Scientific and Cultural Organization-Associated Centers for the Regional Network for the Exchange of Information and Experience in Science and Technology (UNESCO-ASTINFO), and the United Nations' International Referral Network for Environment Information (INFOTERRA).

As the National Center for CARIS in the Philippines, the SLS coordinates and collaborates with the Agricultural Information Bank for Asia (AIBA), which is a project of the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA). SEARCA acts as the regional inputting center for CARIS and AGRIS.

The SLS has established linkage with the UNESCO-supported regional project on Information Network on New and Renewable Energy Resources and Technologies for Asia and the Pacific (INNERTAP). This linkage was strengthened through the signing in 1985 of a Memorandum of Agreement between PCARRD and INNERTAP. INNERTAP was created in 1983 through a memorandum of understanding entered into by the UNESCO and the Philippine National Oil Company — Energy Research and Development Center (PNOC-ERDC), the latter being its Regional Secretariat. It aims to improve renewable energy information flow within, into and out of Asia and the Pacific Regions.

In March 1986, PCARRD proposed the National Agricultural Research Information Monitoring Documentation and Exchange Program (NARDEP) for funding of the International Development Research Center (IDRC) of Canada. Coordinated by the SLS and Research Management Information System (RMIS) of PCARRD, NARDEP aims to provide the framework for the efficient data collection, processing and dissemination of research information within and among the national research centers and PCARRD through the use of computers.

What the SLS Has Done

In 1974, the SLS was tapped by PCARRD as the National Center for Current Agricultural Research Information Systems (CARIS) in the Philippines, a computerized cooperative information system for current and ongoing researches in agricultural sciences and technology.

CARIS was set up by the United Nations' Food and Agriculture Organization (FAO) in 1971 to promote the scientific and technological advancement of agriculture in the developing countries. The designation of SLS as the CARIS National Center was made possible because of its experience in information networking, linkages with the network of national research centers and stations, and trained manpower for scientific documentation work.

For 1987, the SLS inputted 951 new records in the regional database. These were distributed into seven sectors, namely: crops, 533; farm resources and systems, 102; fisheries, 125; forestry, 77; livestock, 77; mines, 9; and socioeconomics, 29. The CARIS National Center SLS contributed significantly in the development of agriculture and natural research in the Philippines and abroad.

Through PCARRD's computer-based Research Information Storage and Retrieval System (RETRES), the ACD-SLS has provided a data banking system for bibliographic information. RETRES establishes the data banking of terminal reports of research, publication, monographs and other library materials as well as develop a query system of literature search. The RETRES also provides research planners and administrators a fast and easy way of reviewing the technology level and research gaps based on the available literature collected.

It also provides input to the FAO-developed database, AGRIS, currently handled by AIBA.

The SLS has developed the accelerated retrieval of terminal reports (TRs) of completed researches in the national research network in which abstracts of TRs are the inputs.

Besides a computer-based information system, the SLS has also developed a System Thesaurus patterned after the FAO Agricultural Vocabulary (AGROVOC) which is currently used for CARIS descriptors. As of 1987, PCARRD has included 1,070 local terms in the proposed Philippine AGROVOC. This AGROVOC, which accommodates local terms, follows the international standard, which makes information documentation easier to manage.

Regional Applied Communication Offices

PCARRD has established a sub-network for applied communication in various regions of the country called Regional Applied Communication Offices (RACOs). At present, there are 13 RACOs which are working components of the national and regional research centers. Each RACO consists of a core staff that serves as the secretariat for the larger information sub-network composed of communication specialists from consortium member-agencies. The RACOS's tasks are as follows:

1. To provide communication support to the research activities of the regional research centers/consortia
2. To pool the scant communication resources of consortium members and cooperating agencies
3. To foster interagency cooperation by providing the venue for cooperative communication work
4. To develop and upgrade regional communication capability
5. To translate technology into low-cost readable communication materials

Now on its 9th year, the RACOs have become stronger conduits of development. Their recent partnership with the region-based communication offices of the DA further strengthens their commitment.

The 13 RACOs organized by PCARRD-ACD include:

1. Bicol Consortium for Agriculture and Resources Research and Development (formerly Bicol Agriculture and Resource Research Consortium (BARRC) – RACO
2. Central Mindanao Agriculture and Resources Research and Development Consortium (CEMARRDEC) – RACO
3. Central Luzon Agriculture and Resources Research and Development Consortium (formerly Central Luzon Agricultural Research Consortium (CLARC) – RACO
4. Central Visayas Consortium for Integrated Regional Research and Development (CVCIRRD) – RACO
5. Cagayan Valley Agriculture and Resources Research and Development (CVARRD) – RACO
6. Highland Agriculture and Resources Research and Development Consortium (formerly Highland Agriculture and Resources Research Consortium (HARRC) – RACO
7. Ilocos Agriculture and Resources Research and Development Consortium (formerly Ilocos Agricultural Research Consortium (ILARC) – RACO
8. La Granja Agricultural Research Center (LGARC) – RACO
9. Northern Mindanao Consortium for Agriculture and Resources Research and Development (formerly Northern and Central Mindanao Coordinated Agriculture and Resources Research Program (NOCEMCARRP) – RACO
10. Palawan Agricultural Research Center (PARC) – RACO
11. Southern Mindanao Agriculture and Resources Research and Development Consortium (SMARRDEC) – RACO
12. Visayas Coordinated Agricultural Research Program (VICARP) – RACO
13. Western Mindanao Agriculture and Resources Research and Development Consortium (WESMARRDEC) – RACO

To be organized soon are the RACOs of Western Mindanao Agriculture and Resources Research and Development (WESVARRDEC) and the Southern Tagalog Agricultural Resources Research and Development (STARRDEC) Consortia.

DA-PCARRD Research-Extension Interface

The signing of a memorandum of agreement between PCARRD and the Department of Agriculture (DA) in 1986 led to the launching of the National Integrated Applied Communication Program (NIACP). This signaled active interfacing of research and extension and led to dynamic research utilization.

The NIACP is a joint undertaking of PCARRD through its Applied Communication Division (ACD) and the DA through the Agricultural Training Institute (ATI). It aims to: 1) institutionalize research-extension linkage, 2) pool scant communication resources in the regions, 3) provide a mechanism for ensuring the flow of information and knowledge, and 4) mobilize various units involved in the responsible processing of research information and knowledge.

In their effort to reach out to the regions, PCARRD-ACD and the DA-ATI implemented the Regional Integrated Applied Communication Program (RIACP). The RIACP operates through the Regional Interagency Task Forces (RITFs) organized in 13 regions of the country. The Task Forces composing of agricultural officers, communication specialists, and subject matter specialists are mandated to: 1) identify appropriate technologies generated by the research centers; 2) design, field test, package, and translate appropriate technologies into usable forms, 3) evaluate and recommend to the extension system effective communication channels, approaches, techniques, and materials.

The PCARRD-DA research-extension linkage in the regional level is coordinated by the Regional Information Officers (RIOs) and Regional Integrated Agricultural Research System (RIARS) Managers of DA, and Regional Applied Communication Officers (RACOs) from the PCARRD network of research centers and stations.

To operationalize the implementation of integrated applied communication program in the national and regional levels, PCARRD-ACD and DA-ATI spearheaded a series of seminar-workshops on technology development transfer and communication materials production and pretesting to: 1) improve the capabilities and enhance the competencies of PCARRD and DA regional offices in the development and utilization of appropriate farming system (production mix) that would increase the real income of farmers, and 2) strengthen the capabilities of the communication offices of PCARRD and DA in the regions in terms of communication materials production.

The major accomplishments of the seminar-workshops include the identification of location-specific technologies and the production of communication materials prototypes, such as primers, leaflets, flyers, posters, and slide tapes. The importance of strong linkage between research and extension was emphasized in the seminar-workshops.

In two years, PCARRD and the DA have established a firm foundation for the intermarriage between research and extension. This relationship is expected to be more meaningful and dynamic in the years ahead. Further cooperation, coordination, and collaboration among the agencies involved are needed to help farmers attain a better quality of life.

Conclusion

PCARRD's perseverance to reach out to its target clientele can be attributed to its access to research information, capability to screen, package and translate technical information into understandable and usable forms, and a mechanism for developing regional capability for applied communication.

The collaboration between PCARRD and DA has strengthened research and extension linkage in the national and regional levels. While this is a realization of PCARRD's endeavor, it still has to bring to the peak of the realization, a realistic strategy that will help free the small farmers from the clutches of poverty.

PCARRD's RMIS and RETRES as Tools for Agricultural Research Management

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Introduction

One of the mandates of PCARRD is to establish a repository of research information in agriculture, forestry and natural resources. To fulfill this mandate, PCARRD initiated in 1974 the development of its Management Information System (MIS) to support not only the necessary transaction processing of Secretariat operations but also to provide information and processing support for management and decision-making functions.

Since then, various information systems have evolved to support PCARRD's various functions and perform more effectively its role as the national research coordinating agency for agriculture, forestry, and natural resources.

PCARRD-MISD Objectives and Current Information Systems

MISD Objectives

The Management Information Services Division (MISD) was organized to develop PCARRD's Management Information System that will provide necessary data for decision making and handle data processing activities to meet the information needs of the Secretariat and the National Agriculture and Resources Research and Development Network (NARRDN).

Current Information Systems and Computer Applications

PCARRD through the MISD, maintains the following information systems and computer applications:

Research Management Information System (RMIS). The RMIS is a computer-based information processing system which supports research program planning, programming, evaluation, and monitoring functions of PCARRD. It provides a complete and comprehensive inventory of all proposed, new, ongoing, and completed researches undertaken on all commodities, as implemented by the agencies in the NARRDN regardless of source of funds (whether it be from government appropriations or counterpart funds for foreign-funded researches).

Research Information Storage and Retrieval System (RETRES). The RETRES is an information storage and retrieval system that facilitates literature search. It supports scientific literature services for effective research information, dissemination, and utilization. It contains bibliographic data bank of all completed researches, publications, monographs and related literature on agriculture, forestry and natural resources research.

Pilot Technology Information System (PTIS). The PTIS is a newly designed information system aimed to document, monitor, and compile all technologies generated in agriculture and natural resources to support technology development, techno-transfer, verification, and dissemination activities. The initial data base created, contains a complete description of selected technologies, its advantages and limitations, its possible uses, and economic benefits.

Equipment, Infrastructure and Manpower Management Systems (EIMMS). The EIMMS is an information processing system that aims to maintain a computer-based inventory of all equipment, infrastructure, and manpower resources in the NARRDN to support institutional development functions of PCARRD. The initial data base created was based on the 1978 and 1982 Resources Survey as processed at SEARCA's computer facilities.

Financial Management System (FMS). The FMS aims to provide financial indicators to formulate operating plans and institute financial control. Its subsystem, the PCARRD-GIA Monitoring

Systems, shows comparative analyses of releases, disbursements, and liquidations of PCARRD-GIA funded researches.

Administrative Support Services (ADSS). The ADSS aims to provide information processing systems for the various administrative functions at the Secretariat.

Initial microcomputer applications developed for this system include the following:

- Financial Transactions and Reporting Sub-System
- Personnel Information Sub-System
- Computerized Payroll
- Leave Credits Monitoring
- Supplies Inventory

Publications Mailing System (PMS). The PMS is an internal processing system that generates mailing labels based on computerized listings of all PCARRD publications and their corresponding subscribers with appropriate sorting schemes to assist in the circulation and dissemination of these publications.

RMIS and RETRES: Major Information Systems in PCARRD

RMIS: Scope and Capabilities

Scope: The RMIS dovetails PCARRD's Research Program Planning Cycle. RMIS monitors researches from the initial packaging of the National Research and Development Program (NRDP), the actual start of implementation, during implementation, and until completion of R and D activities.

In effect, RMIS covers all research activities undertaken in the country on all 31 commodity groups identified by PCARRD, as implemented by the NARRDN regardless of the sources of funds.

Capabilities: The RMIS provides information to various users through the on-line inquiry system and the batch processing of computer-generated reports.

On-line-inquiry system

Through the on-line-inquiry system, the users are provided with information through the following options:

- **Parameter searching** – allows the users to inquire for one or several records in the RMIS data base based on any or a combination of the following parameters:

  - Commodity
  - Status
  - Discipline
  - Research station
  - Expected output
  - Research thrust
  - Research class
  - Priority area
  - Researcher
  - Technical division
  - Region
  - Implementing agency
  - Funding agency

Based on these parameters, the users can either request for a summary list of researches classified under the indicated parameter(s) and/or detailed information of any selected record based on the summary list.

- **Summary report by commodity and by status** – presents a summary report of the budgetary requirement of an individual commodity or commodity group, by status (whether new, ongoing or completed). The total required budget of any given status is broken down according to major expenditure items.

- **Summary report by agency and by commodity** – presents the total budget of a specified funding agency for a particular individual commodity or commodity group. The report shows the budget as broken down into major expenditure items with the corresponding number of researches funded per appropriate status.

Budget allocation per technical division by source of fund – graphically illustrates the allocated budget of a specified funding agency for each or all sectors as represented by the technical divisions, namely: crops, livestock, forestry, farm resources and systems and socioeconomics. The histogram also reflects the actual values of the allocated budget for comparison among various sectors.

In addition to these reports generated on-line, RMIS also is capable of providing the following external reports among others:

- Frequency Distribution of Research and Development Projects by
  - o Commodity
  - o Region
  - o Research station
  - o Funding agency
  - o Implementing agency
  - o Status
- Directory of Research and Development Projects by
  - o Commodity
  - o Region
  - o Research station
  - o Funding agency
  - o Implementing agency
  - o Status
- Field Evaluation Worksheets
- Budget Preparation Form

For researchers out in the field, RMIS provides the necessary information in answer to a series of questions about the current efforts of the national research community:

- What researches are being done?
- Where is the work being carried out? In what research station, by what implementing agency, and in what region?
- Who conducts it?
- How is it being financed?
- When did it start and when is it expected to be completed?
- What agencies are involved in this research?
- What are the objectives of the program/project/study?
- What are the program thrusts or expected outputs?

There are just but few sample questions which RMIS answers. These information enable researchers to be aware of current R and D activities for them to do cooperative work with other proponents who share their common interest. Likewise, it reduces duplication of research efforts resulting to wastage in time and money.

RETRES: Scope and Capabilities

Scope: The RETRES was designed primarily to assist the packaging and dissemination of research results to the end-users. Supplementing RMIS which focuses on the inventory of new, ongoing, and completed researches, RETRES documents the research results of all completed researches through the abstracts of terminal reports and related publications.

It provides bibliographic information to facilitate literature search and information retrieval for scientific literature services (SLS) provided by PCARRD to various researchers in the NARRDN.

The system covers related literature from:

- o Research reports
- o Articles from serials
- o Articles/chapters from books
- o Articles/paper from seminar proceedings and scientific forums
- o Thesis (BS, MS, PhD)
- o Monographs
- o Books
- o Journal or serial publication
- o Bibliographies
- o Statistical series
- o Seminar proceedings
- o Pamphlets
- o Handbooks and manuals

Capabilities: The interactive inquiry capability utilizes user-friendly guided prompts to interrogate the system for relevant bibliographic information maintained in the RETRES data base.

The extended parameters inquiry combines multiple parameter conditions as well as multiple descriptors based on the following parameters:

- o Author/Editor/Researcher
- o Title
- o Imprint and collation data
- o Year published
- o Categorization
- o Descriptors
- o Document type
- o Document form

- o Library location
- o Acquisition data
- o Abstract among others
- o Additional notes

The batch-oriented reporting systems generates a fixed format directory for the abstract bibliography as sorted according to the FAO Agrovoc. The abstract bibliography can be used by researchers, policy makers, planners, administrators and other users in their literature search for research proposal preparation, conduct of researches, and development of policies/programs and plans.

RMIS and RETRES: As Tools for Agricultural Research Management

With all these information available, how can these information systems be used in agricultural research management? We can view the benefits of such information systems in two ways:

1. As they support the functions of agricultural research management; and
2. As they support the information needs of various users in the research community.

RMIS and RETRES in Support of the Functions of Agricultural Research Management

Regardless of their level in organization, agricultural research managers perform the functions of planning, monitoring, evaluation, and program implementation.

Policy Formulation and Planning: To develop a plan whether it be a research and development plan for a research station, a regional center/consortia, a department or the overall national R and D program, the initial step is *to assess existing R and D programs, the state of the art of research in progress and the current resources inputted into present R and D programs.*

For this need, RMIS data base generates an inventory of research activities and a commodity gap analysis reports which present a clear picture of current R and D programs. These programs compared to targetted program thrusts will reveal research gaps.

These research gaps, in turn will guide managers in determining priority areas for R and D and provide analyses on the current situation in R and D programs. If current programs reveal gaps in specific program thrusts, then research managers can identify and assess the constraints why certain program thrusts are not fulfilled.

RMIS information leads us to the following questions:

- Why are there existing gaps in this particular program thrust, problem area, priority area, commodity or discipline?
- Are these gaps due to limitations in resources, i.e., manpower, facilities, financial support or the need to develop/package research programs addressed to these problem areas?
- Should there a need to redirect current resources and channel them towards these gaps?
- Is there a need to formulate policies and procedures based on current situations in view of overall R and D objectives?

While RMIS as an ongoing research information system presents the state-of-the-art in R and D activities, RETRES complements this through published literature. A combination of these information provides a clearer picture of significant findings derived from past activities and related R and D activities which are currently being undertaken, results of which may be fed back to the overall R and D planning process.

Clearly through these information systems, agricultural research managers can assess levels of technology useful to planning technology, technology verification, adaptation, utilization and dissemination activities.

Likewise on planning and programming overall R and D resources, current R and D programs provide basis for projecting resource requirements, developing appropriate resource allocation schemes and scheduling of financial, manpower, equipment resources and other logistics. The RMIS also provides inputs to packaging budget recommendations to the Department of Budget and Management (DBM).

Monitoring

Monitoring determines whether an activity is proceeding according to plan. It provides feedback to management at all levels and enables them to compare progress of work against planned objectives, detect deviations, identify bottlenecks and take corrective actions in the course of research implementation.

As a monitoring system, RMIS provides all the data emanating from the research activity, from the start of implementation, during implementation and until completion. It documents via its historical trail module changes in the research program (whether it be an expansion, merging, or division of research activities), turnover of research personnel and movements in implementation dates. RMIS also supports both activity and financial monitoring as compared to the plans. The administrative data in RMIS present the interrelationships among sources of funding, funding levels, research institutions, researchers and other resources. These data provide basis for the technical research divisions and national commodity R and D teams to detect variations between the program plan and actual progress of work.

Evaluation

Evaluation, as an analytical process, can be performed in various stages. *Ex ante* evaluation analyses the potential impact of an activity before implementation; while *ex-post* evaluation assesses performance after activity completion. Impact evaluation, on the other hand, determines the extent to which the activity can contribute to development goals and efforts. Ongoing evaluation as related to monitoring involves the collection of data and analysis of information during implementation of the activity.

While RMIS can provide information in all levels of evaluation, it is strongest (at the present time) at supporting ongoing evaluation. *RMIS compares actual implementation* versus planned for use of management in determining *efficiency* in resources utilization. It also provides inputs to current field evaluation efforts and regional integrated R and D review and planning workshops.

Program Implementation

During program/project implementation, all scientific, technical, and administrative aspects have to be carefully managed. Research managers need to insure that R and D implementation conforms to the plan; target outputs and objectives carefully met; and program/project resources efficiently utilized.

In this regard, RMIS provides complete financial and administrative data, partly scientific and technical information by way of the objectives. It is anticipated that the latter will soon be strengthened with the expansion of PCARRD's hardware storage capabilities.

Research Information Utilization

Personally, I feel that in addition to the above basic functions of agricultural research managers, utilization of research information must be added to the list.

Unless researches are disseminated, utilized and are able to contribute to development efforts, they cannot be made useful. Agricultural research managers need a good information base to be aware of technological advancement in the field that will steer development efforts.

This function can be supported not only by RMIS but more so by RETRES. RETRES data base facilitates information dissemination to various needs. It also facilitates sourcing and location of much needed information.

RMIS and RETRES Support the Information Needs of Various Users, in Various Levels of Management

The various levels of users of agricultural research information may be categorized as follows:

- Decision-makers including policymakers, planners concerned with strategies for R and D efforts at the station, regional center/consortia, departmental, and national levels;
- Administrators and managers of particular research and development programs;
- Individual researchers, innovators as well as problem solvers and other practitioners in agriculture and natural resources;

- Information specialists and communication media personnel who facilitate the dissemination of information to professionals and the public.

Inasmuch as there is a variety of users of both RMIS and RETRES, let me illustrate how these systems can support the needs of these users:

- For policymakers, planners and key decision makers for R and D programs at station, regional, departmental and national levels.
- RMIS and RETRES present an inventory of multicommodity, multiagency, multidisciplinary areas of research (both in progress and completed) to reveal gaps in overall R and D efforts and to identify problem areas and program thrusts.
- They provide information to avoid duplication of research efforts and encourage cooperative research activities among disciplines, commodities, and agencies with compatible research objectives.
- They provide statistical aggregates on ongoing and completed researches as basis for planning, policy making, evaluation, budgeting, and coordination of National Agriculture and Natural Resources R and D Program and total R and D investment.
- They also provide data on development and technological capabilities as basis for analysis of research productivity and technological developments.
- They provide information to detect trends and shifts in research priority areas and funding.
- They present a source data for technological forecasting and assessment.
- They facilitate flow of current and ongoing agriculture and natural resources R and D information among research institutes in the NARRDN.
- For administrators and managers of particular R and D programs (program/project leaders and coordinators)
  - o They help insure effective management and utilization of resources provided to R and D programs/projects.

- They help insure that program implementation conforms to plan, as directed towards target objectives and expected outputs.
- They facilitate monitoring of the implementation of R and D activities on program/project levels.
- They enable detection of variations, determination planning of corrective actions in order to propose solutions and recommendations.
- They indicate new and emerging technologies resulting from R and D activities.
- They provide information to avoid duplication of efforts and enable cooperative R and D efforts.
- They promote communication among R and D managers and information processors and disseminators.

- For individual researchers and practitioners in agriculture and natural resources research.
  - They locate possible sources of recorded information and R and D literature in order to learn about ongoing and completed R and D activities.
  - They facilitate communication and information exchange and sharing among researchers in various agencies in the NARRDN.
  - They help identify potential innovations or breakthroughs resulting from one's own research.
  - These systems identify possible sources of support for R and D activities.
  - They provide information to avoid duplication of R and D efforts and enable cooperative R and D efforts.

- Information specialists and communication media personnel who facilitate the dissemination of information to professionals and the public.
  - They assist end-users in assessing existing information systems and utilizing agriculture and natural resources research information for various purposes.

- o They facilitate information analysis and synthesis for various users.
- o They provide basis for referral services about ongoing researches, published literature, and other relevant documentation.
- o They assist in the identification of potential users of other information services.
- o They foster wide public awareness and understanding of trends in agriculture and natural resources research.
- o They provide inputs to technology verification, dissemination, transfer, and utilization activities.

Lessons Learned

While today PCARRD takes pride of a comprehensive data base in agriculture and resources research information, it can only look back and reminisce the pains it went through before it achieved this state. Initially, users preferred to maintain their manual processing procedures instead of using computer-based systems. Despite the initial resistance, and with consideration of changes in the environment and the users' growing information needs and the constant effort to manage the system efficiently and effectively, the RMIS and RETRES were able to survive the test of time.

What lessons have we learned in the process of developing these information systems which we can share with other institutions with similar plans?

The first and the most critical factor is management support. Any management information system needs management support to be viable. Without it, no well-designed information system can succeed.

The second significant factor is the total commitment of the systems staff, management and, more importantly, the users to make the information system work despite the numerous problems it will face during implementation.

The third factor is the need for qualified, competent, and committed system staff who will develop, implement, and maintain the information systems. We need qualified EDP staff, and more importantly, people who are well-versed in the agency operations.

In terms of systems development, I would recommend developing small manageable information systems. After careful systems planning, information system development should be modularized so that both systems personnel and users can grow with the system and vice versa. Modularity insures development of a system which the agency can use, operate, and maintain instead of just having a grandiose design which cannot be implemented.

With regard to hardware resources prior to acquisition of any equipment, there should be a thorough systems study of the agencies' needs, hardware and software requirements. Some government agencies make the mistake of acquiring the hardware first before conducting a thorough systems study and requirement analysis; thus, these hardware facilities are not utilized to the fullest.

Lastly, it is important to direct system efforts to satisfy user needs and utilize the full capability of existing systems in order for the users to better appreciate its use.

Future Plans

While PCARRD takes pride in developing a comprehensive information system on agriculture and resources R and D, we are faced with the greater challenge of insuring that this wealth of information benefits not only the PCARRD Secretariat but the NARRDN as well. PCARRD-MISD intends to promote aggressively its service so that these information can provide inputs to management systems, and more importantly to production systems to benefit the end-users in the regions.

Through a proposal entitled National Agriculture and Resources Research Information Monitoring, Documentation and Exchange Program (NARRDEP) which we have packaged for IDRC funding, we intend to develop parallel RMIS and RETRES systems in the regions, particularly in the research consortia starting with the National Multicommodity Research Centers. Through the NARRDEP, we hope to develop regional data processing capability by providing hardware and software resources to the participating centers. Given the support, we will push for more effective information dissemination and sharing through computer media exchange among the members of the NARRDN.

Based on the pilot technology information system, a national technology development information management system (TECH-

DIMS) will also be developed in collaboration with the 13 research consortia in the country.

We also envision the creation of specialized commodity data bases, i.e., agro-crop-climatic soils data base and the use of crop simulation models for technology piloting activities to enable PCARRD to provide farmer advisory services and assist development activities.

For the NARRDN to benefit from technologies generated in other countries, we also hope to access information from existing international data bases for dissemination to the researchers in the NARRDN and the R and D community as a whole.

Management and Utilization of Research Information: The FPRDI Experience

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The Forest Products Research and Development Institute (FPRDI) has been in existence for almost 32 years. Its mission is to generate technologies for the efficient use of wood and other forest products, and to assist the forest products industries and allied enterprises in their technological needs.

The Institute has three research divisions: Housing Materials; Furniture, Wares and Packaging; and Paper, Chemical Products and Dendro-Energy, the main concern of which is commodity-oriented research.

FPRDI has four support units. Two of these, the Technology Utilization Division and the Technical Information Staff are mainly responsible for research information management and utilization activities of the Institute.

The Staff complement totals 323 as of 1989. Of this, 116 are professional researchers, 121 are technical support staff and the rest (95) are administrative support staff.

FPRDI's research activities are interdisciplinary, commodity-based and geared towards the following development thrusts; 1) import substitution, 2) export promotion, 3) employment generation, 4) small-scale enterprise development, 5) environmental protection, 6) expansion of raw materials base for client industries, and 7) energy generation.

The technologies generated by the research activities of the FPRDI could be grouped into the following categories:

- **Technical information** – These are usually data or research results from basic research, example of which is the characterization of bamboo. The data may not have direct application to manufacturing, but the results form the basis for setting the technological coefficients in the manufacturing process.

- **Products** -- New and improved products are being produced through FPRDI research. Some are local substitutes to imported products; others are entirely novel products derived from local materials such as wood novelty items which were nonexistent ten years ago. New items are being made in the laboratories every year.

- **Processes** – Improvements on the manufacturing processes are being made. Every bit of innovation, such as finishing and preservation techniques are studied to improve efficiency in the plants.

- **Equipment** – Industries require machinery, thus improvements and new designs are also the focus of R and D. Some of the most "saleable" technologies are in the form of equipment, such as the Furnace-type Lumber Drier and the High Pressure Sap Displacement Apparatus.

- **Operating Systems** – The highest level of technology integrates all these features for either improving existing plant operations or setting up new enterprises. This covers all manners of technical interventions FPRDI could provide.

Target Beneficiaries

As a government entity, FPRDI strives to serve the Filipino people. Due to limited resources, however, there is a need to prioritize our clientele. The users of our research results could be categorized into:

1. The research and academic community
2. The forest products industries and allied enterprises, and related organizations
3. Government agencies

4. Nongovernment organizations and interest groups

Implicit in this, of course, is the net service to our people who are in the industry and are being served by the industry.

Programs/Thrusts

Serving such a diverse clientele requires various ways of moving information. For instance, the type and form of information required by the scientific community could be different from that of the entrepreneur.

There are several activities involved in managing and using research results. The following are activities on information and technology transfer being undertaken by the Institute:

- Technology documentation
  - o Built-up of information materials
  - o Library services for researchers
  - o Collection, organization, and classification of information and maintenance of a databank

- Communication materials production
  - o Production of publications
  - o Build-up of audio-visual materials, including exhibits and displays
  - o Tri-media information dissemination
  - o Public affairs

- Technology validation – Scaling up/pilot-testing of recommended technologies

- Enterprise development
  - o Build-up of economic and marketing data on recommended technologies
  - o Technological intervention in setting up new industries
  - o Technical assistance and consultancy services to industries

- Technical manpower development
  - o Build-up of training materials and courseware
  - o Industry-oriented training
  - o Impact evaluation

Strategies

The foregoing 'programs' or activities are operationalizations of some strategies by FPRDI for improving information services. Some of these strategies are:

Information management (with the end-view of developing an automated information system): this includes the development of an information network on forest products utilization.

The voluminous amount of information generated at the Institute has to be organized into a systematic and coherent databank which can be used efficiently to provide up-to-date information to users. This requires an automated information system Admittedly, the Institute is barely starting on this mode of information processing. It needs to establish a network for information, along with other concerned or interested R and D agencies Already the groundwork for the establishment of an information network on forest products research information has been laid out. The central node for this network is FPRDI.

The aim of this network is to systematically gather, collate, repackage, and bring available information on forest products research and related information to various interested parties.

Directed/purposive repackaging of information to create mass awareness of FPRDI technologies

Communication materials are principally produced to broaden the public's awareness about FPRDI and its generated technologies. The materials are developed and packaged into various forms suitable for the target clientele. Publications, audio-visual, and broadcast materials and other nonconventional communication channels are used by FPRDI to reach out to different audiences. In effect, what is being done is that communication materials are produced to tailor fit specific groups of people based on their needs, capacities and capabilities.

For instance, a primary technical journal on forest products, the *FPRDI Journal*, is published regularly for researchers, scientists, and academicians. Meanwhile, a laymanized, popular publication, the *Forest Products Technoflow* is published quarterly for the general public.

Other materials like exhibits, video documentaries, school-on-the-air, and other forms of communication are also used to disseminate and promote information on FPRDI's activities and technologies.

Establishment and management of linkages – development and maintenance of linkages and services with media institutions, government and nongovernment organizations, individual firms, and industry groups, etc.

At present, FPRDI maintains linkages with various media groups and entities like newspaper offices and media organizations for the fast and efficient movement of information.

Linkages with individual firms are maintained to develop an efficient feedforward-feedback mechanism. Through its associations with these firms, the Institute is able to transfer research information directly to the production sector.

To illustrate: one problem of the forest products industries is the poor or low quality of the raw wood materials. Due to improper drying and preservation practices, products made out of these are not bought in the market. The need for an efficient and more economical way of drying wood with less degrades prompted FPRDI researchers to come up with a design of a furnace-type lumber dryer.

Currently, the Institute has extensively transferred its technologies on the dryer through a network of associations with various industry groups. In fact, the Institute has successfully constructed some 14 units of the dryer for individual firms or manufacturing groups all over the country.

Technical assistance – the provision of services, consultancies, information materials, and other forms of services to walk-in visitors or through written requests.

Through its technical assistance program, the Institute is able to actively maintain its ties with various clientele groups. FPRDI's technologies and R and D generated information are being delivered to the intended users. The technology transfer staff and the subject matter specialists/researchers coordinate and meet with various groups to deliver needed technologies and information.

These are only some of the more viable strategies employed by FPRDI for managing and utilizing information on forest products research. The Institute is continuously studying ways of efficiently utilizing research-based information so that it can effectively reach its target clientele.

FPRDI has realized that it is important functionally to integrate the services/activities of the Technology Utilization Division and the Technical Information Staff. Whenever possible, information and techno-transfer must coordinate plans and activities to be mutually supportive of each other.

Likewise, upgrading of communication and information facilities and support services must be continually undertaken to better serve the needs of the intended beneficiaries of the Institute. This can be attained through cost management and resource sharing.

Implicit in all these activities and strategies are the feedback, monitoring, and evaluation components. Summative evaluation is done through impact evaluation studies on completed techno-transfer activities.

Strengthening Research Capability

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Introduction

One of the major mandates of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) is to "provide for and implement the upgrading of research capability of research centers/stations through the development of manpower, infrastructure, and facilities." This function is very important especially during the early years of PCARRD when research facilities and manpower were considered insufficient. While huge amount of resources were allocated for the purpose during the succeeding years, its present state is still deemed inadequate.

This paper covers the research capability program developed and implemented by PCARRD since its creation in 1972. The program was funded mainly from the proceeds of three RP-USAID loan agreements and from the Philippine government. The principal components include infrastructure, equipment, and manpower development.

PCARRD's Research Capability Program

Problems and constraints in the agriculture and natural resources research sectors led to the creation of PCARRD on 10 November 1972. With an increasing population and decreasing agricultural lands, increased productivity is a must. This requires the application of appropriate and better technologies as well as making available improved support services. These, however, were very difficult to attain considering the complex problems then plaguing the research sectors which include: lack of central planning and coordination, inadequate funding, facilities and manpower, and ineffective dissemination of research results.

Fully aware of the importance of quality manpower and facilities in the conduct of quality researches, PCARRD after its creation, began tackling this important problem. At the onset of 1973, PCARRD embarked on a survey to assess the research capabilities, needs and potentials of the existing research agencies, centers, and stations. The results of the survey were used in determining the requirements to develop agriculture and natural resources research capability. Such requirements later played a vital role in the initial negotiations for a loan package which provided the national research network the much-needed funds to start its first research facilities and manpower development program.

On 23 December 1975, a US$5.0 M (₱36.38 M) RP-USAID loan agreement was signed. (The agreement was later named the First Agricultural Research and Development Project or ARDP I.) To PCARRD, the agreement was an encouraging signal from the national leadership for its recognition of the importance of research in national development. This recognition was later translated into a US$15.0 M (₱112.96 M) GOP-counterpart funds, equivalent to 75% of the total project cost of ARDP I.

The ARDP I was implemented from April 1976 to December 1980. Total expenditures amounted to about ₱147.755 M (Table 1). Infrastructure development got the biggest share (43.3%) followed by operating costs (38.1%), equipment (9.4%), and manpower development (9.2%).

In identifying the recipients of ARDP I, PCARRD decided to strengthen existing research centers rather than build new ones. The main bulk of the funds went to four research centers, namely: Central Luzon Agricultural Research Center (CLARC), Bicol Agriculture and Resources Research Center (BARRC), La Granja Agricultural Research Center (LGARC), and Southern Mindanao Agricultural Research Center (SMARC).

Before the completion of ARDP I, PCARRD negotiated another loan with USAID to cover the period from 1979 to 1984. On 16 July 1979, the second loan agreement (ARDP II) was signed. It provided ₱73.44 M (39.9%) for infrastructure, ₱29.14 M (15.8%) for manpower development, ₱18.73 M (10.2%) for equipment,

Table 1. Summary of expenditures by PCARRD on Research Capability development as of 31 December 1986 (₱'000).

Project Component	Projects* ARDP I	ARDP II	RRDP	Total
Infrastructure Development	64,042.55	73,438.77	1,097.87	138,579.19
Manpower Development	13,539.74	18,734.65	460.37	32,734.76
Equipment and Materials Procurement	13,843.85	29,138.86	2,101.06	45,083.77
Operating Costs	56,329.00	62,780.00	1,377.48	120,486.48
TOTAL	147,755.14	184,092.28	5,036.78	336,884.20

PCARRD – Philippine Council for Agriculture, Forestry and Natural Resources Research and Development.

ARDP I – Agricultural Research and Development Project I.

ARDP II – Agricultural Research and Development Project II.

RRDP – Rainfed Resources Development Project.

and ₱62.78 M (34.1%) for operating costs (Table 1). The GOP counterpart was about 50% of the total package.

The ARDP II supported the strengthening of eight recipient research centers within the research network, namely:

1. Mariano Marcos State University, lead agency of ILARRC*
2. Isabela State University, lead agency of CVARRD
3. Central Luzon State University, lead agency of CLARRDEC
4. University of the Philippines at Los Baños
5. Ecosystems Research and Development Bureau (formerly FORI)
6. Palawan National Agricultural College, host agency of PARC
7. Visayas State College of Agriculture, lead agency of VICARP
8. University of Southern Mindanao, host agency of USMARC

The two loan packages also provided funding for some of the development requirements of the PCARRD Secretariat in order to effectively administer and manage the national research system.

ARDP I and II spurred the rapid growth of the national and regional research, and provided them the capability to respond to R and D needs. However, more funds for such needs were imperative to deal with the rapidly increasing population and deteriorating environmental conditions.

The third RP-USAID loan agreement, the Rainfed Resources Development Project (RRDP) (later converted into a grant) was signed and became operational in 1983. The first cycle of RRDP covered the period from 1983 to 1986. As of 31 December 1986, about ₱5 M had been spent for infrastructure (22%), manpower development (9%), equipment (42%), and operating costs (27%). The second cycle with an $80 M allocation (₱40 M GOP counterpart) started in 1987 and is expected to be completed in 1989.

The three loan packages generated about ₱337 M into the national research system in ten years, in addition to the regular appropriations from the government. Such amount was instrumental in building a dynamic research system in agriculture and natural resources. The main bulk was channelled towards the building and improvement of research facilities, such as laboratories screenhouses, greenhouses, service buildings, field structures irrigation and water and power distribution systems, equipment, and manpower development.

In support of the national R and D program, the research capability program of PCARRD employed a set of criteria in determining recipient institutions. These criteria include commodity responsibilities, research needs, problems and potentials of the region where the institution is located.

Commodity responsibilities are based on national and regional priorities as well as the capability and resources of the institution. A set of minimum requirements in terms of manpower and facilities have to be satisfied before an agency is given the responsibility to work on a certain commodity and, therefore, become a member of the national R and D network (NRDN). Considering the meager research budget alloted by the government compared to the needs of the NRDN, the selection of the recipient agencies and the magnitude and form of support they should receive has always been difficult. The overriding criterion, however, is the maintenance of an optimum balance of quality researchers, adequate facilities and relevant research programs. Lack of any of the first two components will qualify the agency for a higher priority among the prospective recipients.

Manpower Resources Development Program

The Manpower Resources Development Program (MRDP) of PCARRD was conceived with the following objectives:

- o To prepare the regional research centers for more involvement in countryside development;
- o To ease the heavy dependence of the country on colleges and universities for research manpower; and
- o To lessen the disparity in trained manpower among institutions and regions in the country.

The MRDP has two components: scholarships and technical assistance. Scholarship grants are made available to research personnel to enable them to pursue degree and nondegree programs locally or abroad in their area of specialization.

Technical assistance is generally provided by experts on a short term nature. These experts may come from local or foreign research agencies, colleges, and universities.

The PCARRD MRDP had been supported by ARDP I and II, RRDP, the Philippine government, and international research centers. From 1973 to 1986, the total amount allocated for manpower development from all sources was about ₱54 M (Table 2). The highest contribution came from ARDP II (39.5%), followed by ARDP I (28.0%), other international funding institutions (17.7%), PCARRD (13.9%), and RRDP (0.9%). During the same period, PCARRD awarded about 2,765 scholarships, 899 of which were degree trainings (Table 3).).

Table 2. Funds allocated to PCARRD Manpower Resources Development Program, 1973-1986.

Program	S Sources of Funds* ıS*					
	ARDP I	ARDP II	RRDP	PCARRD	OTHERS	TOTAL
	(pesos x 1000)					
Training	13,540	18,735	460	7,539	9,591	49,865
Degree	10,845	12,787	441	6,741	5,961	36,775

Nondegree	2,695	5,948	19	798	3,630	13,090
Technical Assistance	1,590	2,636	–	–	–	4,226
TOTAL	**15,130**	**21,371**	**460**	**7,539**	**9,591**	**54,091**

PCARRD – Philippine Council for Agriculture, Forestry, and Natural Resources Research and Development.
ARDP I – Agricultural Research and Development Project I
ARDP II – Agricultural Research and Development Project II
RRDP – Rainfed Resources Development Project
Others – FAO/UNDP, etc.

Plans and Programs

The process of strengthening the capability of the NRDN is a continuing concern. Inspite of the substantial investments in research manpower and facilities over the last 15 years, there is still a need to support such activity. As the NRDN grows, different facilities and manpower are needed with the development of more sophisticated research methods and techniques.

To further strenthen the capability of the NRDN, PCARRD is currently working on a proposal on "Strengthening Technology Transfer and Utilization in Agriculture and Natural Resources in the Philippines." The components of the program include: rural-based enterprise development; strenthening the research-extension interface; and research support to small farm production systems and selected rural-based enterprises development. This proposed program is an expansion of the recently approved USAID-assisted program entitled "Strengthening Regional Research Management for the Philippines."

PCARRD, in cooperation with the regional R and D consortia, is currently updating its data on the research capability of the NRDN. The research manpower, infrastructure, and equipment of the network are being surveyed and their status assessed. The information will be needed in determining the requirements of the different agencies vis-a-vis their programs and responsibilities. It is expected to be completed within the year.

PCARRD is also working on a scheme to assist the NRDN in the purchase of research equipment and supplies which are not readily available in the local market. Availability of the equipment and materials at the precise time they are needed is a critical

Table 3. Number of PCARRD scholarship awards, 1973 to 1986.

	Type of Training Degree	Nondegree	Total
By Agency TOTAL	899	1866	2765
Department of Agriculture (DA)	98	651	749
Department of Environment and Natural Resources (DENR)	55	92	147
Department of Science and Technology (DOST)	112	256	368
State Colleges and Universities (SCU's)	412	651	1063
Commodity Research Institutes (CRI)	79	142	221
Other Collaborating Agencies	143	74	217
By Region TOTAL	899	1866	2765
I	81	175	256
II	64	112	176
III	99	232	331
IV	231	595	826
V	61	68	129
VI	86	112	198
VII	8	44	52
VIII	57	108	165
IX	9	20	29
X	20	38	58
XI	23	99	122
XII	72	73	145
NCR	88	190	278
By Sources of Funds TOTAL	899	1866	2765
ARDP I	302	81	383
ARDP II	265	125	390
RRDP	8	8	16
PCARRD	306	1164	1470
Other Sources	18	480	498
ACIAR	2	–	2
AVRDC	–	14	14
Benchmark Soils Project	2	–	2
CIAT	–	12	12
CIMMYT	–	28	28
FAO/UNDP	8	365	373
ICRISAT	–	12	12
IDRC-Root Crops	1	–	1
IITA	–	4	4
INTSORMIL	2	–	2
IBPGR	2	45	47
Peanut-CRSP	1	–	1

factor which would ensure success of the project. Since not all the needed facilities can be obtained due to financial constraints, it is necessary to optimize the use of the existing facilities. The operationalization of the regional consortia on the aspect of sharing of facilities is one way to do it.

Research and development will always remain as an important and vital activity in any country to improve the living conditions of its people. The earlier our national leadership realizes and observes this fact, the better for all of us.

Strengthening Research Capabilities: A BPI Experience

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Manpower Resources Development

Training and Career Development

In-Service Training. The attainment of the Bureau of Plant Industry's goals hinges on the knowledge, skills, and attitudes of its personnel. In view of this, the Bureau of Plant Industry (BPI) devises systematic plans of action annually for personnel training, which may be classified as follows:

- **Orientation/reorganization.** Orientation refers to courses for new employees while reorientation offers courses for old employees who have recently been promoted or transferred.
- **Employee development.** This consists of training activities for first-level employees with secretarial/clerical, custodial, or janitorial positions. Training in the trades and crafts is included in this category.
- **Professional/technical/scientific training.** This covers training for second-level employees in engineering, legal, scientific, social science and such techniques and special skills as automatic data processing, personnel management, finance and budget. Overseas training and study tours are generally included in this category.
- **Supervisory development.** This includes courses for supervisors on work systematization, team building, and system effectiveness.
- **Middle management training.** This consists of such

courses for middle managers as the JET-STREAM; human relations and communications; and project management, monitoring, and evaluation.

- **Career executive development.** This is intended for employees on the third level and includes courses conducted by the Career Executive Service Board or the Civil Service Commission, in coordination with the Development Academy of the Philippines, the Philippine Executive Academy, and the National Defense College of the Philippines.

The National Scholarship Development Program (NSDP). The NSDP has been devised to provide formal education to permanent employees who wish to complete professional or technical courses or to pursue higher studies. Applicants are screened by the BPI screening committee and if qualified, are given money in advance for tuition, prescribed textbooks, and other fees as officially billed by the university or school. The advanced amount is repaid through salary deductions, which may be done either while the employee is enjoying the scholarship or after the completion of the course. Those who are able to maintain a high scholastic record will not be required to repay. This is the government's way of recognizing exemplary academic performance. On the other hand, the scholarship is cut when the scholar fails one of his subjects, resigns, or is dropped from the service.

Applicants are advised to opt for government-preferred courses which will benefit agrarian reform and natural resources; foreign trade; infrastructure utilities; health and nutrition; education and manpower; population; housing, social welfare and community development. Interdisciplinary courses like economics, project development and evaluation, public finance, computer technology, or development communications may also be selected. Classes slated after office hours should be chosen to prevent interruption of office work.

In case of scholarship, fellowship or training grant abroad, the NSDP grants may be deferred until the scholar completes such scholarship, fellowship or training grant.

The CSC Scholarship Program in Public Administration (CSC-SPPA). There is also the scholarship program in public administration for a masteral degree. Those who belong to the career service may qualify to take the competitive examination given by the Civil Service Commission. A successful examinee should enroll within one year after passing the examination.

The BPI shoulders the necessary expenses while the employee is on scholarship. The scholar, however, is required to serve the government for two years for every academic year of scholarship that is enjoyed. In case the scholar does not want to stay with the government service, he has the option to reimburse all expenses.

Overseas Training. Training and development opportunities for government employees are regulated by the Special Committee on Overseas Scholarship and Training Grants which is under chairmanship of the Deputy Director General of the National Economic and Development Authority (NEDA). Initial screening of applicants is done by the BPI while final screening is undertaken by the NEDA. Trainees who have completed a course under this program are obliged to serve the government for three years for every year (or a fraction thereof) of the grant enjoyed.

Incentives and Awards Systems

The BPI gives awards to encourage efficiency and integrity, the qualities which contribute to the overall efficiency of the Bureau and enhance the image of the public servants. The awards, both in cash and in kind, are given to exemplary employee and division, as chosen by the Incentive Awards Evaluation Committee of the BPI.

The nonmonetary awards consists of honor, outstanding performance rating, length of service and retirement awards. Plaques, trophies and certification of commendation are also given to deserving employees and divisions.

Grantees of honor awards and outstanding performance rating awards are given priority for promotion.

Merit Increase

The merit increase is a salary increase granted to employees who have:

- Rendered outstanding performance in assigned functions, including a creditable accomplishment of special assignment that benefits the Bureau;

- Introduced significant cost-saving and efficiency enhancing innovations;
- Rendered outstanding rural service in community projects, or completed an educational course directly useful to office work, provided, however, that each educational qualification is not a minimum requirement for appointment to the position, that performance is at least "very satisfactory" during the rating period immediately preceding the degree, and that the degree was obtained at the initiative of the employee and not at the expense of the Bureau.

Research Facilities Development

Capital outlay for research facilities include buildings, roads, water system, power source, transportation, laboratory and field equipment. The cost of such assets is a major item in the operation of research.

The acquisition of research facilities are through (1) budgetary appropriation, (2) grants-in-aid, (3) foreign-funded projects through loans, and (4) external linkages.

Budgetary Appropriation. Capital expenditure budget is included in the agency annual budget. To avail of this fund, a Malacañang clearance had to be requested prior to budget release. Our experience had shown that this is not usually released especially if it is for the purchase of vehicle and equipment.

Grants-in-Aid. Most of the research facilities of the BPI are grants-in-aid under Bilateral Agreement.

From the Philippine Council on United States Aid (PHILCUSA) in the late 1950s, we were able to equip 12 Regional and one Central Office Seed Laboratories. Included in this project were farm machinery and equipment for seed improvement and production program.

The Philippine-German Crop Protection Program started as a pilot project in 1969. The Bureau of Plant Industry provides land, building and personnel while the German's counterpart include chemicals, motor vehicles, sprayers, laboratory equipment, and other materials needed in the implementation of the project.

The project also established and equipped the Regional Crop Protection Training Center at MRRTC, Nueva Ecija; Regional Crop Protection Center at Regions I, V, VI, VII and X, and Pesticide Residue Laboratories at Manila, Cebu, Cagayan de Oro, and Baguio. Lately, a Biological Control Laboratory in Manila was constructed and equipped by the project.

The project also sends BPI personnel working on crop protection to training, observation tours and study grants here and abroad.

Our other RP-German Project is based in Baguio Experiment Station. RP-German White Potato Research and Development and Seed Production Program. The Seedpotato Serum Laboratory in Baguio was equipped by the project. Rapid Multiplication Technique (RMT) is carried out in this laboratory and green houses in Baguio for basic seed production in Buguias Seed Farm.

Another project is the RP-German Fruit Tree Program which was also implemented at the Baguio Experiment Station. Again, the government provided funds for infrastructure and the Germans donated the needed laboratory equipment and facilities for *in-vitro* laboratory.

Foreign-funded project through loans. The Expanded Seed Production and Distribution Project (ESPDP) is financed by foreign funding from Overseas Economic Cooperation Fund of Japan (OECF) and local counterpart funds from the General Revenue of the Philippines. Foreign funds for the initial stage amounted to ¥781,187,000 and ¥1.357 B for the supplementary stage, while the local counterpart provided ₱36,281,438 for the initial stage and ₱14,320,000 for supplementary stage. Foreign funds cover the cost of land farming equipment, irrigation pumps, seed processing plant, postharvest facilities, vehicles, and other machinery.

Local counterpart fund covers the cost for improving various infrastructures in the different project stations (20 Experiment Stations), such as field improvement, farm building construction, and other physical improvements.

External Linkages

In carrying out its multifaceted functions, the Bureau of Plant Industry coordinates with other agencies both within and outside the Department of Agriculture. Such relationship may be classified into three categories: as source of support/guidance; as a working partner; and as recipient/beneficiary of the Bureau's services.

Among the more notable of the agencies from which the Bureau draws support are the National Economic and Development Authority (NEDA), University of the Philippines at Los Baños (UPLB), the International Rice Research Institute (IRRI), and the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD).

In the areas of planning, the Bureau dovetails its thrusts and priorities with NEDA policies and guidelines.

PCARRD is both a benefactor and working partner of BPI. The Bureau is under the research umbrella of PCARRD and as such receives direct support in carrying out its research activities. At the same time, in its policy-formulation and planning tasks, PCARRD also draws from the Bureau's pool of technical experts. A number of bureau officials are either chairman or members of the various commodity teams of PCARRD. The commodity teams are the planning and policy-formulating bodies for the different commodities under which researches are undertaken.

From IRRI, the bureau receives support in its seed production program, especially on rice. High class seeds of the IR series are provided by IRRI to BPI which are in turn multiplied in the latter's seed farms and eventually distributed to farmer-seed growers. BPI-IRRI Industrial Extension Project is another research-extension program of the BPI.

The Bureau has a similar working relationship with the UP College of Agriculture in the production of seeds other than rice. In addition, BPI occasionally draws assistance from UPLB's pool of technical experts for certain programs/projects.

Strengthening Research Capabilities Through Manpower Resources and Research Facilities Development: FORI's Experience

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Introduction

When we speak of strengthening research capability, we necessarily draw upon two complementing factors: staff quality and the nature, adequacy and appropriateness of work based on research facilities. It is one case of blending of human resources and environment where optimum productivity is the product. This does not altogether ignore the powerful impact brought about by national policy upon productivity. The policy sets the framework. However, its actualization rests upon the capability to deliver. Ultimately, capability is dependent upon the interaction of the two factors: manpower and facilities development.

The Forest Research Institute (FORI) experience reveals that strengthening research capabilities has been extensive. In this context, allow me to present the FORI experience in building up its capabilities as a research institution.

Manpower Resources Development

For the past 14 years, FORI pursued a vigorous staff development program to upgrade and strengthen the capabilities of its personnel. The Manpower Development Program launched in

1975, was designed to have a continuous and a dynamic advanced training in various disciplines for promising technical and non-technical staff of the FORI.

Degree Training Program

As of 30 May 1988, then FORI now the Ecosystems Research and Development Bureau (ERDB), has a total of 257 scholarships granted, 68.09% of which came from FORI/ERDB fund, and 20.62% from PCARRD scholarship grants (Table 1). Other local agencies like the Bureau of Forest Development (BFD), National Science Development Board (NSDB), National Water Resources Council/National Hydraulic Research Center (NWRC/NHRC), and international agencies like the United Nations Development Program (UNDP); East-West Center, Hawaii, USA; Colombo Plan; Canadian International Development Agency (CIDA); Fullbright Hayes – The Philippine American Education

Table 1. Number of FORI/ERDB scholarship grantees from 1974 to May 1988.

Sponsor	Grantees			
	BS	MS	PhD	Total
FORI	35	123	17	175
PCARRD	–	42	11	53
BFD	–	2	–	2
NSDB	–	2	–	2
NWRC/NHRC	–	1	–	1
UNDP/FAO	–	6	4	10
IDRC	–	1	2	3
Fullbright Hayes-PAEF	–	1	–	1
PCARRD-USAID	–	–	1	1
East-West Center	–	–	1	1
Colombo Plan	–	–	1	1
CIDA	–	1	–	1
RRDP-USAID	–	1	1	2
On Assistantship	–	–	4	4
Total	35	180	42	257

Foundation (PAEF), the United States Agency for International Development (USAID), and those that were on assistantship abroad made up the remaining 11.29% of scholarships granted to FORI/ERDB research.

The FORI/EDRB manpower development program has graduated 158 scholars (Table 2) from various disciplines (Table 3). Some of these successful scholars are now rendering services to their mother agency. Others are in the field units now absorbed by DENR regional units. Some have transferred to other institutions.

Table 2. Number of FORI/ERDB scholarship graduates from 1974 to May 1988.

Sponsor	Graduates			
	BS	MS	PhD	Total
FORI	25	73	4	102
PCARRD	–	33	5	38
BFD	–	2	–	2
NSDB	–	2	–	2
NWRC/NHRC	–	1	–	1
UNDP/FAO	–	4	3	7
IDRC	–	1	1	2
Fullbright Hayes-PAEF	–	1	–	1
PCARRD-USAID	–	–	1	1
East-West Center	–	–	–	–
Colombo Plan	–	1	–	1
CIDA	–	1	–	1
RRDP-USAID	–	1	–	1
On Assistantship	–	–	–	–
Total	25	119	14	158

Table 3. Summary of grantees who completed their degrees with their field of specialization, 1974 to June 1988.

BS		MS		PhD	
Economics	–1	Aeral Photogrammetry	–1	Forest Biometry	–1
Forestry	–19	Agriculture	–1	Forest Botany	–1
Inland Fisheries	–1	Agriculture-Soil Sci.	–3	Forest Ecology	–1
Recreation & Parks Admn.	–3	Agrometeorology	–1	Forest Mensuration	–1
Industrial Mgt. & Manager's Program	–1	Animal Science	–1	Forest Resources Mgt.	–2
		Anthropology	–1	Silviculture	–3
		Environmental Science	–1	Timber Management	–1
		Extension Education	–1	Tree Improvement	–1
		Fiscal Administration	–1	Watershed Mgt. and Environmental Science	–1
		Forest Biological Sciences	–1	Wildlife Ecology	–1
		Forest Biometry	–1	Range Management	–1
		Forest Botany-Taxonomy	–1		
		Forest Ecology	–3		
		Forest Economics	–5		
		Forest Entomology	–3		
		Forest Genetics	–3		
		Forest Mensuration	–1		
		Forest Pathology	–4		
		Forest Resources Mgt.	–2		
		Forest Engineering	–4		
		Pathology	–2		
		Physiology-Seed Technology	–1		
		Plant Physiology	–2		
		Production Management	–1		
		Public Administration	–3		
		Range Ecology	–1		
		Range Management	–4		

Table 3. Continued.

BS	MS		PhD
	Rural Sociology	–3	
	Silviculture	–23	
	Silviculture and Forest Influences	–2	
	Soils	–1	
	Statistics	–1	
	Timber Management	–6	
	Tree Improvement	–2	
	Tree Physiology	–8	
	Water Resources Eng'g.	–1	
	Water Resources Mgt.	–1	
	Watershed Management	–8	
	Wildlife Management	–5	
	Zoology	–4	
	Botany-Plant Nutrition	–1	
	National Security Admn.	–1	
Total 25		119	14

At present, of the 61 researchers taking up advanced studies (Table 4), 23 are pursuing their Ph.D. degree; 31 are taking their master's degree and 7 are working for their B.S. degree.

This school year 1988-89, the ERDB Manpower Development Program will send three scholarship grantees to pursue a masteral program in Forestry at the University of the Philippines at Los Baños (UPLB). Two of these grantees are sponsored by ERDB and one is under the sponsorship of FAO/UNDP.

Nondegree Training Program

To provide opportunities for other qualified and deserving personnel and to strengthen our staff development program, the

Table 4. Number of scholarship grantees who are still pursuing their BS/MS/PhD programs as of 30 May 1988.

Sponsor	Ongoing			
	BS	MS	PhD	Total
FORI	7	29	11	47
PCARRD	–	–	4	4
UNDP/FAC	–	2	1	3
IDRC	–	–	1	1
East-West Center	–	–	1	1
RRDP/USAID	–	–	1	1
On Assistantship	–	–	4	4
Total	7	31	23	61

FORI/ERDB has sent participants to local and foreign trainings, seminars, workshops, conferences, and study or observation tours.

For local trainings, participants were sent to the Development Academy of the Philippines (DAP), Junior Executive Training (JET) Program, and Philippine Executive Academy (PEA). Some also went on training courses, seminars/workshops under the sponsorship of BIOTROP, DANIDA, FAO, JICA, IDRC-IUFRO, PCARRD-USAID, IFIAS, UNESCO-MAB, and ASEAN-US Watershed Project.

Lately, we have sent abroad participants for training on Forestry Products Research, Watershed Management, Bird Migration Research Techniques, Community Forestry Development Techniques, Forest Entomology and Research Training Program, Financial Economic Analysis and Determination of Social Impacts of Watershed Management Projects.

In the reorganization of the DENR, research staff of FORI/ERDB were assigned to vital positions in the DENR Organizational set-up. Twelve of our key officers who are holders of MS or PhD degrees were tapped as Regional Technical Directors. The transfer and/or reassignment of these well-trained researchers of ERDB, helped in filling up many of the key positions in DENR. However, ERDB will have to build up its manpower capabilities again in order to cope with the demand for high caliber researchers to fill in the gap.

Research Facilities Development

A Review

The FORI/ERDB research facilities build-up wraps up more than a decade of experience. It is more of a centralized operation which started out simply with a core of 153 working staff mostly from the Forest Research Division (FRD) of the BFD, housed at the Los Baños Forest Experiment Station. The latter was one of five forest experiment stations of the defunct FRD. The building was designed to accommodate only 40 as against 556 personnel in 1976. In the same year, FORI finalized the blue print of the FORI Headquarters Building.

To beef-up research facilities build-up, the Institute carried out various programs as follows:

- Acquisition of suitable research sites and experimental forests
- Establishment of a national research network on forest production and harvesting research comprising of eight research centers and 21 research stations
- Construction of needed research infrastructures for the conduct of research/research infrastructure development
- Acquisition of scientific equipment and vehicles
- Computerization program
- Research tie-ups/linkages

Acquisition of suitable research sites and experimental forests. This was undertaken to provide working and training ground for researchers while these equally serve as show-window of intensive forest research and development projects on forest production and harvesting.

Establishment of a national research network on forest production and harvesting research comprising of eight research centers and 21 research stations. FORI established a national research network primarily to develop forest production and harvesting research. This added 80 research centers and 21 research stations to its existing five research divisions. The centers were strategically located in the country and provided adequate logistic facilities, to support major research activities. The stations were likewise strategically located and supplemented the work of the centers.

Research infrastructure development. With the construction of the needed structures for the conduct of research, work performance was greatly accelerated and enhanced. The FORI Central Office Headquarters was finally constructed in 1978. The field research units were provided ,office buildings complete with support facilities such as mini-libraries, greenhouses, basic forestry tools for forestry research, including a motor vehicle for mobility and flexibility. Bunkhouses and housing units were constructed purposely for FORI personnel while guesthouses were also provided for FORI visitors.

Acquisition of scientific equipment and vehicle. At the Central Office in Los Baños in 1977, the acquisition of a small capability data processing unit, laboratory equipment, and office vehicles was initially made possible through the United Nations Development Program (UNDP) assistance. The UNDP Consultant on forestry administration, Mr. Malcolm J. Williamson, has been largely responsible for working out the UNDP assistance to FORI's staff development and research equipment acquisition programs.

Computerization Program. Through this program, efficiency and economy in data processing, documentation, and information retrieval had been achieved.

Research tie-ups/linkages. FORI encouraged the assistance and cooperation of other national and international agencies primarily to augment its meager research budget obtained directly from the national government. Out of these tie-ups, infrastructure development has likewise received a big boost.

The Current Scenario

To date, ERDB has invested extensively in the Central Office and the field units to develop its research facilities. However, in the light of the current DENR reorganization and regionalization thrust, most of the research facilities and all the field units had been integrated into the regions. The facilities which include the center building, equipment, experimental forest, etc. became a part and parcel of the regional office.

Recommendation

Committed to the pursuit of truth, relevance, and responsiveness to the needs of the times, ERDB had long traversed the line from a highly centralized organization to a more autonomous regional set-up, where each center has a high degree of flexibility to pursue its regionalization thrust. It had extensively invested in the development of manpower resources and facilities of the field research units.

Over and above, there are valuable lessons to be learned out of the past administrative experience. Having gone through the gamut of establishing each piece and parcel of working unit, ERDB remains committed to harnessing each unit to its fullest measure of utilization, production, development, and actualization.

In view of the aforementioned, and in the light of the role of manpower resources and research facilities development in strengthening research capability, the following strategies are recommended:

- **Research Facilities and Funding**

Research facilities should be encouraged and developed to meet the actual and future needs of the region.

Funding should be made available in accordance with what has been approved in the appropriation to boost the morale, confidence, enthusiasm and cooperation of field staff and to promote self-reliance and productivity. The human factor which ordinarily serves as a constraint to productivity is then reversed to become a most enhancing attribute to increase productivity.

- **Research Coordination**

As mandated, ERDB will develop a DENR plan for the Philippine ecosystems and natural resources. Along this line, the research units of all the regional offices would be brought to the mainstream of the research planning, management, and evaluation processes of ERDB. Hence, theoretically and technically, the RTD's for research are the implementing arms of the ERDB's research programs. It is not, however, altogether correct to say that it is the ERDB's research program. It is in fact the DENR's research program, only that ERDB is spearheading the process.

Likewise, the research thrusts and priorities identified during re gional consultation, which are now implemented for planning pu poses are not totally that of ERDB but are those of the DENI regional offices. The ERDB's role is more of a catalyst.

On another aspect of research management, we would like t advance the proposition that ERDB as a staff bureau shoul support the research program of the regions as developed by then during the regional consultations. This way, a system of researcl management, though structurally loose, can be strongly develope in its process. This would, however, require a strong commitmen and understanding towards research among the Regional Execu tive Directors (RED). As a consequence, ERDB suggests the draw ing of guidelines to be developed jointly by the regions and ERDB We are laying this with emphasis and urgency before research i lost and resources dissipated due to inappropriate linkage an understanding. The research system developed by PCARRD whicl up to now remains as a finer mechanism for research managemen can be a good reference to determine relationship in the manage ment of research between ERDB and the regional offices.

- **Research Management**

While this paper aims to look at the manpower and research facilities, it also aims to emphasize on the research management because ultimately, all resources would be wasted if they are not properly developed and harnessed with the intended focus, object- ive and relevance. Presently, DENR is developing its R and D plans, reviewing its manpower and research facilities in the region. identifying problem areas, and prioritizing and formulating strate- gies to solve problems. We are now for the first time entering the ecosystems approach in research management as mandated under Executive Order No. 192. Broader areas integratedly identified are not just traditional forestry fields but include other components which were not within the research domain of the FORI before. It is, therefore, expected that there will be great deficiency in both manpower and facilities now existing in the region relative to the broader coverage provided for in Executive Order No. 192. Initial regional consultations conducted in Regions VIII and Region IX show such situation.

- **Commitment of Manpower and Resources to Research**

The other point that should be stressed is the commitment to research of both manpower and resources. It is important that such commitment be secured at the regional office. We feel guardedly confident that this workshop is a first step to such commitment, and we would like to feel and be assured that such commitment be made a continuing resolve.

Research Capability Development: CSSAC Experience

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Research capability development is the building of a broad and strong institutional base (manpower and facilities) to carry out a balanced development program addressed to regional needs. Manpower development, on one hand, relates to the sufficient supply of adequately trained and motivated people to perform the task required of the organization's mission and objectives. Physical facilities development, on the other hand, provides the needed climate and hardware to ensure quality research output.

To achieve a broad and strong institutional base, we set forth in a serious research capability development planning activity. We envisioned the output as a framework plan with critical mix of manpower and facilities vis-a-vis emerging regional needs. The capability build-up is based on five factors: resource endowment, trends and opportunities, prevailing industries, development plans of line agencies, and the mission and goal of the institution. We feel that a clear understanding of these factors and their interrelationships would generate the needed information to fill the manpower and facility gap. Obviously, the analysis would crystallize a research agenda which require manpower and facilities: manpower expressed in terms of disciplines and specialization, facilities indicated as laboratories, and equipment.

The manpower development program stresses that the institution has the right number and kind of people in the right place at the right time. It also takes into account the attitudes and aspirations of employees and the institution's response to the changing external and internal environment.

Essentially, the number and kind of people is determined based on the role/mission of the college and the uniqueness of its target.

Facility development, on the other hand, is an offshoot of manpower development. The type of environment, and technical hardware largely depend on the number and kind of people in the organization.

We have developed the necessary linkage with financial sources for the various investment needs of manpower and facility development. Likewise, we developed a phasing mechanism wherein manpower and facility development are scheduled in the implementation strategy based on the order of priority.

In summary, the attainment of a strong and broad institutional base largely depends on the grasp of the existing scenario, the target area and the expected role of the institution. Manpower development does not merely involve recruitment or hiring of the right people, but instilling an environment wherein every person would feel he is a part of the institution. Quality research output comes easy if everybody is committed and happy. As this is achieved, the process of making the right people working confidently and efficiently in the institution for greater effectiveness in terms of academic excellence, relevance, and responsiveness is happily being attained.

Salient Features of the Accounting and Auditing Manual for Research Operations

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The Accounting Manual provides general guidelines in the accounting of funds for research and development and related activities. It provides the use of: 1) Books of Accounts including Project Cost Ledger; 2) Chart of Accounts; 3) Accounting Procedures, process and paper flows; 4) Accounting forms, records and reports; and 5) Sample accounting entries for interagency transfer of funds, receipts, and disbursements of funds.

The auditing requirements applicable to research transactions as indicated below incorporate updated as well as new provisions:

Personal Services

Under personal services, the following were highlighted: granting of merit increase and annual 5-day vacation leave. It also includes hazard allowance which is the inclusion of provisions that this may be paid in amounts predetermined by the research agency concerned and that the decision on the category to which a particular assignment may be classified will be determined by the head of DOST or PCARRD.

Honoraria coverage includes extension workers among recipients; redefinition of technical personnel to include auditors, accountants, and other personnel whose technical expertise in their own fields of specialization is required.

Honorarium rates include a provision specifying that "unless otherwise expressly stipulated in the Memorandum of Agreement between a government institution and a foreign/local donor, the rates of honoraria shall conform with the schedule and guidelines formulated by the National Research and Development System of the DOST in consultation with the Department of Budget and Management."

Medical allowance may be granted on the basis of a substantive law.

The DOST System Career Path is recommended for adoption by members of the National Research and Development System.

Travel

Travelling allowances are those provided for in Executive Order No. 53.

The allowable rates 1/ (reimbursement of actual expenses) are as follows:

Place of Travel	Rate per unit Breakfast	Lunch	Dinner	Total Rate per day
Urbanized cities	₱25	₱45	₱40	₱110
Chartered cities	25	40	35	100
Other places	25	35	30	90

It also features cash advance for travel, and the issuance of fuel by a government agency to privately-owned vehicles which is strictly prohibited, as well as reimbursement for the cost of gasoline and oil where a private vehicle is used. However, reimbursement may be made of the equivalent cost of the customary mode of transportation.

Repair and Maintenance of National Government Facilities

It includes relevant provisions of PD No. 1594 regarding contracts/letter orders and provisions relating to government takeover by administration of delayed infrastructure projects or awarding of the contract to their qualified contractors.

1/ All rates established herein are subject to change due to inflation and other fiscal considerations that would affect the purchasing power of the peso.

Other Services

It includes the following:

- Printing services – this includes a provision that printing work of forms which pertain only to a particular agency/office including technical, scientific, and popular information vital to the development programs of the government in the effective dissemination of science and technology to the end-users and that the printing work may, at the option of the requisitioning agency, be contracted directly with private printers.
- Supervision and bonding of accountable officers – with additional provisions.
- Membership fees/dues to private organizations – new provision: Membership fees/dues to government associations, "national professional organizations duly accredited by the Professional Regulation Commission, the Integrated Bar of the Philippines", etc. may be allowed if charged against the "Extraordinary and Miscellaneous Expenses" account of an agency.
- Performance awards – inclusion of a provision that these awards are separate and distinct from those that may be granted by agency heads pursuant to PD No. 807 relating to merit increases.

Supplies and Materials

Supplies and materials include: a) semi-expendable property having value of less than ₱1,500; and b) large cattle, including carabaos, cows, horses, mules, assess and other members of the bovine family, irrespective of acquisition cost, used solely and exclusively in research work.

Emergency purchases do not require canvass when the amount involved is less than ₱2,000.

Extraordinary and Miscellaneous Expense

This chapter replaces the chapters on Discretionary Expenses and Representation Expenses

Furniture and Equipment Outlay

Furniture and equipment outlay includes computer hardware, property having a value of ₱1,500 or more and nonexpendable property to be used in specialized research work with a value of P1,500 or more.

Purchases over ₱2,000 per purchase order will be supported by canvass from at least three sources.

PD No. 1502 stipulates that purchases exceeding ₱5,000 are subjected to public bidding. However, considering the tremendous increase in prices of commodities in the market, it is suggested that this amount be raised to ₱50,000, same as that for supplies and materials.

Suggestions of the National Research and Development System For comments/considerations by the Civil Service Commission, Department of Budget and Management and Commission on Audit in their review of the Revised Auditing Manual for Research Operations

PROVIDING FOR ADDITIONAL ADMINISTRATIVE REFORMS TO PROMOTE EFFICIENCY AND PRODUCTIVITY OF SCIENTIFIC AND TECHNOLOGICAL RESEARCH AND DEVELOPMENT ACTIVITIES

WHEREAS, economic recovery is a matter of utmost national concern;

WHEREAS, agriculture and natural resources are among the major sources of growth for economic recovery;

WHEREAS, in order to attain economic recovery, the government has focused its attention to the full development of its scientific and technological resources;

WHEREAS, an integrated national/regional agriculture and resources research and development program is vital for the attainment of national goals for economic growth;

WHEREAS, it is necessary that research and development in science and technology be given utmost encouragement and divorced from restraints.

NOW, THEREFORE, it is hereby promulgated that:

Sec. 1. The Department of Science and Technology (DOST), through PCARRD, shall endorse to the Department of Budget and Management (DBM) and the National Economic and Development Authority (NEDA) all agency requests for funding whether from local or external sources, for research and development projects and related activities.

Sec. 2. In consonance with E.O. No. 128, all funds (government and external) intended for research and development and related activities shall be programmed in consultation/coordination with the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) and the Department of Science and Technology (DOST). Grantees may directly receive external funds and funds from local donors provided these are purely grants and would not require counterpart funding from the government and provided, further, that the Department of Budget and Management and the Bureau of Treasury are appropriately informed about the receipt of such funds. Funds from the government shall be treated as continuing appropriations, and shall be comprehensively released at the beginning of the year to implementing units.

Sec. 3 The source agency shall disburse as outright expense, whenever appropriate, funds intended for research and development and related activities and release the same directly to implementing units who shall record such receipts as trust funds.

Sec. 4. Funds, regardless of its source, intended for research and development and related activities may be realigned to meet the projects' requirements for personal services, maintenance and operating expenses, and capital outlay upon approval by the head of agency or donor whenever appropriate.

Sec. 5. Unexpended fund balances of completed projects shall not revert to the national treasury but shall be used to fund priority research and development undertakings.

Sec. 6. All revenues and receipts accruing from research and development and related activities such as, but not limited to, sale or royalties from publications, training fees, payment for literature/information search or data processing services, sale of produce as well as unexpended balances of research grants shall be deposited as trust funds. With prior approval of the grantor or head of agency, as the case may be, these may be used to augment operating funds for research and development and related activities.

Sec. 7. All output of research and development and related activities for printing, binding and other incidental work shall be exempted from the provisions of Section 1644 of the Revised Administrative Code, as amended; and from the requirements of the Department of General Services Order No. 4, Series of 1972.

Sec. 8. The DOST through PCARRD in consultation with the Commission on Audit (COA) and Department of Budget and Management (DBM) is directed to initiate the formulation of rules and regulations and procedures to improve the accounting and budgeting systems for research and development. This shall carry the force of law.

Sec. 9. The accounting system for research funds and all rules, regulations and procedures prescribed for research and development and related activities shall be implemented by all agencies accredited by DOST or its Science and Technology Councils as part of the National Research and Development System.

Sec. 10. Whenever appropriate as determined by the head of agency and the auditor of the Commission on Audit, contracts for services, supplies and materials and equipment required in the conduct of R and D activities shall not be subject to bidding.

Sec. 11. The DOST through PCARRD is directed to formulate and adopt provisions on travel rates, travel insurance, use of private vehicles in meritorious cases, travel related representation expenses and other types of expenditures incurred to facilitate the coordination/conduct of R and D activities. This shall carry the force of law.

Sec. 12. All items of equipment, supplies and materials and vehicles for research and development and related activities imported by PCARRD and DOST or by representatives of local/international agencies/organizations in consultation with DOST and PCARRD shall be exempt from payment of customs duties or other taxes.

Sec. 13. The Department of Science and Technology (DOST), through PCARRD, is directed to coordinate with Civil Service Commission (CSC) and other concerned government entities in the formulation of policies regarding civil service eligibilities, qualification standards, remuneration schemes for researchers and research administrators. Specifically, for civil service eligibilities, graduate degrees shall be considered as equivalents.

Sec. 14. All acts, decrees, orders, rules and regulations or parts thereof inconsistent herewith are hereby revoked, amended or modified accordingly.

Promulgated this ______ day of __________, in the year of our Lord, Nineteen Hundred and Eighty-eight.

Managing Research-Extension Linkages

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Introduction

In recent years, linkage between research and extension has received increased attention and large investments particularly in the third world. Many of these investments include loans from the World Bank (WB) and regional banks and grants from foundations and donor countries.

A study of 128 WB-funded projects in agricultural research and extension in ten-member countries, concluded that a major constraint to strengthening the process of technology development and transfer is that these functions were treated in isolation from each other by member countries and by the Bank. World Bank efforts in dealing with this issue continue in many places throughout the world. The issue is the current focus of discussions regarding a possible second agricultural support services project in the Philippines (World Bank, 1983). The International Service for National Agricultural Research (ISNAR) is currently involved with a study on research-extension (technology transfer) linkages. The need for and definition of the study came from recommendations of managers of national agricultural research systems (NARS) who highlighted this as a primary concern. The goal of this three-year project is "to identify ways to strengthen the linkages between agricultural research and technology transfer systems in order to improve (1) the relevance of research efforts through a better flow of information and farmers' needs for the research system and (2) the transfer of technology to agricultural producers and other users of agricultural innovation." The project is now in its second year and involves six country case studies, including a study of linkages involved in the adoption of agricultural innovations in the Philippines.

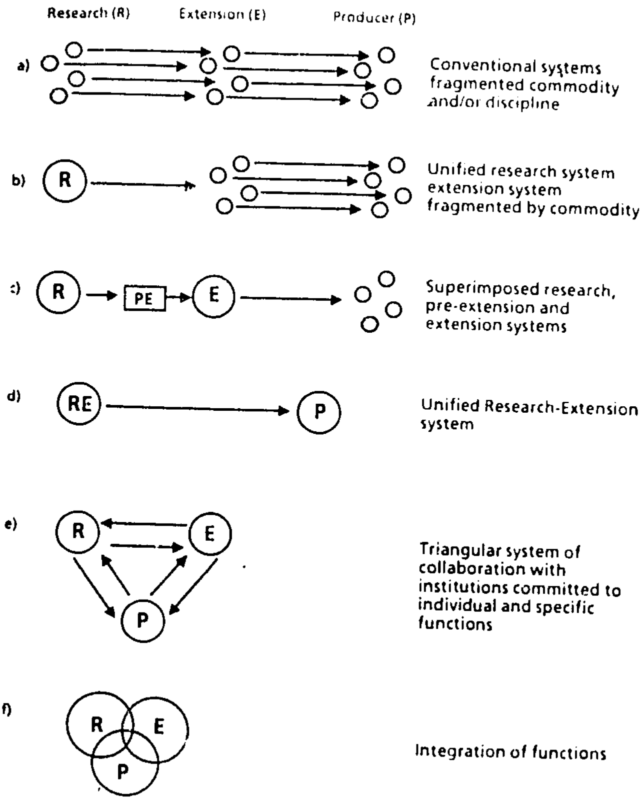
Agricultural Technology Systems

A discussion on research-extension linkages requires an understanding of the functions and processes involved in agricultural technology generation and transfer. There is an increasing acceptance in viewing research and extension functions in the context of a single system. A recent ISNAR publication on NARS linkages presents several common technology transfer schemes (Figure 1) for increasing integrated research-extension-producer interactions (Stoop, 1988).

Several attempts have been made to explain agricultural technology systems through the creation of models. Some focus on technology, including inputs and services; while others give emphasis to knowledge/information flows. One such model was developed by Kenneth McDermott as shown in Figure 2 (McDermott, 1983).

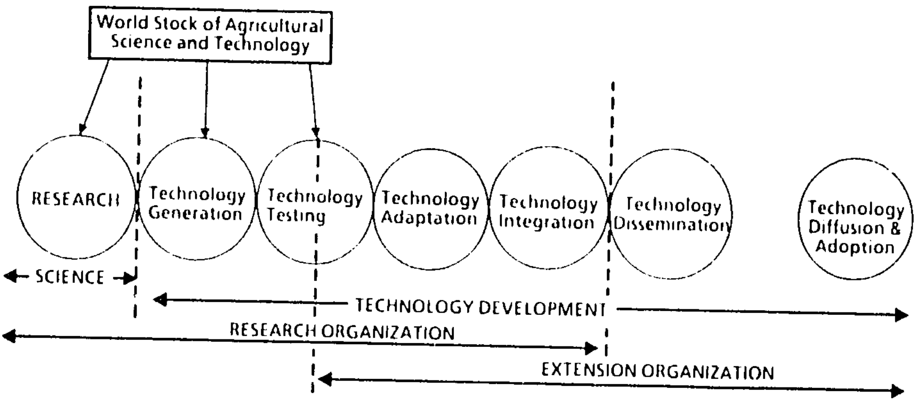
Bernardo (SEARCA, 1986) described another research-extension process (Figure 3) which is a very useful model for understanding the types of research activities and processes involved. It is particularly helpful in defining the area of interface between research and extension, explaining problems, and identifying the need for strengthening linkages.

Figure 4 shows a model developed by Paul Engel of the Netherlands to describe the technology development process (Engel, 1988). The model focuses on the subprocesses involved in any technology development system where both basic research and extension contribute and benefit from the system to serve the farming community. For technology development, Engel made very useful distinctions between: (1) definition of object domain



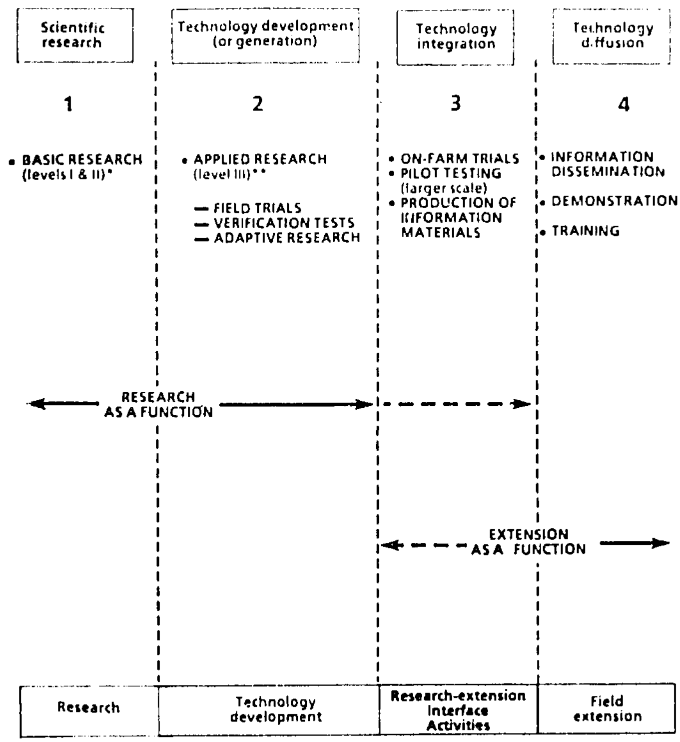
Source: W. A. Stoop, ISNAR.

Fig. 1. Several Common technology transfer schemes for increasingly integrated Research-Extension-Producer interactions.



Source: McDermott, in Rivera and Schram (eds).

Fig. 2. The technology innovation process.

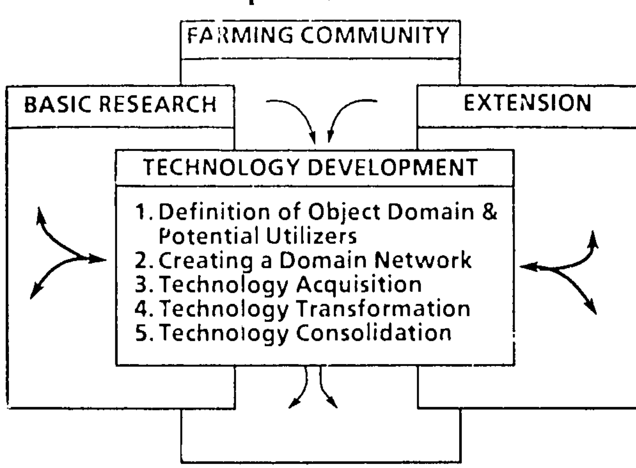


* Level research basic in general sciences such as chemistry, physics and mathematics and level II research – basic research in plant genetics, plant physiology, entomology, plant pathology, nutrition, etc.

** Level III research – applied research or technology development such as in plant breeding, control of insect pests and diseases and fertilizers.

Source: F. A. Bernardo, SEARCA

Fig. 3. The research extension process.



Source: Paul Engel, ISNAR RTTL Project, 1988.

Fig. 4. Research-Extension Linkages: Developing technology to serve a purpose.

(problem fields) and potential users; (2) creating domain networks; (3) technology acquisition; (4) technology transformation; and (5) technology consolidation.

While the process is not necessarily sequential, the amount of energy expended for any one of the processes changes over time for any one object domain. A wide range of research activities (technology transformation) is combined with locally available technology and externally acquired technology to derive new technology for a transfer and delivery system to users. Knowledge, materials, and services make up useful technology.

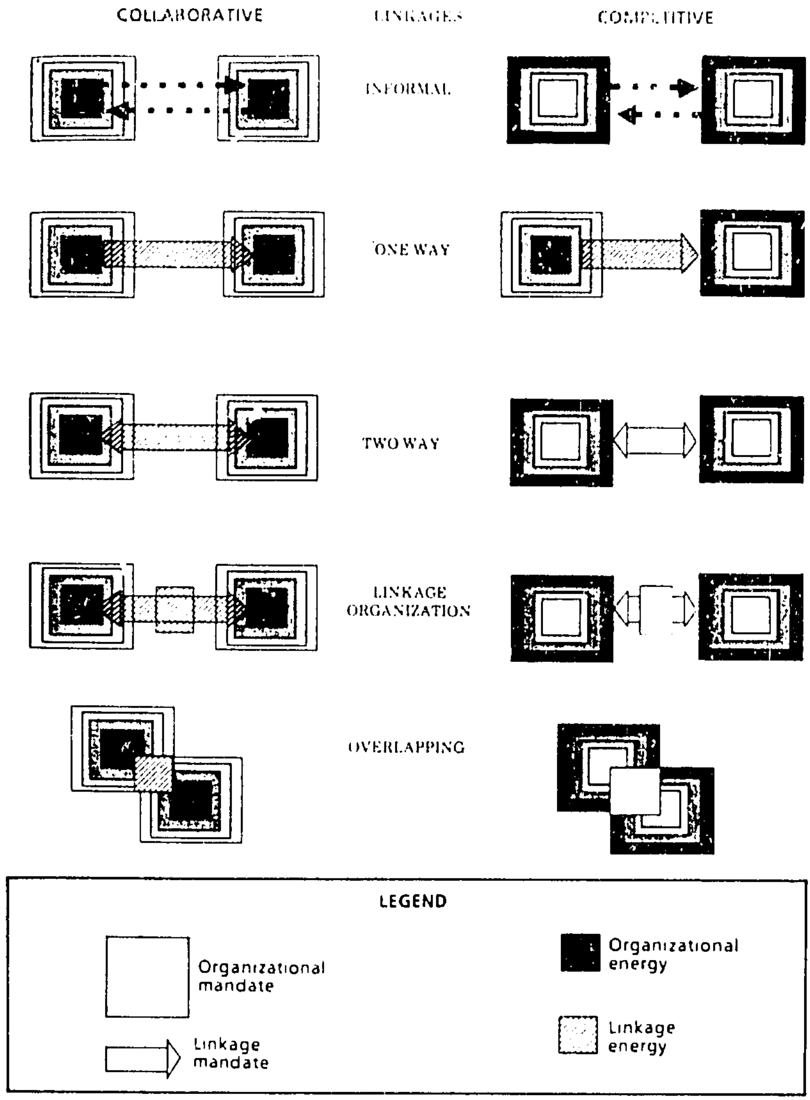
Organizational Behavior

A review of agricultural research-extension linkages also requires an understanding of organizational behavior.

Types of linkages (external relationships) between two organizations are presented in Figure 5. The boxes represent the boundary of the mandate (legitimizer) of an organization. The darkened area within the boxes shows where the energy (resources) of the organization is applied in relation to the mandate. The arrows represent the linkage mandate and the shaded areas within show a level of energy devoted to linkages.

On the left-hand side are several linkage arrangements which demonstrate a level of collaborative effort. The energy is focused at the core or center of the mandate (not the periphery) and the linkages relate to these priority areas. The first organizational arrangement shows effective informal linkages in the absence of a legitimate, defined relationship. The three in the middle show three types of linkage mandates which are functioning, including one with a linkage institution. The last shows organizations with overlapping mandates, but with some economy of energy of resource use (no duplication).

On the right side are the same linkage arrangements involving organizations in a competitive relationship. While competition can result in benefits to clients (consumers) of private organizations, it often results in poor allocation of resources and causes confusion for clients of public organizations. The energy of the organizations is mostly applied at the periphery of the mandate, and the central focus of the mandate is given second priority or



Source: L. Zuidema, ISNAR 1988

Fig. 5. Organizational behavioral models.

left unattended. This is because most of the human and other resources are focused on protection of the structure and resources of the organization itself.

In some cases, energy may also be consumed to capture the mandate of another organization with the justification that the best defense is a good offense. In this case, it is almost impossible to establish and maintain effective program linkages in a highly competitive organization setting. The following points summarize the lessons in Figure 5.

- Organizational mandates govern the utilization of energy.
- Energy is limited to available and mobilizable resources.
- All linkages require energy.
- Competitive mandates may divert scarce energy away from central mandates and towards territorial protection and even invasions.
- Rationalizing respect roles and responsibilities of two or more organizations in a system potentially optimizes utilization of energy to fulfill mandates and facilitate effective linkages.

Linkage Issues

ISNAR has reviewed a large number of national agricultural research systems over the past years. In most of these reviews, several linkages issues relating specifically to technology generation and transfer have been identified (Kaimowitz, 1988). Some of the **structural and organizational issues** concerning research-extension linkages are expressed as follows:

- Should research and extension be combined in one institution at the national, regional or experiment station level? What should be the hierarchical relation between the two?

It was found that combination of the functions in one institution does not necessarily ensure adequate linkages. Whether combined or not, accountability of one to the other was the critical issue.

- What special structures should be set up for carrying out linkage functions e.g., coordinating committees and liaison departments. What activities should they perform?

Who should administer them?

The reports emphasize the creation of permanent liaison departments within research and extension units. While coordinating committees are viewed as useful, results of these as sole mechanisms for liaison have been disappointing.

- For what functions should research and technology transfer institutions have joint responsibility?

Four functions for consideration are: diagnostic activities, adaptive research (on-farm trials), review of research results, and impact evaluation.

- What relation exists between the degree of centralization of authority and resources and the possibilities for effective linkages?

Decentralization of both authority and resources has generally been positive with respect to research-extension-producer linkages. However, it is important to maintain a critical mass of researchers in any location.

- What implications do the use of general, regional, or commodity-specific structures have for linkage possibilities?

In general, high levels of vertical integration of functions enhance the possibility of effective linkages and stimulate producer demand for technology. Single-commodity programs, however, are not suitable for producers or regions where many commodities are raised and the resource base is highly variable.

- How should different functions be divided among public- and private-sector institutions?

In the past, little attention has been paid to private sector interactions.

- What institutional forms facilitate informal linkages?

Physical proximity and regular contact between researchers and extension persons are the most common recommendations.

- How do appropriate institutional forms vary as a result of differences in the organization of agricultural production and marketing?

Experience shows that it is important to adapt institutions to the local environment and realities.

Causes of Linkage Problems

Kaimowitz (1987) identified four general causes of inadequate linkages, namely:

A. Structural and Organizational Problems
   - No one assigned to perform functions such as adaptive research, results, or feedback to researchers.
   - Linkage activities assigned to an inappropriate institute or department, or divided in such a way as to reduce effectiveness.
   - Excessive centralization or decentralization.
   - Insufficient authority to ensure that institutions coordinate their activities and perform their responsibilities.
   - Institutional incompatibilities, such as research by commodity and extension by region, different clientele, or different time schedules for planning and budgeting.

B. Motivational/Incentive Problems
   - Individuals may have little incentive from management to perform linkage functions.
   - Maintenance of institutional autonomy may be reinforced.
   - Rewards for journal publication may be higher than for technology transfer activities.

C. Resource Problems
   - Financial resources for linkage functions, such as publications, testing of research results, and training of extension workers may be scarce.
   - Human resources may be overloaded and not available for these functions.

D. Communication Problems
   - Value systems, educational backgrounds, and communication patterns may differ widely between research and extension workers.
   - Physical means of communications may be weak or nonexistent in critical areas.

Linkage Principles

In an agricultural technology system, different actors play varying and complementary roles and responsibilities. In most cases, the success of each group of actors is dependent on the success of the others in the system. Since most systems include actors in different institutional settings, it is especially necessary to develop linkage mechanisms. Even where many groups of actors are located within an institution, linkages are not automatic and must be managed carefully.

Some functions in a system require intensive linkages and themselves are linkage mechanisms for collaboration between research and extension institutions. An example is adaptive research involving on-farm testing. In other cases, linkage mechanisms involve processes which are important for effective technology development as in feedback information about user needs to researchers.

Before discussing linkage mechanisms, it is useful to review some linkage principles:

- o A common purpose (domain consensus)
- o Perceived advantages for institutional collaboration
- o Common ground or proximity to facilitate collaboration
- o Compatible points of contact (meshed gears run smoothly)
- o Individual incentives for working together
- o Effective communications and feedback flows

These principles are necessary for the effective functioning of any mechanism which facilitates research and extension linkages in institutions and individuals.

Linkage Mechanisms

As part of the ISNAR research-extension linkage study, over 400 documents dealing with the topic have been reviewed. From these documents, a range of mechanisms used to deal with the problems of research-extension linkages can be described. Most of these are based on the context of specific situations and would not be appropriate in all cases.

In many cases, however, solutions are adoptable, at least in part, since they relate to levels of performance in a system over which a manager or policymaker may have some control. Mechanisms fit into two basic categories: (1) structural and organizational; and (2) managerial.

Structural and Organizational Mechanisms

- o Combining research and extension functions into one unit
- o Decentralizing research and extension activities into regional institutions
- o Fielding subject-matter specialists in extension
- o Staffing extension liaison positions in research institutions
- o Establishing communication/information departments
- o Redefining roles and responsibilities between research and extension units
- o Creating interagency committees/councils
- o Developing interagency agreements for collaboration
- o Physically locating research and extension units together
- o Providing for farmer participation in research activities
- o Liaison with private and nongovernment organization

Managerial Mechanisms

- o Redefining job descriptions to strengthen relationships
- o Establishing joint reviews of research and extension activities
- o Improving individual incentives (personal, professional and financial) for collaboration
- o Changing evaluation procedures to emphasize collaboration
- o Exchange of personnel resources such as posting extension staff in a research organization
- o Joint training for expanded roles in a technology system
- o Joint use of facilities and service such as soil-testing laboratory
- o Joint participation in functions such as field testing and demonstrations
- o Promotion of informal linkages
- o Information exchanges using jointly developed formats

The ISNAR project will examine these and other mechanisms by looking at specific innovations developed in research institutions, disseminated through technology transfer units and adopted by farmers.

In the Philippines, we are exploring the possibility of studies on a range of technologies on: (1) the production of the white potato (seed storage, rapid multiplication, and variety development); (2) downy mildew resistance in corn (seed treatment and variety development for white and yellow corn); and low-input, hilly agricultural land technologies (hedgerows, rotations, improved fallow and weed control).

The study hopes to develop diagnostic tools for national research managers to identify and deal with linkage problems relating to technology transfer. Solutions may be related to structural/organizational issues, human resource management, resource allocation, and/or systems management.

Linkage Issues in Farming Systems Research

The questions of linkages between research and extension are basic and critical for all agricultural technology systems. In recent years, the linkage issue has come into sharp focus with respect to farming systems research and extension (FSR and E). Since many FSR and E activities are still embodied in special project, most NARS managers and policymakers now face the question of institutionalizing FSR and E practices and procedures.

An ISNAR study dealing with on-farm client-oriented research (OFCOR) is near completion. The study involves case studies in nine countries (Bangladesh, Indonesia, Nepal, Ecuador, Guatemala, Panama, Senegal, Zambia, and Zimbabwe). A general finding is that OFCOR programs have been fairly successful in diagnosing and at improving the quality of information available on farmers' conditions. However, on-farm research cannot be a substitute for developing linkages with extension for the transfer of technology to farmers.

Two of the central issues of the study are organizational and managerial issues relating to: (1) the integration of on-farm and experiment station research, and (2) linkages between OFCOR and extension.

On-farm and Experiment Station Research

With respect to the integration of on-farm and experiment station research, research managers in the OFCOR studied countries that have used one or more of the following direct linkage mechanisms (Merrill-Sands and McAllister, 1988).

- o Joint problem diagnosis and collaborative priority-setting and planning exercises**
- o Joint programming and review meeting**
- o Joint decision-making on release of recommendations

- o Periodic joint visits to the field**
- o Formal collaboration in trials and surveys
- o Assignment of responsibility for coordination to a specific individual or group**
- o Formal guidelines for allocating time to collaborative activities
- o Specific allocation of funds for collaboration
- o Facilitation of informal consultation**

These mechanisms helped to: (1) create incentives to stimulate and reward collaboration; (2) mobilize resources to support communication, cooperation, and joint activities; and (3) provide opportunities for formal and informal interaction.

On-farm Research and Extension

With respect to linkages between on-farm research and extension, the study identified the following types of relationships (Ewell, 1988):

- o OFCOR as an alternative diffusion mechanisms - This occurred where formal linkages to extension were weak or extension itself was not fully functional.
- o Informal cooperation at the field level This included cooperation by extension workers in securing cooperation of local leaders, identifying collaborators, organizing field days, etc.
- o Participation of OFCOR staff in rural development projects Donor projects often require the collaboration of research and extension workers which may or may not be sustained institutionally.
- o Participation of extension staff as technicians in the research programs Extension staff have been involved as both interviewers in surveys and assistants in experiments. Problems occur where training and time allocations are inadequate.
- o Participation of senior extension specialists as scientists in OFCOR programs Often called research-extension liaison officers, activities involved on-farm demonstration, field days, in-service training for extension

** Present in over 75% of the cases.

workers, and materials preparation.

- o Formal operational linkages between OFCOR and extension programs -- The T and V system was designed to facilitate this coordination.
- o Coordinating committees -- Functional coordinating committees must have authority to be effective.

The case study of the Zambia OFCOR project provides some useful concepts and lessons (Kean and Singogo, 1988). The basis for the linkage between research and extension is the adaptive research planning team (ARPT) established in 1980 within the Research Branch of the Department of Agriculture. These regionally based, area-focused teams are separate and distinct from the commodity and specialist research teams (CSRT) which function on a national basis. The ARPTs include an agronomist, an agricultural economist and a research extension liaison officer (RELO). Where livestock is important, livestock officers are part of the team. Trial assistants from the Extension Branch complete the ARPT.

The ARPT has been the primary mechanisms for linkage between research and extension. Involvement of ARPTs in extension activities has included: farmer field days, production of monthly extension newsletters, in-service training of extension workers and farmers, and production of recommendation packages. The involvement of extension in APRT activities has included: participation in biannual program planning and evaluation meetings, participation in formal and informal surveys, conduct of on-farm trials and tests (by trial assistants seconded to the ARPT from the Extension Branch), and revision and release of crop recommendations. The ARPT system has its problems, and the experience from area to area has been quite variable. In general, however, the system has been effective in involving farmers, extension workers and researchers in a team effort to address the needs of small farmers in selected areas of the country. This area team approach is very similar to what has been proposed for the Highlands Agricultural Development Project (HADP), which is just starting in the Philippines.

Conclusion

Agricultural research must be articulated with extension activities to have an effective public response to farmer needs. In recent years, the need for collaboration has become more urgent as the focus of agricultural research differentiated between the needs of different client groups, and as resources for both activities have become more scarce.

However, institutional structures do not always permit effective collaboration and certainly do not reflect our current understanding of an agricultural technology system. The need for collaboration between researchers, extension workers, and farmers brings us to focus on research-extension linkages.

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DA Experiences in Strengthening Research and Extension Linkage

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"For more than three-fourths of a century, the Philippine agricultural research-extension system has adopted a diffusionist strategy that emphasizes the dissemination of technology packages from research centers to the rural populace who are treated as mere receivers and users of new information. The initiative of planning, developing, and testing technologies resides in the research and extension have limited farmers' feedback and effective influence in the research system" (Ponce et al. 1986). Such statement aptly describes the inadequacies of the country's agricultural research and technology transfer system. Recognizing this, the DA's 1987 Medium-Term Program of Action states that "research priorities are not aligned with farmers' needs and capabilities" and "technology transfer has proceeded at a slow pace due to the weak linkage between research and extension."

One purpose of this paper is to provide a brief description of some of the strategies/approaches and programs/projects aimed at accelerating rural development through better research and extension linkage.

Farming System Approach and the Regional Integrated Agricultural Research System (RIARS)

In a move to concentrate on adaptive and on-farm research and evolve a strategy to operationalize research and extension linkage, the RIARS was established and operationalized in 1982 under the Agricultural Support Services Project (ASSP). In each region, an integrated agricultural research station was established. It is headed by a RIARS manager who is in charge of a core team of research specialists, who in turn, supervises groups of production technicians (DA extension workers) known as Provincial Technology Verification Teams (PTVTs). The members of these teams were trained on farming systems approach and methodologies of conducting adaptive or technology verification trials.

The primary objective of the RIARS team is to provide the link between applied research and farmer adoption of new technologies. Technologies (mostly involving cropping patterns) are tested for adaptation to local agroecological condition and are verified for economic viability under local farming situation. The verified technology is then extended through a series of Barangay Pilot Production Programs. Throughout the entire process, the researchers, extensionists, and farmers interact closely with one another.

Training and Visit (T and V) System

The T and V system has been adopted by the DA extension service for technology dissemination. Under this system, the extensionists are given a thorough training on applicable technologies. After training, the extensionists train selected farmers who are leaders in their respective communities. These farmers will later train another group of farmers. The rationale is that, since the development of technologies is centered on the needs of small farmers, it will have more impact if they become both the agents and beneficiaries of development.

Linkages Between DA and SCUs

UPLB-DA Linkages

While DA-UPLB collaboration was at first heavy on research, in the late 70s, activities shifted towards extension and implementation of action projects under the then NFAC/UPLB Countryside Action Program (CAP). Some of the technologies generated by UPLB were tested and applied in a number of action projects.

In 1985, after further reorientation and consolidation of component projects into the Agricultural Development Program for the Countryside (ADPC), the CAP's framework and approach shifted from direct technology transfer to the community development approach. This approach is being piloted in four action projects, namely: Laguna Countryside Action Project (LACAP), the Institutional Development Projects in Albay and sub-province of Guimaras, (IDP-Albay and IDP-Guimaras), and the Family and School Hillyland Development Project in Cebu (FSHDP-Cebu). In these projects, operational models featuring functional linkages between UPLB technical specialists and DA extension workers are employed. The basic objective is to effectively complement the DA extension delivery system.

CLSU-DA

In the Integrated Agricultural Production and Marketing (IAPM) Project, the Central Luzon State University (CLSU) and the DA undertook cooperative efforts in policy-making and in four major project thrusts. One of these thrusts was technology packages in which CLSU played the lead role. The technology package thrust was aimed at generating and verifying production, processing, and marketing technologies to be disseminated through an extension delivery system, with the DA extension workers serving as the channels of technology formulated by CLSU.

ViSCA-DA

In Eastern Visayas (Region VIII), interagency linkages for rural development is perhaps best exemplified through the Farming Systems Development Project-Eastern Visayas (FSDP-EV). This USAID-assisted project was aimed at "establishing a mechanism for adapting and disseminating rainfed agricultural technologies to the resource condition found in Region VIII." This project provided great opportunity for collaboration between ViSCA and DA in both research and extension activities in several site research management units (SRMU) found in diverse upland areas in the region.

The DECS Agricultural Education Outreach Project (AEOP)

The Department of Education, Culture and Sports (DECS) leads in this project with DA sitting in its advisory board. Under the AEOP, six agricultural colleges and universities (Aklan Agricultural College, Camarines Sur State Agricultural College, Don Severino Agricultural College, Pampanga Agricultural College, Palawan National Agricultural College, Western Luzon Junior Agricultural College, and Central Mindanao University) worked on an extension model with agricultural students as "contact leaders" who are fielded to farming communities. Essentially, these students act as extension agents in the barangays as part of their "farm practice" requirement.

One interagency project that is regarded as successful and illustrative example of how extension and research linkage was achieved is the Kabusugan sa Kaunlaran (KABSAKA) which involves IRRI, PCARRD, NFAC (now NAFC) and the then Bureau of Agricultural Extension. BAEx, along with IRRI, provided data compilation and feedback, in addition to providing personnel support and making local arrangements in the project sites.

Renewed Attention to Extension and Research (E-R) Linkage

The same DA Medium-Term Program of Action, which called attention to the poor E-R linkage, also offered new measures to be adopted by DA to enable it to strengthen this linkage. These are as follows:

- Use of formal interagency agreement to ensure coordination in the drawing up of a National Research and Extension Agenda
- Creation of the Bureau of Agricultural Research (BAR) and the Research Advisory Committee to oversee the development of research and the E-R linkage
- Promotion of local linkages by locating research and extension personnel in the same work area, subsequently, reorganizing their activities for better complementation, coordina-

tion, and greater physical contact (through the RIARS network)

- Use of specialized technical staff or subject matter specialists as intermediaries between researchers and local extension workers (linking up of the PTVTs with the DA's 12 regional research stations)
- Involving researchers in the training of extension staff (through intensification of PTVT on-farm research and extension activities with farmers' participation and through the linking up of DA with SCUs and NGOs)
- Making adaptive research the joint responsibility of research and extension personnel in the RIARS/PTVT Network
- Tapping of other institutions for technology transfer (through a link up of DA extension force with SCUs and NGOs; institutionalization of a farmer exchange program; and extentionist exchange program between DA and SCUs or NGOs)
- Establishment of procedures to coordinate planning, implementation, and evaluation of research technology transfer activities.

The National Five-Year R and E Agenda

In addition to the policies set in the DA's Medium-Term Program of Action, the DA is now finalizing the country's National Agricultural Research and Extension Agenda which will provide a guide in identifying research and extension directions and policies. This was arrived at in collaboration with PCARRD and PCARRD using the diagnostic approach which BAR conducted through a series of regional consultations with the participation of farmers, DA regional and line officers, and representatives from other research agencies.

Emerging DA Policies Specific to the Strengthening of the E-R Linkage

The DA realizes that for it to live up to its goal of increased farmers' income, it must have a strong presence in the rural and farming communities through extension. To reinforce this positicn, the DA held a "National Policy Workshop on the Status of Agricultural Extension in the Philippines" last 25-27 April 1988 in Davao City. One of the major areas deliberated on was the linkage between extension and research for which policy guidelines were formulated.

The important features of the evolving policies include the following:

- Mechanisms to ensure timeliness and relevant research result to extension services
  - o Interfacing between RIARS-Provincial Technology Verification Teams and Extension Technicians
  - o Involvement of regional SMS in consultations, services, and review
  - o Effective feedback mechanism

- Improvement of institutional linkages at the regional and provincial level
  - o Strengthening of regional research consortia
  - o Organization of provincial research committee
  - o Memorandum of Agreement among concerned sectors
  - o Inclusion of Provincial Research Coordinators as members of the PAFC

- Improvement of data management and utilization in research and extension system.
  - o Provision of regional/provincial computer and corresponding manpower
  - o Strong linkage between research/extension and applied communication
  - o Strengthening the applied communication unit of the province

- Motivation incentive systems for carrying out linkage function
  - o Upgrading of salary of extension technicians
  - o Continuing manpower development (for research/extension technicians.
  - o Periodic interfacing between research and extension

It is our hope that through various policies such as those contained in the Medium-Term Program of Action, the National R and E Agenda and the validated results of the National Policy Workshop on Extension, the DA would be able to constitute into itself a potent E-R linkage.

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Research and Extension Linkage As I See It

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Introduction

Research and extension linkage seems to be a persistent problem in operationalization considering the numerous seminars and workshops devoted to the same topic. This implies that what usually transpires in seminars and workshops is not elaborated in real life situation. This means that the linkage between the two systems does not actually occur in a systematic manner through organized efforts by individuals and groups in the delivery system.

The persistence of the problem in operationalization could also mean that the linkage between research and extension is actually going on, but it is not formally recorded because it has become customary in the day-to-day activity of extension personnel. What has become habitual and routinary escape our perceptual filters.

But extension, in its essence, cannot really proceed without research because extension work is based largely on research. The very foundation of extension is technical information produced by research. Without research, an extension worker does not have the technical information to disseminate to the farmers. This interrelationship between research and extension is very evident in the spread of technological innovations in rice in the 1960s.

Shortcomings in Research and Deviations in Extension

The perceived weakness, then, in the linkage between research and extension is not the connection between the two. This is inferred only from farm situations on account of the inability of rural families to develop efficient farms and acquire higher incomes. But this inference may not be justified scientifically because there are policy and other variables which research and extension cannot manipulate in order to bring about progress in rural communities. The concerns of extension is not unlimited.

It seems that the weakness is not in the link in the chain between research and extension. The problem lies endogenously in each system of research and extension. This is not to pin down errors in both systems but to bring into perspective the inadequacies in research and extension vis-a-vis the packaging and transfer of technology.

In agricultural research, many studies conducted in state universities and colleges have yet to be verified. In experiment stations of the Department of Agriculture, the technologies they developed are presumed to have been diffused to rural social systems, but they are still very deficient in the evaluation of the impact of these technologies on farm productivity, income, and levels of living on a continuing basis. There is, therefore, the lack of accurate information on a wide range of benefits derived from agricultural research. What seems to be measured is the increasing number of researches conducted over the years in both agencies of the government.

In extension, there is a serious deviancy in its present conceptualization. There is the view that the concept of extension essentially includes inputs. This conceptualization primarily makes the extension worker and people as the bearer of inputs, a middleman between the government and people who delivers the services to the latter. And without these inputs education of farm families cannot proceed.

This organizational view may be instigated by years of politics tremendously affecting policies, organization, operation, and personnel of the Department of Agriculture. The extension worker does not perceive extension anymore as nonpolitical and nonsectarian, and he is not restricted in service to any party, race, religion, or members of any organization.

There is also the confusion as to what specific clientele are served by extension. While its audience is large and heterogenous, the ultimate goal of extension is improved family living. Therefore, the rural family is its primary clientele especially that agriculture is the predominant economy in the Philippines. Farm productivity and profitability or increased farm incomes are only means to attain the ultimate goal of extension.

Extension workers do not seem to comprehend that extension is essentially educational, although it is unlike the common concept of an educational institution, for it has the following characteristics:

- It has no fixed curriculum or course of study.
- It confers no degrees and gives no diplomas.
- It uses farms, homes, and places of business as classrooms.
- The extension worker is a teacher who has a large audience.
- The subject matter as used by the extension worker is more practical than theoretical and is intended for immediate application in the solution of problems.
- Application of the subject matter requires a change of both mental and physical behavior.
- Participation is largely voluntary.
- Service in extension does not mean performing a routine service. Instead, extension renders technical service – which is essential to the application of information. The operation requires knowledge or skill or facilities not possessed by its clientele.
- It uses a variety of methods but emphasizes demonstration.
- Extension values people more than things.
- Extension is based largely on research, thus it is practical and dynamic.
- Extension works with all the members as a family.
- It makes extensive use of local leaders.
- It is aggressive in promoting the application of information.

However, there is still another point which needs clarification, which has reference to the question where inputs should be properly placed in the totality of extension. It seems that with this question and the rest of the other problems in the preceding discussion, extension education has become a lost art among our field workers. This makes it necessary then to recall the basics and find out what is the scope of extension.

In extension, the scope is defined in terms of the people to be served, the subject matter to be included in the program, and the methods to be used. The last element is where inputs belong. To facilitate instruction in extension, which primarily involves the learning of the farmer, inputs must be determined and applied. In a sense, inputs are aids in facilitating the learning process. They make vivid the application of information in the solution of a problem.

As regards the people to be served, the extension organization has to make a decision on what sector in the population is to be given emphasis. Is it the farm and rural nonfarm population? For example, the Smith-Lever Act as amended states that extension is intended for all people of the United States except those who are attending college. But since the Federal funds are intended for agriculture, the U.S. Cooperative Extension Services gives major emphasis to the rural home.

With regard to the subject matter to be included in the program, extension could either broaden or delimit it. Traditionally, the subject matter of extension includes agriculture, home economics, marketing, and cooperatives. Of course other relevant areas can be included but the extension organization should not be overloaded with educational activities which makes it inefficient as well as ineffective.

The extension worker is not a bearer of inputs or services. He is a teacher in a natural environment. As programs are developed by local communities on the bases of felt needs and expressed desires, he is an adviser and a consultant to this clientele. And since he is also a communicator and bearer of innovations, he is an imparter of knowledge that has practical application in the solution of problems in the local community.

Retraining the Extension Worker

Perhaps what is not very well appreciated is the need to reeducate extension personnel to make them more responsive to technological changes. This type of reeducation is learning the basics of extension education. The present extension workers in the Philippines are generally trained in technical agriculture. While this training is important to build their stock-in-trade or repertoire of knowledge, the extension worker operates in the context of interrelationships of social institutions. He deals with social behavior which is not confined within a single institution. Once he is in the field, he works with individuals whose motivations are influenced by family, religion, politics, economy, and a host of other social factors.

The extension worker is a teacher who interacts with people in a natural environment. As such he is a learned companion, adviser, and consultant of farm families. The philosophy, principles, and concepts which make the extension worker as a teacher in a natural environment requires an approach and methodology which he must integrate with technical knowledge in agriculture.

As the extension worker interacts with farm families and the local community, he needs to be equipped with the skills in conducting simple studies to enable him to determine the situation of his clientele as a basis for effective educational activities. He needs to be trained in applied social research and in community organizing.

The work situation in which the extension worker operates is a complex web of interrelationships. To effectively manage himself and the transfer of technology under this intricate social circumstance demands a remolding of the personality of the extension worker whose main task is to create a change in human behavior.

With a greater capability of the extension worker to promote the application of technological information, the linkage between research and extension can be strengthened. For after all linkage is an abstraction. It can only be observed when the extension worker has developed the value to utilize research information adapted to the level of understanding of his clientele. In a larger sense, strong research and extension systems make a strong linkage between the two. An effective linkage can only develop when both systems are strong. Towards this end, the state universities and colleges and the Department of Agriculture have to forge a common endeavor in which research information can be regularly made available to the extension worker whose knowledge must be continually replenished and updated to make him more responsive to the situation of his clientele.

The reeducation of the extension worker could be a preparation for him to meet the challenge of agricultural and rural development now and in the next decade. In the end, however, he is one fortunate teacher because he does not have to write on a "tabula rasa." He interacts with farmers who are experienced and rational in the choice of farming techniques.

Message

Hon. Fulgencio S. Factoran, Jr.
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I must commend and give praise to the organizers of this workshop, PCARRD and ISNAR, for showing the way to what we must emphasize and articulate in agriculture and natural resources research.

PCARRD's past and present achievements could only lead to this important high-level gathering and meeting of minds. For the Council, even in the chaotic days of our recent history, has been a candle in the dark, as far as recommending research priorities in agriculture and natural resources development was concerned. We must, therefore, support PCARRD by lighting more candles to clearly see our directions in research. This calls for more intimate collaboration and relationship among research agencies in the country. We must, first of all, firmly establish the network system in agriculture and natural resources through research and development.

I agree that the participants in the national R and D network need to be fully briefed on how the system is expected to operate at maximum effectiveness. This is necessary because we are still in a transition where, we see shifts in assignments and appointments of new government officials to sensitive positions, new policy thrusts, and new organizational and management structures.

In relation to the topics discussed in this workshop, I would like to share with you what we are doing and what we have so far done at the Department of Environment and Natural Resources (DENR).

The new organizational set-up at DENR is concerned with research management. The Department was reorganized after its functions and mandates were redefined by Executive Order No. 192, issued in 1987. The Order states that the DENR is the primary government agency responsible for the conservation, management, development, and proper use of the country's environment and natural resources. These resources include forest and grazing lands, minerals, and other resources found in such areas as watersheds and lands of public domain.

A set of policy objectives welds DENR's activities together and serves as the framework for policy formulation. These policy objectives mandate the DENR to:

- Ensure the availability and sustainability of the country's natural resources through judicious utilization and systematic rehabilitation or replacement;
- Increase the productivity of natural resources to meet the demand of our growing population for forest products, minerals, and land;
- Enhance the contributions to national economic and social development of the natural resources sectors; and
- Conserve specific terrestial and marine areas that are representative of the Philippine natural and cultural heritage.

To realize these crucial objectives, research has to play a vital role. For at the core, R and D is simply the basic tool with which we satisfy the urge to know. In natural resources management, we would like to know exactly where these resources can be found, how much of them do we really have, and how we can maximize or optimize their uses without causing damage to the environment.

It may seem timeworn but the truism that natural resources are the fundamental capital for national development still holds true. We have learned bitter lessons which we inherited from the past about this truism. If the government before us had not been profligate and cavalier towards the exploitation of the country's natural wealth, if it had not mismanaged these resources, then we would not have sunk in morass we are in today.

But we shall, with a determined effort try to restore and replenish the natural resources that were wrecked. And we shall judiciously turn these resources into sustainable capital. In moving towards this direction, we have restructured the research arms of the DENR. This involved creation of new offices, integration of existing agencies, and redefinition of research policies and functions.

Thus, we now have the Office of the Undersecretary for Environment and Research, which, among others, assists and advises the Secretary on the promulgation of rules and regulations concerning environmental management and ecosystems research. It also supervises all research activities of the Department and exercises its control over the environment and research bureaus.

Three new staff bureaus were placed under the Office of Environment and Research, namely, the Environmental Management Bureau (EMB), Protected Areas and Wildlife Bureau (PAWB), and the Ecosystems Research and Development Bureau (ERDB). I would like to highlight the functions of ERDB because they are intimately related to the work of PCARRD and the other research agencies represented here.

ERDB is actually a merger of the old Forest Research Institute and the research staff of the National Mangrove Committee. The latter Committee, however, still exists today under the reconstituted set-up. By integrating the functions of two separate entities, we came up with a more holistic approach to research on natural resources. Thus, we have marshalled and mobilized manpower, mindpower, and facilities to focus not only on forestry research but also on other Philippine ecosystems.

The Bureau is tasked to formulate and recommend an integrated research program covering such ecosystems and natural resources as forests, minerals, and land. Also assigned to it are the following functions:

- Formulation of a system of priorities in the allocation of resources to various research programs, and technical assistance in the implementation of these research programs;
- Research leading to the generation of new and innovative technologies for the sustainable uses of Philippine ecosystems and natural resources; and
- Coordinative work that will assist and monitor researches undertaken by DENR field offices and other agencies.

ERDB has several functional divisions; namely; Forest Ecosystems Research, Grassland and Degraded Lands Ecosystems Research, Coastal Zone and Freshwater Ecosystems Research, Upland Farm Ecosystem Research, and Technology Development.

DENR has established provisions for R and D at the regional level. We have for this purpose integrated our research activities with field operations. Except for the research activities being conducted by ERDB at the Los Baños Research Station at Mount

Makiling, we are now implementing research activities through the Regional Environment and Development Offices. These offices are under the direct supervision of the Undersecretary for Field Operations.

Each DENR-regional office has a regional technical director for research, with two divisions under him. These are the Technology Transfer Division and an Ecosystems Research and Conservation Division.

Let me give you a brief overview of the research thrusts of our Department, both on the short and long-term time frames. The ongoing short-term research program which we hope to achieve during the next five years (1988-1992) includes the following projects:

- Policy and Program Studies. This project examines various natural resources issues of current significance. It involves the review or revision of laws, rules and regulations and the evaluation of the impact or effectiveness of major policies and programs.
- Remote Sensing Program. This is directed to the use of remotely-sensed data for resource and environmental surveys, assessment and monitoring. It includes the continuing research, development and popularization of the technology, planning for the establishment and operationalization of a ground receiving station and airborne remote sensing capability. Work is also being done on the interfacing of digital image processing, photo grammetric and geo-based information systems, and the pilot testing and application of remote sensing data for topographic mapping.
- ASEAN-US Watershed Project. This project aims to establish a watershed research network among the ASEAN countries with upland protection, soil erosion control, improved water quality, quantity and distribution as main areas of concern.
- Research and Development on Mineral Resources Utilization. This seeks to generate methods, technologies, and policies that will encourage optimum extraction and maximum utilization of high-grade, high-value mineral deposits.
- Uses of Isotopes Techniques for the Investigation of

Saltwater-intruded Aquifer in Selected Areas in the Philippines. This project aims to study and determine the nature and origin of saltwater and groundwater circulation patterns in some parts of the country.

- Bamboo Research and Development Project. This R and D Project aims to promote bamboo cultivation and production and create new employment opportunities, especially in the rural areas.

- Calauit Wildlife Project. The purpose of the project is to propagate, maintain and study the biology and ecology of Philippine endemic species, as well as the translocated African species that were brought in the reservation. The project also aims to protect the marine resources in the area.

  A related project is the "Bio-Ecological Study" on the Philippine tarsier, Eastern sarus Crane, Bleeding Heart pigeon, flying lemur, and other rare, endangered and/or economically important species of Philippine wildlife.

- Batangas Bay Monitoring Project. This will collect information on water quality and related factors affecting the overall ecological integrity of Batangas Bay. On a broader scale, the "Water Resources Program Review and Evaluation" project assesses the environmental and social impacts of water resources development projects.

- Forestry Research Projects. Activities falling under this thrust are rather extensive, considering our present intense, almost desperate, drive to conserve, nurture, and replenish our remaining forest resources. Some of these research activities, being implemented on medium or short-term basis are: 1) Development and improvement of appropriate technologies for the protection, rehabilitation and management of forest watersheds, 2) increased production and improvement of harvesting, post-harvest and utilization technologies for forest products, including lesser-known tree species; 3) development of seed production and propagation technologies for selected forest species; 4) analysis, development and improvement of the marketing distribution of forestry commodities and inputs; 5) varietal improvement studies for forest and wildlife species; 6) development and utilization of biotechnology, such as nitrogen fixation, tissue control, mycorrhizal and biocontrol for improved forest production; and 7) development of conservation and management technologies for forestry species.

DENR's long-term research projects, which otherwise also contain short and medium range elements, include the following:

- Research to examine the incentive structures offered by other countries for their mining industry;
- In-depth analysis of world market prospects for Philippine minerals as a prerequisite to designing, in coordination with the Department of Trade and Industry, a long-term trade policy for the mineral sector;
- Research on the development of pollution control facilities using local materials and expertise;
- Study on the viability of creating a forest renewal or conservation fund that will finance all forest development and conservation programs, including forestry research, education and training (the idea of establishing a "Forest Conservation Foundation" is part of this study);
- Research and development studies on improving the efficiency of biomass-consuming methods such as in charcoal-making;
- Research on alternative fuelwood species, provenance trials, and growth performance in different selected sites; and
- Research on mangrove species and the effects of converting mangrove areas into commercial fishponds.

On a medium term basis, we have also on tap the following projects:

- Continuing studies on participatory approaches in agroforestry and social forestry programs;
- In mining and geology, the pursuit of:
  - o a special study to determine the type and level of ʹıx credits consistent with the government's developˌ.ıental goals;

- unbiased, independent research to determine the real impact of mine pollution;
- research to minimize mineral extraction costs while maximizing the revenue per unit of ore;
- research on ways to attract risk capital and investment in mineral exploration; and
- creation or participation in a network of national and regional research and training institutions concerned with the mining industry.

I am well aware that this workshop has splendidly succeeded in imbuing the participants with a new or renewed sense of value in their common pursuit to promote and enhance the role of research and research management in the development of our country. Rest assured of the cooperation and active participation of the Department of Environment and Natural Resources in the national and interagency R and D network for agriculture and natural resources which you sought to strengthen in this workshop.

The results of this workshop would further guide us at DENR in formulating and implementing research policies, rules and regulations. But to cap our common commitment to the development of our country through research, let us not forget that all our efforts are directed toward the welfare of our people, 70% of whom are living below the poverty line. The poorest of the poor, includes the migrant highland dwellers, the kaingeros, and the subsistence municipal fishermen. To them, the technical matters we discuss and the plans and policies we propose are meaningless unless we explain to them what we really plan and sincerely intend to do.

On this note, I thank the organizers of this workshop for this opportunity to address the participants after the completion of their reorientation and study exercises on research and research management.

Thank you.

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