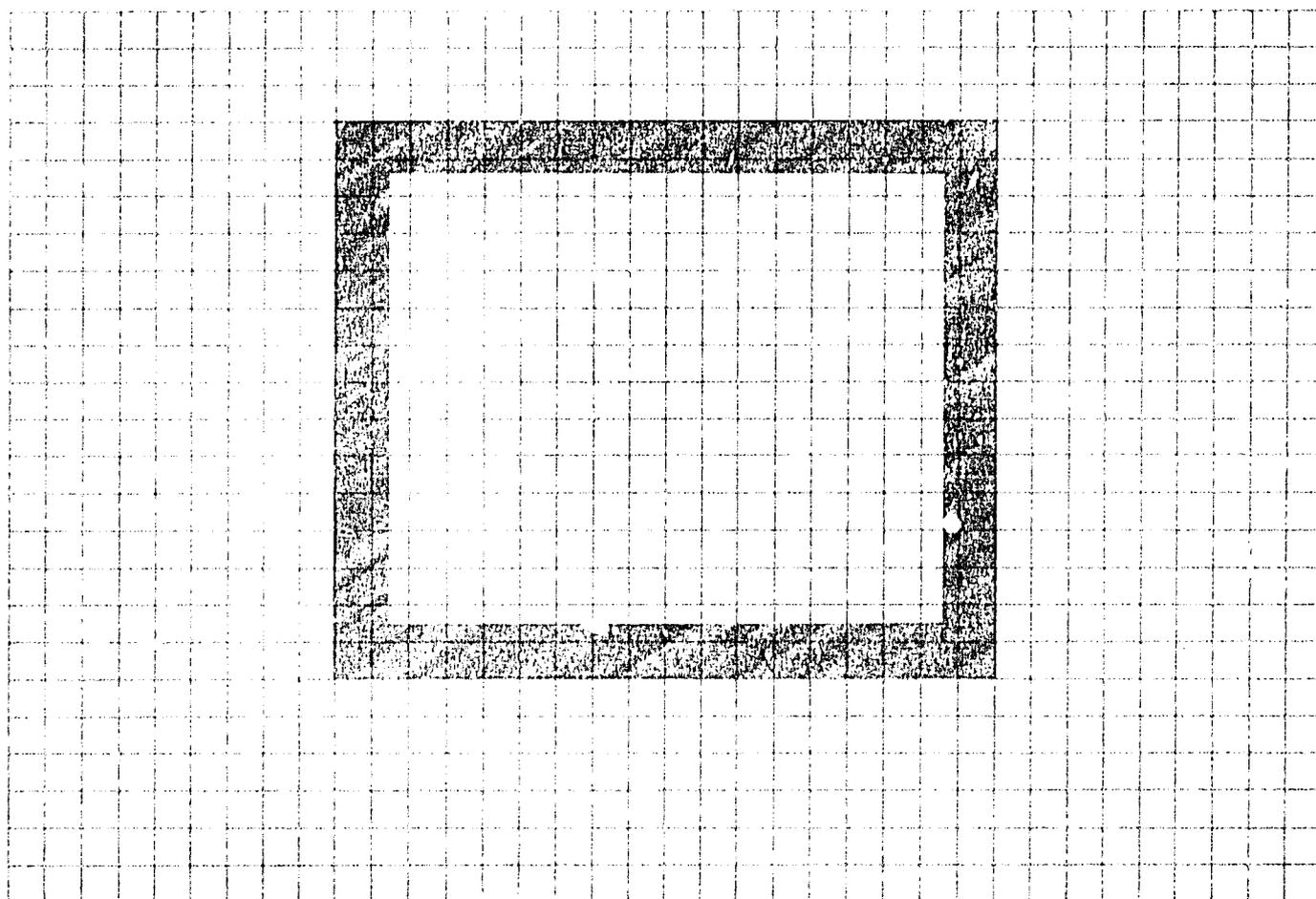


THE MAKING
OF THE
PHILIPPINE AGRICULTURE
AND
RESOURCES RESEARCH
SYSTEM:

A CASE FOR THE DEVELOPING WORLD

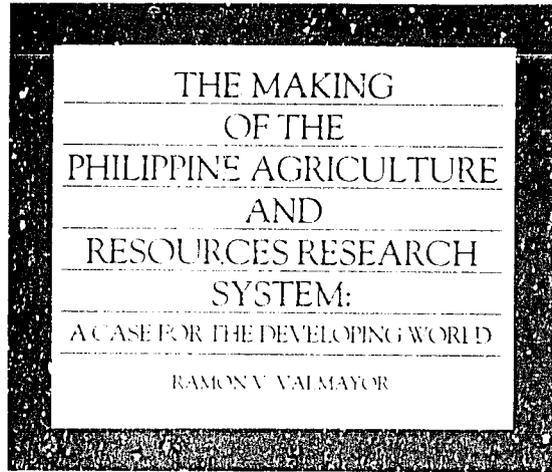
RAMON V. VALMAYOR



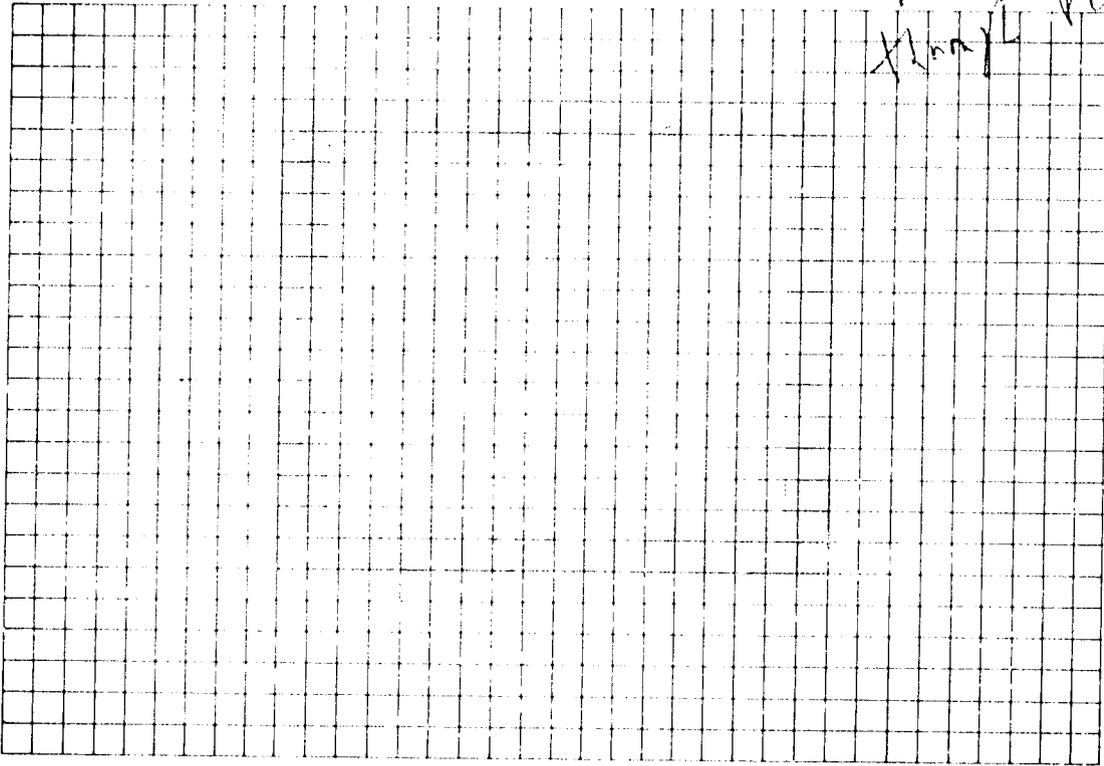
PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES
RESEARCH AND DEVELOPMENT

PL 1131-1037

Dr. Schmitz,



In sincere appreciation
of recent case, history and
Interim's cooperation
with the National Research
System in the Philippines
through PCARR.
Date: 1/20/86



Dedication

*To Arturo P. Tanco, b., Minister of Agriculture (1971-1984), Republic of the Philippines,
whose foresight and active support nurtured to maturity a national research system
now heralded as the model for other research councils in the Philippines
and the rest of the developing world.*

Foreword

The story of the making of the Philippine agriculture and resources research system is replete with lessons for those who steer the course of their country's social and economic growth.

It is important that we chronicle the growth of PCARRD and the national research system, and delve into the whys and wherefores of organizing and implementing research.

The Bellagio Conference of 1977 underscored the need for "a strong and effective national agricultural research system" in order to achieve economic and social progress in developing countries. The Bellagio Conference also reminded the international research community that their efforts will come to naught unless sound national research systems are able to locally verify and fine-tune new technologies.

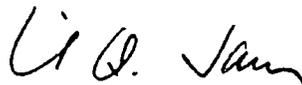
As Albert H. Moseman, renowned expert on agricultural research management, once said, "National research capability becomes crucial not only because each country has its location-specific problems to cater to, but because it also needs, for the sake of national interest and identity, its own autonomous bases of knowledge and technological capacity."

Building up such bases of knowledge and technology requires more than just funneling of resources. It requires commitment on a national scale and from a much broader perspective.

PCARRD is proof of the Philippines' commitment to accord agriculture and resources research the support and priority it deserves, on a more ample scale than in the past. This commitment has borne fruit, as we see in the significant strides made by PCARRD in strengthening national research capability and in ensuring that research programs are responsive to the needs of the country.

It is a tribute to PCARRD's efforts that in 1982 the National Science and Technology Authority (NSTA) created a system of councils through which it would oversee all national research and development efforts. PCARRD is part of this system of councils. It is, in fact, the model for the other three councils, the mandates of which are fashioned closely after those of PCARRD.

With PCARRD forging a path for us, we are confident that we are moving steadily toward achieving and sustaining social and economic growth through agriculture and resources research and development.



EMIL Q. JAVIER
Director General
National Science
and Technology Authority

Preface

Thirteen years ago, men with vision dared translate into action an idea many thought could never work.

The idea was to set into motion a national research planning, coordinating and monitoring agency that would consolidate the research sector into a first-rate national research enterprise. This agency was to be called the Philippine Council for Agricultural Research, today known as the Philippine Council for Agriculture and Resources Research and Development or PCARRD.

The idea of establishing a national planning and coordinating agency was ushered in by the vicissitudes that buffeted this part of the world in the early seventies. The agricultural research sector then was no match for the harsh realities confronting the nation. Despite considerable investments in research by both government and private entities, no substantial benefits were accruing to the nation's teeming millions.

Research institutions generally used a major portion of their budget for capital outlay to finance construction work. While this meant more research facilities, it drastically reduced allocations for operational expenses and, because of the excessive number of research stations and facilities, resources were spread thinly.

Research proposals were often exploited by research-implementing agencies as mere devices for acquiring bigger funds. Once approved, appropriations were promptly diverted to other purposes.

But the more fundamental problem was the lack of coordination among stations and their research activities. Coordination was difficult to achieve because the various agencies involved were not under the same jurisdiction or administrative control.

There was no mechanism for planning and implementing research projects on a national scale. Research did not respond to national goals, concentrating on rice, corn, and sugarcane, even as the national program pressed for an agribusiness approach to export crops, feedgrains, livestock, fisheries, forestry, and the "second generation" problems of the cereal industry.

PCARRD's inception was therefore directed towards doing away with waste and duplication and the usual chaos of *ad hoc* arrangements within the research community. Its task was to define the goals, purposes and scope of agriculture and natural resources research in a country which was then, as it is today, a nation of many moods and gaeties: a nation of extremes, of want in the midst of plenty.

But, of course, we do not intend to dabble in mere retrospection. We trace the past as a salute to the pioneering efforts of the men who shaped PCARRD.

We also acknowledge the international agencies and research organizations that so generously committed their expertise and resources to helping what was then a fledgling institution find its way in the mainstream of world agriculture. We highlight, in particular, the more than 12 years of PCARRD-USAID cooperation that fueled the development of our national research capability.

The history of PCARRD is the history of the national research system. This book documents that history. It captures the experiences of a research community determined to create an impact on national affairs, and reflects on the role of PCARRD in the near future.

Through this volume, we hope to offer a first-hand test case in research management and operations to developing nations in the course of establishing their own research enterprise.

The past years have taught us that just as a gem cannot be polished without friction, neither can a research system be perfected without trials. We have faced tremendous odds but we have chosen to view these problems, not as impediments to growth, but as opportunities for progress.

Truly, much has been achieved but much more remains to be done. In more practical terms, the ballgame is the present and the challenge is the future.

November 1985

Ramon V. Valmayor
RAMON V. VALMAYOR
Executive Director
PCARRD

Acknowledgments

The author wishes to acknowledge the assistance of the PCARRD Secretariat in the writing and production of this book. He wishes to thank, in particular, Crops Research Department Director Dely P. Gapasin, Ma. Lulu A. Rodriguez, Leonarda G. Nallana, Ester L. Lopez, Ignacio C. Pagsuberon, and Blandina L. de Mesa.

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“There is nothing more difficult to take in hand, more perilous to conduct, more uncertain in its success than to take the lead in the introduction of a new order of things. Yet this is the measure of the task of this generation.

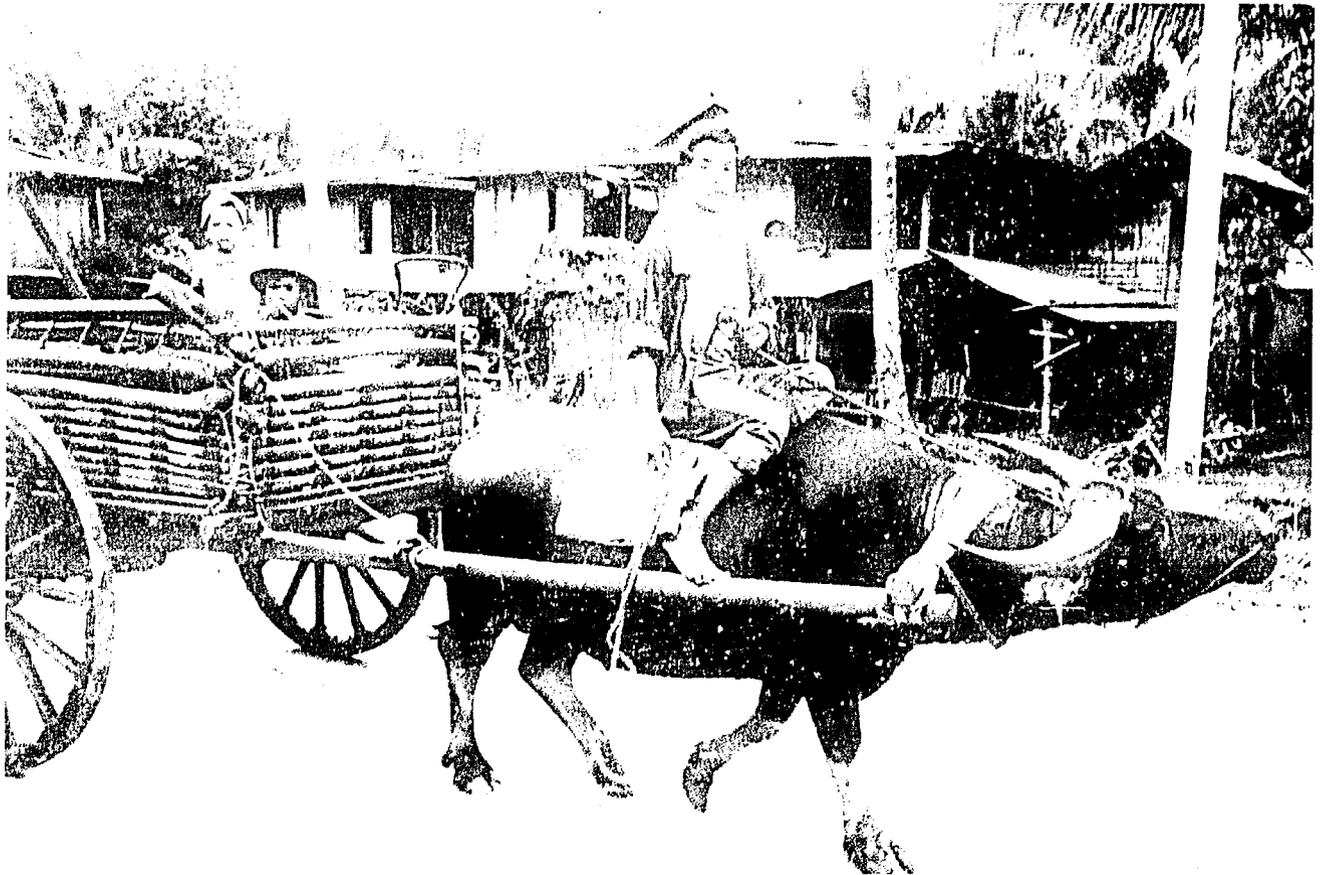
In the Philippines, a more tangible answer to this task came with the birth of a national research system to which we strive to give more vitality. We have chosen this road to develop a firmer scientific foundation by which we could meet the challenges and uncertainties of the times, for it will not do merely to state that the present crisis is rooted in circumstances beyond our control.

The burden of research leadership in a time such as this is to provide vision in the midst of uncertainty; to hold out hope and confidence when threats and difficulties appear to mount; and to clear a path through which people may find refuge and security.”

FERDINAND E. MARCOS
President
Republic of the Philippines
1980

PART

A Tryst with Agricultural Destiny: The Birth of PCARRD



The farmer's needs are simple but the ways to meeting them grow continually more complex. Thus, the past thirteen years have witnessed the emergence of a constellation of research centers and stations throughout the country — diverse in certain ways but unified in purpose, firmly anchored on a collective mission to support national development goals and fill the need for location-specific technology.

CHAPTER I

In Search of Alternatives

With the advent of the sixties, our national leaders were becoming more conscious of the need for a strong research capability to help counter setbacks in agricultural productivity and cushion the country from devastating shifts in the global economy.

Secretary of Agriculture Arturo R. Tanco, Jr. had long been mulling over the merits of having an institution that would oversee the planning and implementation of agricultural research in the country.

There had, in fact, been a number of attempts to assess the country's research capability and provide direction in research planning. However, these efforts were fragmented and could not cover in depth the full spectrum of research in agriculture, forestry, and fisheries (National Agricultural Research System Survey Technical Panel, 1971).

As time passed, the ineffectiveness of research in reversing the shortfall in agricultural productivity rankled. Tanco was intent on finding alternatives.

THE MISSION

In August 1970, the Secretary learned of an Asian Travelling Seminar on institution building, organized by Dr. Ralph W. Cummings, Sr. of the North Carolina State University. The Philippines was invited to send a delegation to the seminar.

Tanco handpicked three men: Dr. Joseph C. Madamba and Dr. Fernando A. Bernardo, both from the University of the Philippines at Los Baños (UPLB), and Domingo F. Panganiban from the Bureau of Plant Industry.

The seminar's first stop was Bangkok, Thailand. Here, Cummings guided the group through a study of institution-building processes at Kasetsart University and the Ministry of Agriculture.

From Thailand, the participants flew to India for scheduled visits to Punjab Agricultural University in Ludhiana and G.B. Pant Agricultural University in Pantnagar.

The last stop proved to be the highest point in the travelling seminar, at least for the Filipino delegation. This was the visit to the Indian Council of Agricultural Research (ICAR) in New Delhi (Bernardo and Bernardo, 1985).

The Filipinos were highly impressed with the system of national coordination for agricultural research. They pressed the ICAR representatives for details on the Indian Council's organizational mechanisms and programs. Before the briefing session ended, the men were abuzz with ideas.

Inspired by their observations in India, the Philippine delegation penned a report to Tanco which, not surprisingly, dwelt heavily on the advisability of setting up our own council for agriculture, similar to ICAR.

There had been a number of attempts to assess the country's research capability and provide direction in research planning.

However, these efforts were fragmented and could not cover in depth the full spectrum of research in agriculture, forestry, and fisheries. Thus, a National Agricultural Research System Survey Technical Panel was directed to assess existing research programs and resources and to formulate an overall agricultural research program for the Philippines.



Agriculture Secretary
Arturo R. Tanco, Jr.

The report affirmed Tanco's belief in the value of a central research planning and coordinating body. It laid open a definite course of action for him.

Before the year ended, Tanco had submitted his recommendations to President Ferdinand E. Marcos.

THE PANEL OF INQUIRY

Spurred by Tanco's recommendations, President Marcos, in early 1971, created the Presidential Committee Executive Panel to Develop a National Agricultural Research System. The Executive Panel was directed to survey and evaluate existing research programs and resources and to draw up policy recommendations for the improvement of agricultural research in the Philippines.

The Honorable Gerardo Sicat, Chairman of the National Economic Council (now the National Economic

and Development Authority or NEDA), was designated chairman of the Executive Panel. The other members were the Chairman of the Board of Investments and the National Science Development Board (NSDB), the Undersecretary of Agriculture, and the Vice president of the UP at Los Banos (Technical Panel, 1971).

The Executive Panel, created under Presidential Administrative Order No. 267, in turn formed a National Agricultural Research System Survey Technical Panel, to assess current research resources and to formulate an overall program of research for the Philippines.

The Technical Panel, composed of outstanding Filipino scientists and administrators, was chaired by Prof. Pedro S. Landencia, then chief of the Agricultural Research Division of the NSDB. The rest of the Panel members were Makamba, Dr. Ricardo M. Lantican of the UPLB College of Agriculture, Commissioner Domingo D. Tapiador of the Philippine Fisheries Commission, and Prof. Edward S. Tayengco of the UP College of Business Administration.

Dr. Joseph F. Metz, Jr., Team Leader of the UP-Cornell project at Los Banos, served as consultant of the Panel.

The Technical Panel was directed to evaluate the food and agriculture research policies and programs of the Department of Agriculture and Natural Resources (DANR). This study, tagged as Phase I, began in January 1971 and ended about a month later. It covered five agencies under DANR, namely, the Bureau of Plant Industry, Bureau of Animal Industry, Bureau of Fisheries, Bureau of Soils, and Bureau of Forest Development.

Results of the survey showed that a study of DANR was not enough. A more thorough, incisive look at the total

national research system was imperative.

Thus, Phase II was immediately set into motion. The final mission: to develop a plan for a national research capability in agriculture, forestry and fisheries.

The Technical Panel that was to undertake Phase II retained its original members, except for Tapiador. Four new members were commissioned — Dr. Filomena F. Campos of the Association of Colleges of Agriculture of the Philippines (ACAP), Dr. Filiberto S. Pollisco of the UP College of Forestry, Dr. Levy A. Trinidad of DANR's Bureau of Agricultural Economics, and Porfirio Manacop from the private sector.

Laudencia remained as chairman of the Technical Panel; Madamba now served as vice-chairman.

Again, Metz was tapped as consultant, this time representing the United States Agency for International Development (USAID). He would work together with Dr. Albert H. Moseman of the Agricultural Development Council and Cummings of the Ford Foundation, the same man who led the Asian Travelling Seminar of 1970. All three had broad experience in the administration of agricultural research in the United States and Asia.

The USAID, Ford Foundation, Agricultural Development Council, and the National Food and Agriculture Council provided financial assistance to both Phases I and II. These institutions also extended help in analyzing the panel's findings and in developing recommendations through the services of their top-level consultants (PCAR, 1974).

Working from May through December 1971, the panel compiled substantial data for a six-volume report that covered the following study areas:

Volume I — The Philippine agricultural research system: evaluation and recommendations

Volume II — Recommended research areas for Philippine agriculture in the seventies

Volume III — Agricultural research in the Philippines: organization and agencies

Volume IV — Manpower resources in Philippine agricultural research, 1968-1971

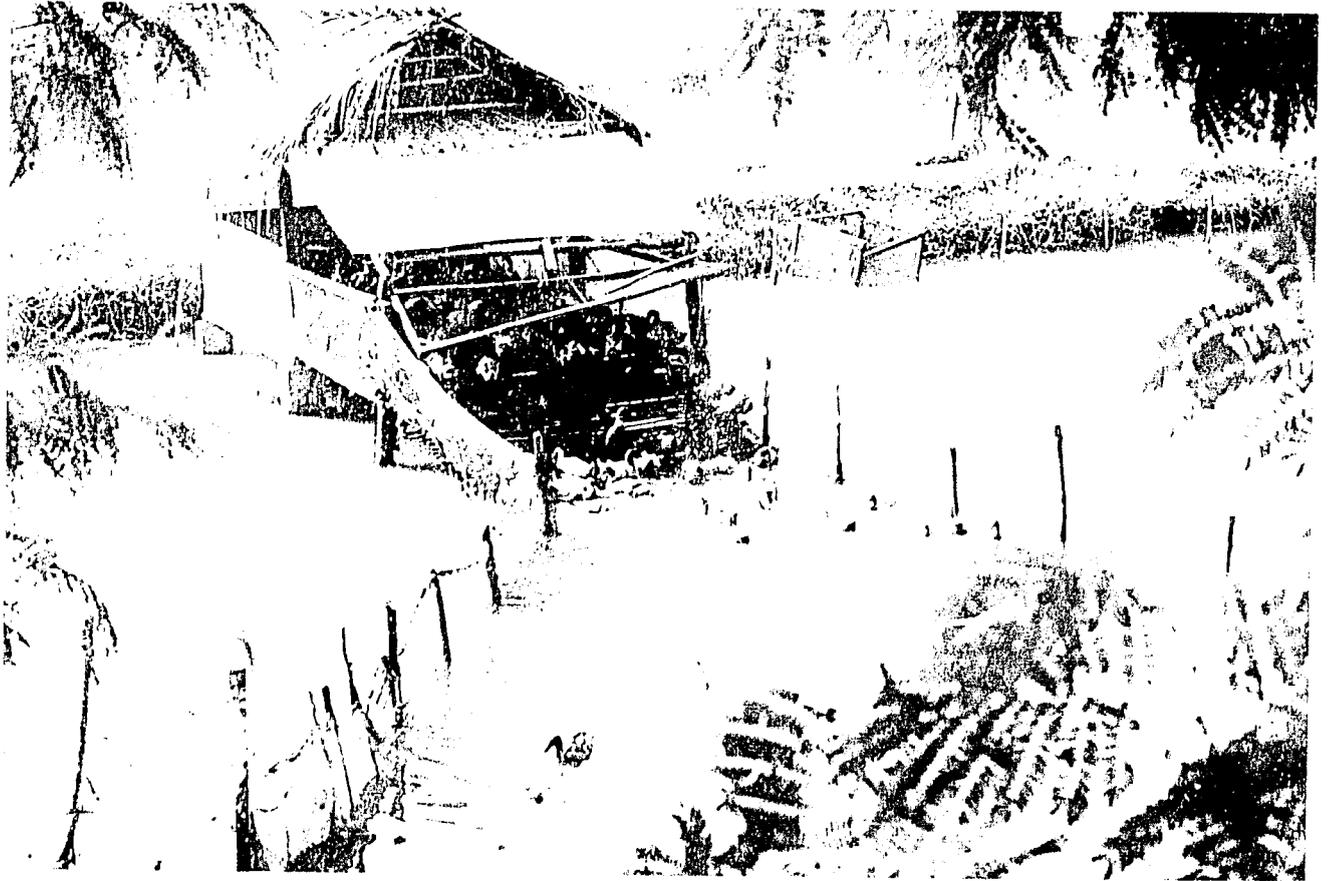
Volume V — Inventory of agricultural researches in the Philippines, 1968-1971

Volume VI — Observations on agricultural research systems of the United States of America, Australia, and Thailand

The Technical Panel's report contained descriptions and analyses of the organization and functions, manpower resources, facilities, funding schemes, and research programs of major agencies undertaking agricultural research in the Philippines.

On 20 December 1971, the Technical Panel of Phase II submitted the first two volumes of their report to Sicat

These documents would change the course of Philippine agriculture.



Integrated duck-fish farming at the Central Luzon State University (CLSU) in Muñoz, Nueva Ecija, lead agency for the Central Luzon Agricultural Research Center (CLARC). Duck waste used as feed for tilapia enhances the biological productivity of the fish.

Charting New Beginnings

mbarking on a series of field visits throughout the country in May 1971, the Technical Panel sought to identify constraints to the progress of agricultural research. The problems, pervasive and complex as they were, amounted to a lack of central planning and coordination, inadequate funding and facilities, a dearth of trained manpower, and ineffective dissemination of research results.

THE PROBLEMS

Among the more significant findings of the Technical Panel were the following:

Lack of Central Planning

Although a substantial amount of funds was being allocated by government for agricultural research, useful research output was limited and creating little impact on the agriculture sector. The fundamental problem was that responsibility for agricultural research was dispersed among many agencies.

Research did not respond to national goals since there was no mechanism for planning and implementing research projects on a national scale.

Consequently, there was no national research program to speak of.

Imbalance in research with respect to commodities and problem areas was strongly evident. There was no system, even within the NSDB, for identifying national research priorities. As a result, priorities were often as numerous as the

number of research agencies.

There was, as the Panel described it, "a buzz of activity going on but with little relevance and direction."

Even procedures for the preparation, evaluation, and implementation of research projects were vague and loosely implemented. Project proposals were normally approved by the chief administrator of the agency. The approval, however, was merely a formality and not a guarantee that the project would be funded.

According to the Technical Panel, there had been attempts to improve the planning and implementation of research projects, but these attempts were reportedly "too narrow and localized in nature." The Panel cited examples of these, such as the ACAP Research Council, the Office of the Director of Research of the UP College of Agriculture, the defunct Food Research Board of the National Food and Agriculture Council, and the Advisory Committee for Agricultural Research of the NSDB.

Lack of Coordination

Coordination of research was difficult to achieve because the various agencies involved in research did not fall within the same jurisdiction.

The Technical Panel's survey revealed there was very little effort made to coordinate within divisions of research agencies, much less among these agencies.

Although a substantial amount of funds was being allocated by government for agricultural research, the latter did not respond to national goals since there was no mechanism for planning and implementing research projects on a national scale. There was no national research program to speak of. Consequently, the Technical Panel of 1971 recommended the creation of PCAR to serve as the "main arm of the government in planning, coordinating, and implementing the national agricultural research program."

Inadequate Funding

Most agencies gave very low priority to research. Funds earmarked for research were often diverted to support other activities of the agencies. Research institutions generally used a major portion of their budget for capital outlay, with very little earmarked for operating expenses to support project implementation.

The lack of an effective mechanism for drawing up research priorities aggravated matters. A researcher sometimes had to wait two years to get his proposal funded.

As a rule, procedures for obtaining research funds were cumbersome and time-consuming. This resulted in uncertain and irregular fund releases.

Even Philippine laws contributed to the imbalance in the distribution of research funds. It was common practice then to create, through legislation, institutes for major crop or animal commodities. According to the Panel, these institutes generated funds from regular government budgets or levies from the industry concerned. After carefully assessing the situation, the Panel learned that, in effect, fiscal resources were tied down to specific commodity undertakings, causing a disparity in the distribution of research funds.

Yearly levies, for instance, ranged from about "P2.0 million for fish products to P14.0 million for sugar products." The Panel noted that as a result, some agencies had more money than they could put to use, while others had to make do with much less than needed.

Inadequate Facilities

Research facilities and equipment were far from adequate. There were too many research stations, but because of "meager" research budgets, these stations did not operate fully.

Another serious limitation was the lack of library facilities in many research institutions. Only the UP, the International Rice Research Institute (IRRI), and some NSDB agencies had notable bookholdings.

Dearth of Adequately Trained Manpower

A core of competent local scientists was badly needed to fill the needs of multi-disciplinary research.

Most research personnel lacked technical training. Expertise was concentrated mostly in the colleges and universities, particularly at the UPLB College of Agriculture.

The Technical Panel also noted an imbalance in terms of fields of specialization. A good number specialized in the crop sciences, while there was a definite manpower gap in fisheries, forestry and agricultural economics.

This imbalance in field specialization was evident even in the team approach to research. Only "production-oriented" specialists were involved in research teams, to the exclusion of experts in processing and marketing.

Members of the Panel traced the lack of adequately trained manpower to the absence of adequate incentives. Salaries were usually higher in private firms than in government agencies. Inadequate funding and facilities also discouraged bright young scientists from serving in government research positions.

Ineffective Dissemination of Research Results

As early as 1971, the Technical Panel identified the problem of disseminating research results effectively to both researchers and end-users.

Again, the lack of funds hampered efforts to publicize research results. Research information was not properly

documented on a national scale. The NSDB tried to inventory research information but with limited success.

RECOMMENDATIONS

After a thorough analysis of their findings, the Technical Panel drafted a corresponding set of recommendations which, in essence, pointed out areas for new beginnings.

Some of the major recommendations of the Panel are cited here to serve as reference points when we assess the growth of PCARRD and the national research system in later chapters:

- Develop relevance and direction in agricultural research programs by making these responsive to national goals and by channelling all agricultural research efforts in that direction.
 - Remove barriers to the development of competent research personnel and raise salaries to levels competitive with other opportunities available to trained researchers.
 - Establish a systematic research manpower development program to improve the training and qualifications of staff engaged in agricultural research programs.
 - Provide a mechanism to maximize the use of present resources for agricultural research.
- At that time, research leadership was concentrated in the agricultural colleges and universities, particularly the UPLB. This pool of manpower had to be tapped and given full opportunity to participate and provide leadership and direction in the national research effort.
- Concentrate field research resources in a few but fully equipped research stations.
 - Strengthen library facilities in key institutions around the country and make these available to all agricultural research workers.

- Provide safeguards to avoid multiplicity of legislative acts in support of specific organizations.

These recommendations addressed the problems of inadequate funding and facilities and the dearth of well-trained scientific manpower. The more fundamental problems of lack of central planning and coordination, however, required more profound and far-reaching changes.

Thus, the Technical Panel recommended the creation of the Philippine Council for Agricultural Research (PCAR), to serve as the "main arm of the government in planning, coordinating, and implementing the national agricultural research program."

The Panel called for the immediate promulgation of a Presidential Executive Order to implement the basic features of PCAR. This executive order would:

- establish the mechanism for having all government funds earmarked for agricultural research programmed by PCAR,
 - define the composition of the PCAR Governing Council and the PCAR Technical Program Planning and Review Board,
 - direct the organization of the PCAR Secretariat up to the Commodity Research Program Planning and Implementation Team level,
 - provide funds for the initial operations of PCAR, and
 - call upon research agencies concerned to reorganize and re-orient their respective research programs and participate in drawing up the national agricultural research program through the PCAR mechanism.
- Aware of the urgent need for research that would make an impact on people's lives, the Panel pressed for the establishment of a national network of strategically located agricultural research centers and stations.

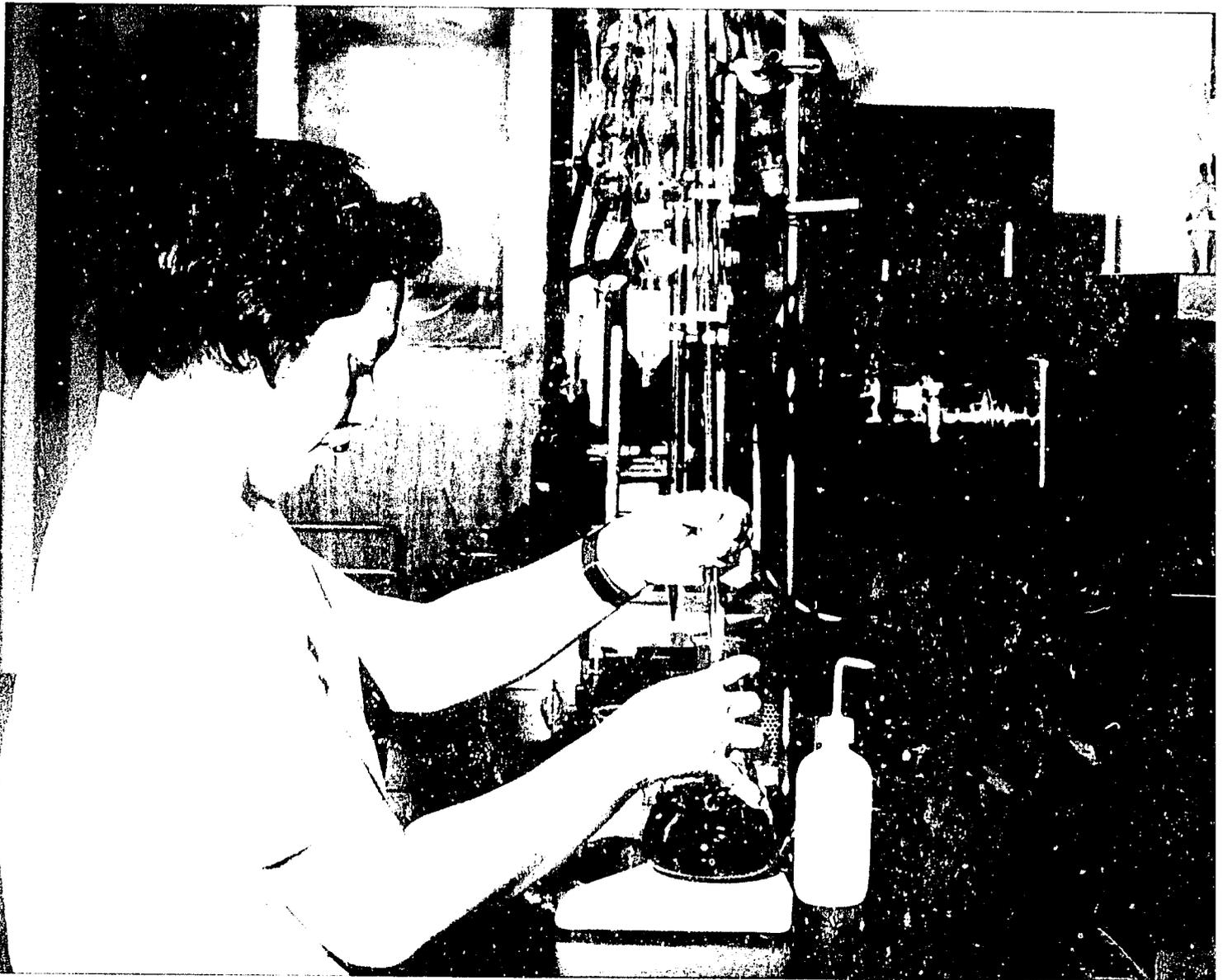
To further ensure the efficient and effective conduct of research, the Panel prescribed the establishment of uniform procedures among all agencies for developing project outlines, progress reports, and project evaluations; and the institution of appropriate budgeting, accounting, and auditing regulations for a more responsive administration of research funds.

A critical step in formulating the national research program was the identification of problem areas in

agriculture that required immediate attention. The Panel set the following criteria for determining priorities among the various commodity research programs:

- economic and social importance,
- available pool of knowledge on the commodity concerned,
- extent of research that still had to be done on a given commodity, and
- available research capability for the commodity concerned, in terms of manpower, facilities and funding.

The Technical Panel's survey of 1971 revealed that research facilities and equipment were far from adequate.



The recommended mechanism for updating priorities among commodity research programs was through action, initially by the PCAR Technical Program Planning and Review Board (now the Technical Advisory Committee or TAC) and finally by the PCAR Governing Council.

The Technical Panel's commitment to their mission and their conviction in the need for a strong and dynamic national research system showed through in the detailed plan the members drew up for the establishment and implementation of PCAR. Their report furnished certain "excellent in-depth assessments and recommendations that continue to hold relevance today" (International Agricultural Development Service, 1980).

Their recommendations signalled what President Marcos, almost eight years later, would refer to as "the introduction of a new order of things . . . a difficult . . . perilous . . . and uncertain task . . ." in which PCARRD would take the lead.



Among the major problems of agricultural research in the sixties was the dearth of adequately trained manpower. Thus, the Technical Panel recommended the implementation of a comprehensive and systematic manpower development program.



The new campus of the Visayas State College of Agriculture (ViSCA), lead agency for the Visayas Coordinated Agricultural Research Program (VICARP). The administration building stands at the center beneath Mt. Pangasugan which is shrouded in morning mist.

CHAPTER 3

The Creation of PCAR

After the Presidential Committee Executive Panel submitted the Technical Panel's findings, recommendations and detailed implementation plan to the President, there was really nothing left to do but wait for the slow wheels of the legislative process to grind. But even while plans to improve agricultural research capability were being firmed up, things were coming to a head on the social and political front.

POLITICAL BACKDROP

As the problems of the sixties — urban and rural unemployment, high population growth, food shortage, unequal income distribution, and political and social unrest — crept into the seventies, national leadership found itself at a crossroad. Its constitutional prerogatives were severely put to test.

On 21 September 1972, the President of the Republic declared the country under Martial Law by issuing Proclamation 1081. This proclamation enabled the President to act directly and decisively to contain internal aggression and maintain political stability. The government acted swiftly to institute sweeping reforms that would ease unemployment, improve agricultural productivity, and achieve a more equitable distribution of wealth and income.

The demands of the New Society greatly speeded up implementation of the

Technical Panel's recommendations for the establishment of a national agricultural research system. Barely a week after the declaration of Martial Law, Tanco received orders to draft a presidential decree creating the Philippine Council for Agricultural Research.

Tanco called in DANR Undersecretary Jose D. Drilon, Jr. to help draft the decree, together with Madamba and Lantican who had participated actively in both the Phase I and Phase II studies. Since the men, particularly the latter two, knew the Technical Panel's recommendations by heart, it did not take them long to complete their task.

As Drilon (1976) recounted years later, three days after they submitted the draft legislation, on 10 November 1972, the President signed Presidential Decree No. 48. The Decree spelled out the functions and powers of PCAR, the organization and composition of the Council and the Secretariat, and the provisions for research program leaders (Appendix 1).

THE MANDATE

Aware of the problems plaguing the country's agricultural research system, the President vested PCAR with the following major functions and powers:

- define goals, purposes, and scope of research necessary to support progressive development of agriculture, forestry and

The President's declaration of martial law greatly speeded up implementation of the Technical Panel's recommendations on the establishment of a national research system.

fisheries for the nation on a continuing basis;

- using the basic guidelines of relevance, excellence, and cooperation, develop the national agricultural research program based on a multidisciplinary, interagency, and systems approach for the various component commodities;
- establish a system of priorities for agriculture, forestry, and fisheries research and provide meaningful mechanisms for updating these priorities;
- develop and implement a fund-generating strategy for supporting agricultural research;
- program the allocation of all government revenue earmarked for agricultural research to implement a dynamic national agricultural research program;
- provide the mechanism for assessment of progress and updating the national agricultural research program;
- establish and provide support for a national network of centers of excellence for the various commodity research programs by drawing from the facilities of cooperating universities and colleges and other research agencies and linking these closely with selected PCAR research centers and stations;
- develop a mechanism for full communication among workers in research, extension, education, and national development;
- establish a repository for research information in agriculture, forestry, and fisheries;
- provide for a systematic program of agricultural research manpower development and improvement; and
- provide for appropriate incentives to encourage topnotch researchers to remain working in their respective areas of agricultural research.

The President also granted PCAR 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.

For administrative purposes, the Council was attached to the DANR.

The President also decreed that the PCAR Governing Council would be composed of the following officials:

- The Chairman, National Science Development Board . . . Chairman
- The Secretary of Agriculture and Natural Resources . . . Vice-chairman
- The Budget Commissioner
- A Representative of the National Economic and Development Authority
- The President, Association of Colleges of Agriculture of the Philippines
- The Chancellor, University of the Philippines at Los Baños
- One outstanding leader in agricultural business to be appointed by the President upon recommendation of the PCAR Governing Council

Inclusion of the NSDB Chairman, the Secretary of Agriculture and Natural Resources, the Budget Commissioner and the NEDA representative in the Governing Council strengthened the assurance of supporting funds. Since the NSDB then was the major source of research funds, it was important to keep the Board informed of national research priorities identified by PCAR. It was also vital for the Budget Commission (now the Office of Budget and Management or OBM) to understand and appreciate the requirements of the national research system so that budget allocation would conform with research needs.

On the other hand, linkage with NEDA ensured close coordination of research program planning with national development objectives.

Since the composition of the PCAR Governing Council covered a broad range of representation, from the finance to the education sectors, it enabled PCAR to keep close tabs on the needs and priorities of the various sectors. The line agencies of DANR, for instance, would be the immediate users of whatever research results the national research system would generate. Thus, national research thrusts had to be supportive of the DANR's production programs.

In the same vein, representatives from the private sector provided PCAR with feedback on the actual performance of research-based technology in the field. While the rest of the Governing Council members analyzed research priorities from a national point of view, the representatives from the private sector evaluated national research thrusts from a more practical point of view, placing greater stress on economic viability and social acceptability.

Finally, the PCAR Governing Council, through the ACAP and UPLB representatives, provided the link needed to pool the scientific manpower and resources which were largely concentrated in the agricultural colleges and universities, particularly UPLB.



Mt. Kanlaon (at left) looms over fields of sugarcane trials at the La Granja Agricultural Research Center (LGARC) in La Carlota, Negros Occidental. LGARC, the first center organized by PCARRD in 1975, is a center-oriented consortium with its member agencies in close proximity to one another.

CHAPTER 4

Breaking New Ground

As PCAR grew and its capabilities became known, its scope and functions were broadened as well. Within a decade after its establishment, PCAR marked two major changes in its mandate to keep up with the needs of a rapidly changing environment.

PCARR: STRENGTHENING RESOURCES RESEARCH

When the DANR was reorganized in 1974 to form two separate departments, the Department of Agriculture (DA) and the Department of Natural Resources (DNR), the PCAR Governing Council ruled that in spite of this separation of responsibilities, there should only be one planning and coordinating body for both agriculture and natural resources. PCAR was therefore attached administratively to the NSDB, since the previous set-up wherein PCAR was attached to the DANR was no longer appropriate.

Soon after the reorganization, Secretary of Natural Resources Jose Leido, Jr. lobbied for the inclusion of mines research within PCAR's range of concerns and responsibilities. Leido's move was endorsed by PCAR Governing Council Chairman Florencio A. Medina and Agriculture Secretary Tanco.

On 29 December 1975, Presidential Decree No. 864 was issued "to expand the functions of PCAR to include mines research (except petroleum and oil), and change its name to the Philippine

Council for Agriculture and Resources Research (PCARR)" (Appendix 2).

"Mines research," President Marcos declared, "is best done in relation to agricultural, forestry and fisheries resources, in order to consider their combined effects in maintaining a favorable ecological balance."

The mining industry, then one of the more lucrative foreign exchange earners, was proving to be a major factor in the growth of the Philippine economy. Although only a small percentage of mineral resources had been exploited, the country was producing significant amounts of mineral products that gave her prominence as a mining country (PCARRD, 1983).

Through Presidential Decree No. 864, President Marcos entrusted PCARR with the following functions, in addition to those stipulated in Presidential Decree No. 48:

- have authority and responsibility, as part of the scope of its operations, over all government-supported research on mineral resources except petroleum and other mineral oils;
- establish, support and manage the operation of a national network of centers of excellence for the various research programs in crops; livestock; forestry; fisheries; soil, water, and mineral resources; and socio-economics research related to agriculture and natural resources; and
- enter into agreements or relationships with other similar

When the DANR was reorganized into the Departments of Agriculture and Natural Resources, the PCAR Governing Council ruled that in spite of this separation of responsibilities, there should only be one planning and coordinating body for both agriculture and natural resources. Thus, PCAR was renamed PCARR.



In December 1975, PCARRD was given major responsibility for planning and coordinating mines research in relation to agriculture, forestry, and fisheries.

institutions or organizations, both national and international, in furtherance of the above purposes.

Presidential Decree No. 864 also modified the composition of the PCARR Governing Council. By virtue of their offices, the Secretaries of the DA and the DNR were appointed vice-chairmen of the PCARR Governing Council. Their membership in the Governing Council stressed the equal importance PCARR sought to give to both the agriculture and natural resources sectors. The most significant change in composition, however, was the PCARR Director General's appointment as a member of the Governing Council. In addition, there were to be two (instead of one) outstanding leaders in the business sector. As before, these representatives from the private sector would be appointed by the President of the Republic, upon recommendation of the PCARR Governing Council.

PCARRD: MEETING DEVELOPMENT IMPERATIVES

The dawning of the eighties marked another auspicious turning point in the history of PCARR and in the development of Philippine science and technology. The reorganization of the country's science and technology machinery, effected by Executive Order No. 784 which President Marcos signed on 17 March 1982, paved the way for the development and implementation of a more comprehensive science and technology plan for the country.

The Executive Order reorganized the NSDB into the National Science and Technology Authority (NSTA) which was to "provide central direction, leadership and coordination of scientific and technological research and development activities both in the government and the private sector."

The man to be largely credited for the move to revitalize the country's science and technology machinery was the NSTA Director General (formerly NSDB Chairman) himself, Emil Q. Javier. Javier's appointment as NSTA Director General with the rank of Minister of Science made him the third PCARR Governing Council Chairman, succeeding the former NSDB Chairman Melecio S. Magno.

Drawing largely on the PCARR experience, Javier conceived of certain structural changes he believed were needed to make science and technology work for development. He drew up the framework for the reorganization of the old Board and pushed for the creation of a system of councils, of which PCARR is the precursor.

Under the new set-up, PCARR, which functioned previously as an NSDB-attached agency, became one of the four sectoral councils under the NSTA umbrella. To emphasize its development orientation, PCARR was re-named the Philippine Council for Agriculture and Resources Research and Development (PCARRD) and its head was henceforth called the Executive Director.

The creation of a system of sectoral councils is a salute to PCARRD's efforts to forge a dynamic research system. In the new national science and technology structure, it is envisioned that the primary role of promoting, planning, coordinating, and monitoring research will devolve from NSTA proper to the sectoral councils. The other three councils are the Philippine Council for Health Research and Development (PCHRD), Philippine Council for Industry and Energy Research and Development (PCIERD), and the National Research Council of the Philippines (NRCP).

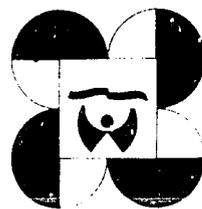
The science and technology councils are under the administrative supervision

of NSTA except NRCP which is attached to the Authority for policy and program coordination.

Each council is mandated, within its areas of concern, to formulate plans and policies; establish a system of priorities; develop a national research and development program; establish and manage a national network of centers of excellence for their various research programs; provide a mechanism for their coordination and assessment; and maintain a repository of research information.

The councils are also tasked to strengthen the research institutions within their respective networks and provide for systematic manpower development programs (NSTA, n.d.).

The addition of the developmental function to the PCARRD mandate strengthens further the development orientation of the institution. It lays stress on the conviction that research should not end with the termination of a research effort nor the publication of research outcomes, but with the eventual application of research results by farmers and other clientele groups.



The New PCARRD Logo

The *salakot* — popular emblem of the Filipino farmer — in the PCARRD logo depicts the Council's concern for research to impinge upon the lives and well-being of the common folk and to push the momentum of research from scientific centers to the farms. As this headgear protects those who toil in the fields against the sun and rain, so must the national research system cushion them from the impact of a changing economy with technologies that are practical, effective and acceptable in their socio-cultural milieu.

The *salakot's* upper dome dramatizes the bounty and the promise of Philippine agriculture while the brim depicts the breadth of natural resources which today require even more judicious management.

The *salakot* is held up by a figure which represents an agriculture and resources research community that has been fused into a cogent and systematic national research enterprise — aggressive, alert and responsive to national goals.

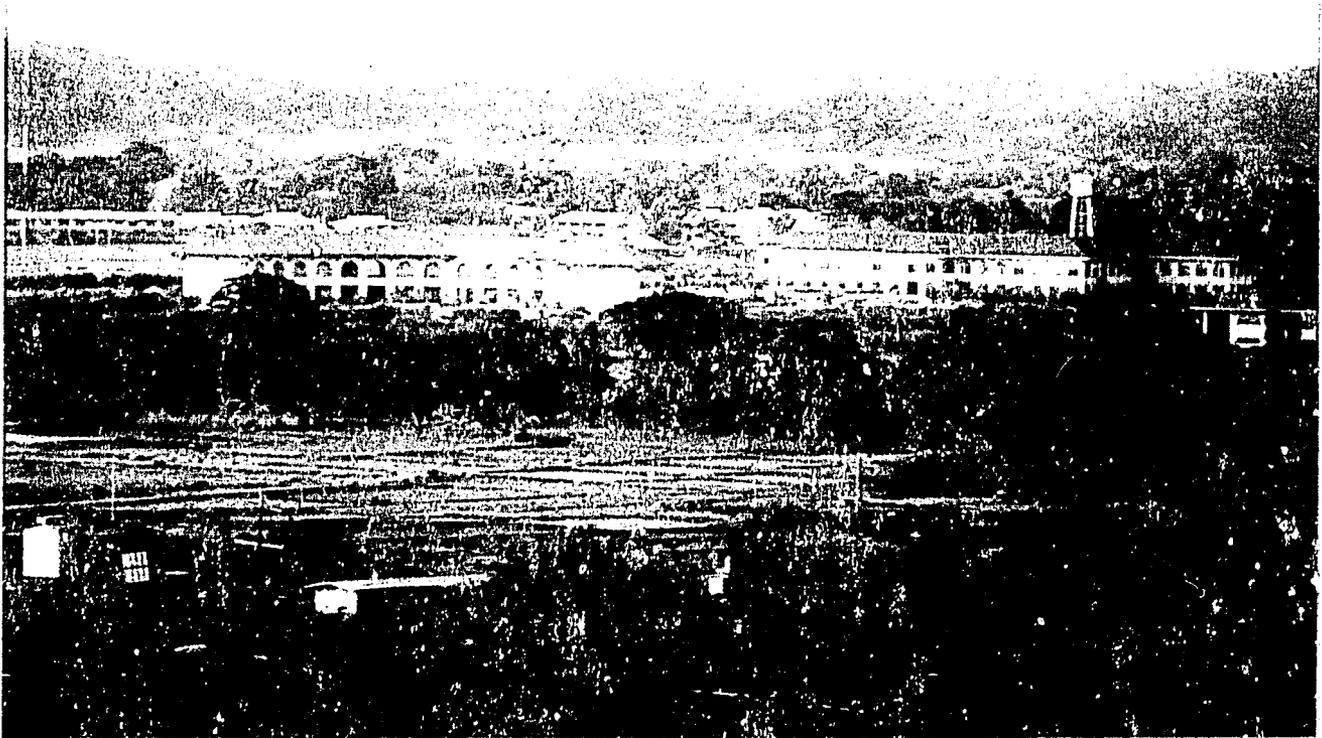
The PCARRD logo, surrounded by four circles, symbolizes PCARRD's strengthened development orientation and commitment, as one of the four sectoral councils of the reorganized National Science and Technology Authority, to the hallmarks of relevance, excellence, harmony, and cost-effectiveness.



Dr. Emil Q. Javier (then UPLB Chancellor) accepts the chairmanship of the NSDB from outgoing head Melecio S. Magno at turnover ceremonies during the 97th meeting of the PCARRD Governing Council.

PART II

Building the National Research System



The Mariano Marcos State University (MMSU), in Batac, Ilocos Norte. The MMSU is lead agency for the Ilocos Agricultural Research Center (ILARC)

Organizational Structure

CAKRD is not just a few research administrators and technical staff working along narrow, specialized fields. It capitalizes heavily on available expertise in all facets of development-related activities like research in the social, physical, and biological sciences, education, management, administration, planning, and policymaking. In its task of finding research-based solutions to constraints in the development efforts of the country, PCARRD marshalls expertise and resources from private and public, national and international research and development entities.

Although PCARRD's structure has remained essentially the same since its inception in 1972, the composition of its organizational bodies has been modified from time to time to keep up with its changing scope and functions.

PCARRD is organized into three main bodies: the Governing Council, the Technical Advisory Committee (TAC, formerly called the Technical Program Planning and Review Board), and the Secretariat.

THE GOVERNING COUNCIL

The Governing Council is the policymaking body of PCARRD. As explained previously, the Governing Council's composition guarantees a stable link with national development as well as science and technology goals. This linkage assures continued relevance

and responsiveness of the national research program to critical issues in agriculture and natural resources. It also provides for wider participation by all agencies concerned with research and development, including educational institutions, Ministry bureaus and the private sector.

The GC is presently composed of the following:

- Director General, National Science and Technology Authority . . . Chairman
- Deputy Minister, Ministry of Agriculture and Food (MAF) . . . Vice-chairman
- Deputy Minister, Ministry of Natural Resources (MNR) . . . Vice-chairman
- Executive Director, PCARRD. . . Ex-officio Secretary
- Deputy Administrator, National Food Authority
- Chancellor, University of the Philippines at Los Baños
- Three representatives from the private sector who have shown outstanding work in the fields of agriculture and natural resources

The make-up and functions of the Governing Council follow closely the recommendations contained in the Technical Panel report of December 1971. The functions of the Governing Council are to:

- provide for a continuing evaluation of the national research program for agriculture and natural resources;

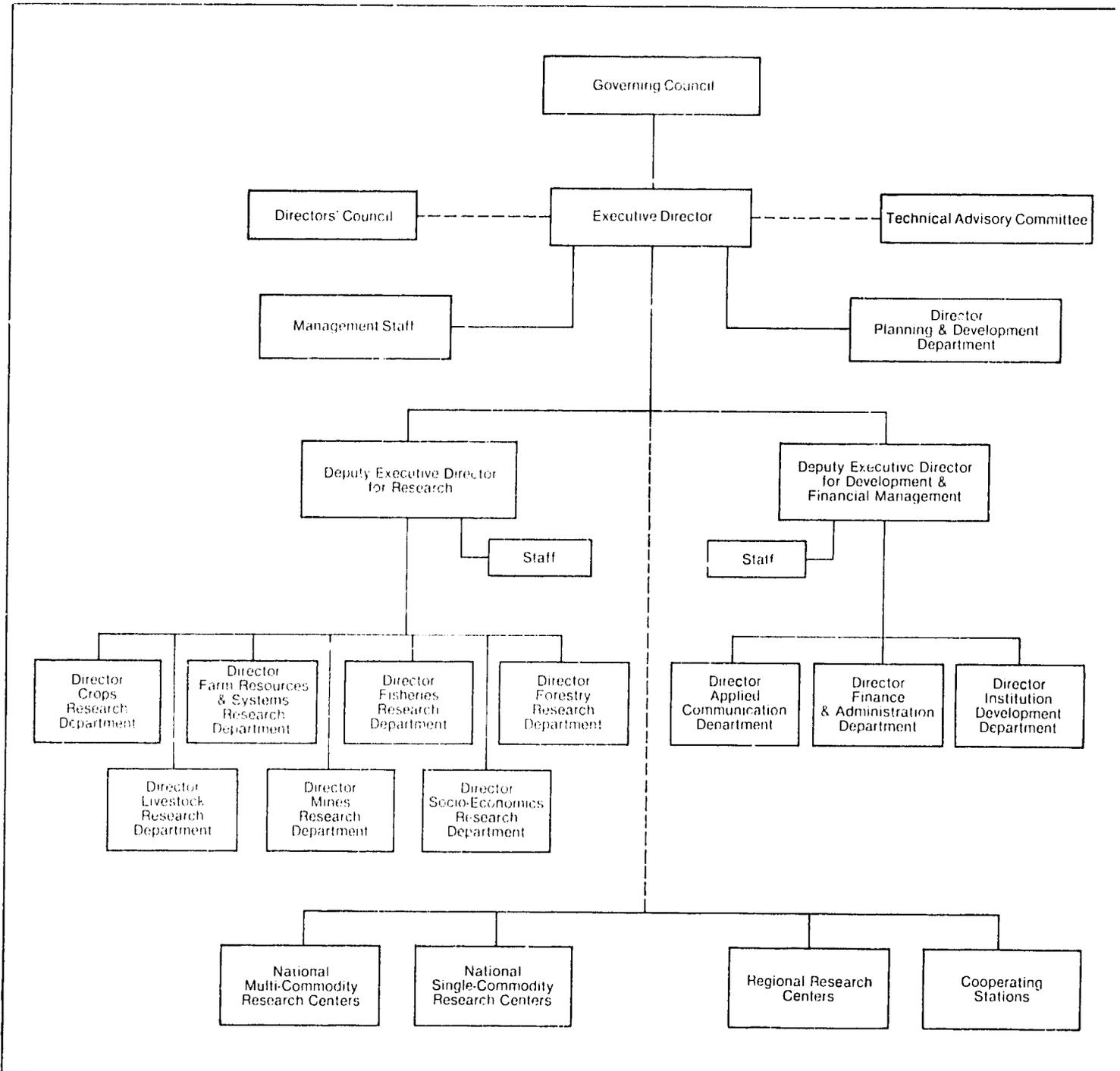
"In the context of the changing environment in which an enterprise operates, and considering the natural complexity of handling people in group endeavors, organization and staffing are continuing functions which must be re-examined periodically. Also, they are functions which must be dealt with, whenever possible, with an eye for a balance between flexibility that would allow the viable 'tailoring' of the organization and its movement toward desired ends, and stability that would keep or promote organizational pressures."

JOSE D. DRILON, JR.

Organizational Set-Up
of PCARRD
and the National
Research System

- formulate policies, rules and regulations on the administration of the program;
 - approve the budget allocation to support national agriculture and resources research programs which are funded from government revenues and tax levies;

- determine operational procedures regarding the appointment, promotion, and termination of research personnel supported by government funding for agriculture and resources research; and
 - establish the overall pattern of operation of the national agriculture and resources research program.



THE TECHNICAL ADVISORY COMMITTEE (TAC)

The Technical Advisory Committee assists the PCARRD Executive Director in ensuring the quality, competence and effectiveness of the national research program. It defines and recommends national priorities for research in agriculture and natural resources. Based on these priorities, the TAC reviews the national research programs for each of the 36 commodity groups before recommending these to the Governing Council for approval.

The TAC also reviews the PCARRD budget and recommends appropriate action to the Governing Council. Grants-in-aid for research are allocated based on the recommendations of the Committee. In general, the TAC reviews and recommends guidelines and policies for the development and use of research manpower and facilities and the funding of research throughout PCARRD's nationwide network of research centers and stations.

The TAC is currently composed of the following:

- Executive Director, PCARRD . . . Chairman
- Director, Agricultural Research Office, MAF . . . Vice-chairman
- Assistant Secretary for Planning, MNR . . . Vice-chairman
- Deputy Executive Director for Research, PCARRD . . . Ex-officio Secretary
- Director, Agricultural Programs Office, NEDA
- Chairman, Agriculture and Forestry Department, NRCF
- Executive Director, National Food and Agriculture Council
- Chief, Planning and Programs Service, MNR



- Chief, Budget Operations Division, OBM
- Chief, Special Projects Services, NSTA
- Three research directors from the national research system
- Four representatives from the private sector

The Governing Council (GC) in session with NSDB Chairman Florencio A. Medina (in black suit) presiding. Seated from left to right are: CUSU President Amado Caraga, PCARRD Director General Madamba UPLB Chancellor Abelardo G. Samonte, Dr. Heanor Fernando, of UPLB, and former Deputy Minister of Agriculture Manuel O. Lim, Jr.

THE SECRETARIAT

The PCARRD Secretariat consists of technical and administrative personnel who implement the policies and guidelines formulated by the Governing Council.

Section 5 of Presidential Decree No. 864 authorizes the Governing Council "to reorganize its Secretariat and research network by creating, consolidating, or integrating as many divisions and research stations as may be necessary to accomplish its functions and objectives." All appointments to the PCARRD directorate, core staff, and national commodity teams are approved by the Governing Council.

The Secretariat Core Staff

The core staff is presently headed by the Executive Director, who is assisted by the Deputy Executive Director for Research

and the Deputy Executive Director for Development and Financial Management.

The PCARRD directorate includes seven directors who head the following research departments: Crops, Livestock, Forestry, Fisheries, Mines, Farm Resources and Systems, and Socio-economics. Four other directors head the following departments: Applied Communication, Planning and Development, Finance and Administration, and Institution Development.

The Basic Principles of Agricultural Research

The National Agricultural Research System Survey Technical Panel of 1971 drew up eight basic principles of agricultural research to guide them in undertaking their study.

These principles represent the underpinnings of a strong and effective national research system, the factors that one must consider in building up national research capability

- *Agricultural progress is important and vital to national welfare.* The effective application of modern science in all phases of agriculture is essential

Agriculture includes crops, livestock, fisheries, and forestry. Research in these areas covers the production, processing, marketing, and utilization aspects. It involves the supply of factors of production and related trade in agricultural products, and the associated social and economic aspects of agricultural development.

- *The research program must respond to current needs of developing agriculture and be sensitive to the needs of the future.* The research program must provide for a thorough study of basic principles and for nationwide adaptation and application to various ecological situations. Above all, the research program must be stable and alert to provide the nation with a sense of direction in times of crisis

- *The agricultural research program should be balanced* in terms of commodities and problems; various supporting disciplines; and appropriate combinations of basic, applied, adaptive, and developmental aspects.

- *The research organization and program should be flexible* and provide for a continuing reappraisal of programs, progress, and priorities. Agricultural research should be directed at priority problems. It must be production-oriented, designed to solve problems in the field, cognizant of marketing requirements and socio-economic factors

- *A team approach in solving problems should be developed.* Different institutions and agencies responsible for research must maintain an open flow of communication among themselves and exploit other effective mechanisms for joint planning to avoid duplication of efforts.

- *Available scientific talent should be fully utilized and opportunities for continuous professional improvement must be provided.* Quality, training, and prestige of scientists must be appropriately recognized and rewarded. Efficiency must be emphasized to gain public support and attract financial assistance. Merit and performance should be considered foremost in staff recruitment, promotion and compensation

- *The research program in responding to public needs, should be insulated from undue political pressures*

- *Finally, relevance, excellence and cooperation should be the hallmarks of all research undertakings*

Through its research departments, PCARRD processes, coordinates, monitors, and backstops the implementation of the national research program.

Each research department is responsible for coordinating the activities of the national commodity teams under its jurisdiction. In addition, each department has a conglomerate of concerns such as manpower development, project development, workshop coordination, technology packaging, and research commodity programming and monitoring.

National Commodity Research Teams

Interagency and multidisciplinary national commodity research teams, under the jurisdiction of the research departments, plan, coordinate, review, and evaluate national research programs for their respective commodities. These teams draw on the recognized expertise of local researchers, extension workers, and representatives from the private sector, participating on an "on-call" basis.

National commodity teams identify problem areas and establish research priorities in their respective commodities. The teams also provide for a multidisciplinary review of ongoing research projects and an appraisal of the priority level of proposed projects. Ongoing projects are evaluated and recommended for continuation, suspension, termination, or revision of work plans. Finally, the teams identify research stations that will have primary responsibility for their respective commodities.

Commodity team leaders and members were designated specific responsibilities by the Governing Council at its third meeting on 29 December 1972 (PCARR, 1979). The team leader is expected to fulfill the following functions:

- provide leadership for the team in undertaking critical analysis of the status and problems of the commodity;
- present the commodity research program evolved by the team to the PCARRD Directors' Council and backstop the research division directors in presenting the program to the TAC;
- as chairman of the technical review panel, coordinate with proponents regarding revisions in the latter's research proposals;
- ensure the periodic assessment of priorities and the updating of the entire regional or national agricultural research program of his commodity by convening the commodity research team members and coordinating team activities;
- maintain working linkages with team leaders of closely related commodities and keep abreast with their plans, programs, and activities for greater coordination in planning and actual research work; and
- recommend to the research division director concerned the composition of the commodity team.

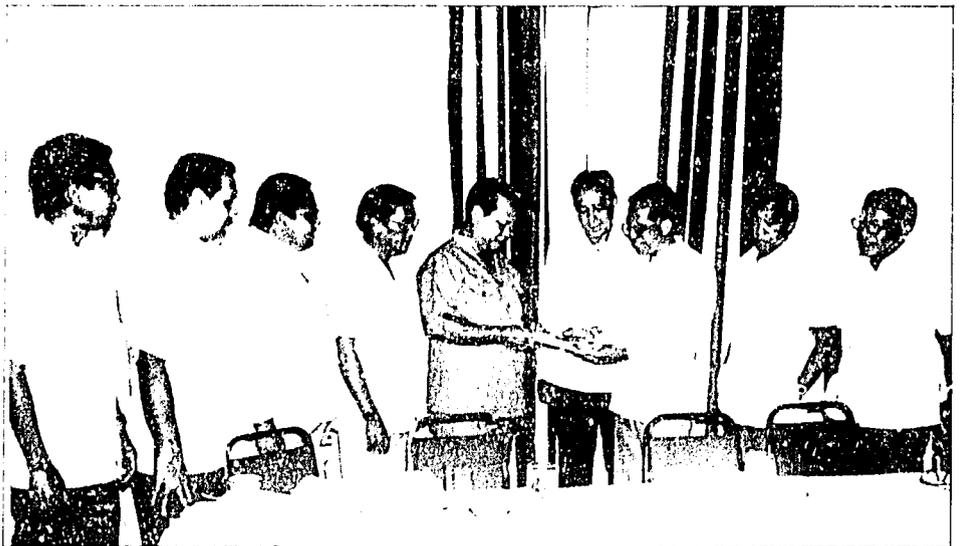
Members of the national commodity research teams are expected to perform the following functions:

- provide the commodity team with benchmark information on research gaps in their particular disciplines within the commodity;
- assist the team leader in gauging the relevance and social benefit of the various research areas incorporated in the national research program; and
- assist the team leader in the field evaluation of ongoing projects.

National commodity research team leaders serve an average of one day a week, monitoring the various commodity research programs. Team members, whose number may vary from 5 to 14 per commodity, serve for approximately 10 days a year.

The "on-call" arrangement enables PCARRD to stick to a minimum core staff while providing for the involvement of the best scientific minds in the country. Thus, critical problems in agriculture and natural resources are resolved without unnecessarily draining the manpower resources of other agencies within the national research system.

Tanco (fourth from left) stresses a point during Governing Council deliberations on research priorities. Seated from left to right are Samonte, FORI Director Filiberto S. Pollisco, Natural Resources Secretary Leido, NSDB Chairman Magno, and Madamba.



Members of the Governing Council witness the recent launching of the *Philippines Recommends* on goat farming. From left to right are Assistant Director Virgilio A. Fernandez of PCARRD's Forestry Research Division, private sector representatives Luis F. Lorenzo and USM President Hadj Jamil S. Imlan, NFA Deputy Administrator Pablo V.

Pablo, Bureau of Animal Industry Director Renato Bulay, Valmayor, NSTA Director General Javier, MAF Deputy Minister Orlando Sacay and UPLB representative Dr. Ricardo M. Lantican. All except Fernandez and Bulay are current members of the Governing Council.



Transplanting and shading of tobacco seedlings at the Philippine Tobacco Research and Training Center (PTRTC) experimental farm. The PTRTC is a member agency of ILARC.

CHAPTER 6

Setting the Direction for Research

Setting directions for research is PCARRD's primary function. It must ensure the formulation of a well-defined national research program to be implemented by the national research system.

A MEETING OF MINDS

A Prelude to the First National Research Congress

In December 1972, barely a month after the formal organization of PCARRD, the Secretariat was already laying the groundwork for the First National Agricultural Research System Congress. The Congress would harness the expertise of some 500 Filipino scientists, development workers, and policymakers to develop a national agricultural research program which would make agricultural research in the country a dynamic force for national development.

Meanwhile, a big debate regarding the holding of a system-wide Congress in February ensued during the first meeting of the Technical Program Planning and Review Board on 27 December 1972. Some members felt that there was not enough time and money and not enough research leaders to compose the commodity research teams. Madamba, supported by Agriculture Undersecretary Drilon and Agriculture

Secretary Tanco, pushed determinedly for the early holding of the Congress. Madamba knew that if they did not begin on time, a lot of opportunities would be lost and PCARRD's timetable would be set back by a whole year. Two days later, on 29 December 1972, the plans for the National Agricultural Research System Congress were approved at the third meeting of the Governing Council. The problem of financing the Congress was partly solved by tapping various donors from the government and private sectors.

In January 1973, multidisciplinary and interagency commodity research teams were formed to serve as the main planning body for the commodity research programs. Eighteen initial commodities were established: Coconut; Corn and Sorghum; Forage, Pasture and Range Resources; Fruit Crops; Soybean and other Field Legumes; Rice; Sugarcane; Vegetable Crops; Swine; Poultry; Beef-Carabeef; Forest Production; Forest Products Utilization; Soil Resources; Water Resources; Marine Fisheries; Inland Fisheries; and Applied Rural Sociology.

As used in the national research program, the term *commodity* includes physical products such as rice and coconut, resources like soil and water, and disciplines like rural sociology and macroeconomics.

"Any research program should exhibit adaptability to the varied and dynamic changes taking place in the economy. It should be adapted to changing requirements and expectational achievements. To be effective, programs must be planned to gear them to the challenges of the future."

JOSEPH C. MADAMBA



The First National Agricultural Research System Congress was a major step in developing the national research program.

The First National Agricultural Research System Congress

On 12-17 February 1973, the leaders and members of the initial 18 commodity research teams participated in the Congress. Other participants included 500 outstanding Filipino researchers and representatives from 25 government bureaus and agencies, 13 universities and colleges, and 15 private firms; and four cabinet members -- Cesar E.A. Virata of Finance, Agriculture Secretary Tanco, NSDB Chairman Medina, and Vicente Paterno of the Board of Investments. Together, they evolved a comprehensive and well-planned national research program for agriculture, forestry and fisheries -- the first such effort in the history of Philippine agriculture.

During the six-day session, members of the research congress established commodity benchmark information through intimate knowledge of their respective commodities. The members also examined a compilation of abstracts of all researches completed since 1967 and the listing of all ongoing researches as of early 1972. All the necessary working papers were prepared by the PCARRD Secretariat before the Congress. Using an integrative and multidisciplinary approach, the Congress

participants pinpointed commodity industry objectives, identified problem areas and alternative solutions, and established priorities among identified research areas based on relevance and usefulness.

Three main guidelines were considered in the formulation of the national research program. These were the following:

- that the research program should jibe with and be supportive of the nation's development goals;
- that the research program should maintain a balance between short- and long-range research to maintain its momentum; and
- that the goals set forth in the research program should not be a mere statement of objectives, but rather, a quantification of objectives.

Having identified the research areas, the participants of the Congress proceeded to determine the available technical manpower, gaps and training needs and drew up an estimate of the budget required to effectively implement the research program. Finally, the output of the different teams were consolidated as the National Research Program -- the research agenda for the seventies.

RELEVANCE AS THE ULTIMATE GOAL

Additions and Divisions

Recognizing that the research needs of the national economy and the development of the agricultural sector were not confined to the 18 initial commodities, PCARRD created 11 more commodities in July 1973: The additional commodities were: Abaca and other Perennial Fiber Crops; Cotton, Annual Fibers and Sericulture; Root Crops; Tobacco; Ornamental Horticulture; Industrial Oil and Spice Crops; Cacao, Coffee and Tea; Rubber; Dairy; Parks and Wildlife; and Macroeconomics.

Fifteen months later, in October 1974, the Governing Council approved the reorganization of the Forest Production and Forest Products Utilization Commodities under the Forestry Research Division. This move paved the way for the creation of three more commodities: Timber Products, Non-Timber Products, and Fiber Boards and Paper Products.

Dr. Filiberto S. Pollisco, one of the PCARRD pioneers who has headed the Forestry Research Division since 1972 to date, explained the reorganization thus: "The restructuring of the Forest Production and Forest Products Utilization Commodities is deemed necessary in order to jibe with the overall policy of PCARR with respect to the system of integrated approach of conducting research in agriculture, forestry and fisheries. It is also in consonance with the national government's current drive to give more emphasis and encouragement to the private sector engaged in forest industrial plantation."

Pollisco also cited three advantages of the restructuring – firstly, it would lead to the conversion of two main commodities from a *pseudo* status to that of real commodities; secondly, it would facilitate computerization and documentation; and thirdly, it would provide better opportunities for inter-agency linkages among different government and private research agencies and institutions.

On 20 December 1974, the establishment of another commodity, this time under the Fisheries Research Division, was approved by the Governing Council. Aquaculture was separated from Inland Fisheries in recognition of the importance of aquaculture to the fisheries sector.

Dr. Elvira O. Tan, who succeeded Innocencio Ronquillo as Director of the

Fisheries Research Division, explained that the separation of the two commodities would define more clearly the responsibilities for each sector, provide for greater impact, and allow a wider involvement of fisheries researchers directed towards more definite objectives. With these changes, the number of commodities under the Fisheries Research Division increased to three: Aquaculture, Inland Water Fisheries, and Marine Fisheries.

Since 1973, an additional number of commodities have been identified. Some of these were fused while others were separated to give way to the creation of new ones. Notable among these changes was the emergence of two commodities under the Mines Research Division: Metallic Minerals and Non-Metallic Minerals. This change was a result of Presidential Decree No. 864 which provided for the expansion of PCARRD's mandate to include mines research.

Responsibility for the Forage, Pasture and Range Resources Commodity was transferred from the Crops Research Division to the Livestock Research Division in late 1976. The commodity was renamed Forage, Pasture and Grasslands. The commodity was originally organized under the Crops Research Division because, by its very nature, the optimum management of forage, pasture and grasslands hinges on their being treated as "crops." However, when viewed from a different perspective, the use of forage, pastures and grasslands can best be projected and appreciated by the livestock sector although, again, the commodity is greatly influenced by both the crop and forestry sectors.

On the other hand, to facilitate the monitoring and coordination of research activities, three commodities were integrated into the Plantation Crops

Commodity. These were: Cacao, Coffee and Tea; Rubber; and Industrial Oil and Spice Crops. Likewise, Abaca and other Perennial Fiber Crops and Cotton, Annual Fibers and Sericulture were fused to become the Fiber Crops Commodity. Ornamental Horticulture was expanded to include Medicinal Crops and was renamed Ornamental and Medicinal Crops.

In the forestry sector, the growing problem of deforestation and its accompanying effects on watersheds justified the creation of the Reforestation and Forest Watershed Commodity. Later, the Timber Products Commodity was divided into four commodities, namely, Dipterocarps and Lesser-Used Species, Pines and other Softwood Species, Mangrove and Beach-Type Forests, and Molave-Type Forests.

A significant change was to take place in another technical division. The Soil and Water Resources Research Division expanded its thrust to cover the "development and improvement of agricultural systems through scientific management of farm resources." As a result, two commodities, namely, Farming Systems and Agricultural Engineering, were added to the division's range of responsibilities. To reflect the change in its scope and areas of concern, the division was renamed Farm Resources and Systems Research Division in 1981.

Because of these changes, the commodity groupings increased from 18 in 1973 to 36 in 1981. There have been no changes since then. These series of changes in commodity organization do not reflect uncertainty in the direction of research in various commodities, rather, it is a mark of dynamic flexibility — a quality that has characterized PCARRD's operations in response to policy pronouncements, industry and

sectoral developments, and needs of target clientele.

Tying Up National and Regional Research Programs

The national research programs and priorities formulated during the First National Agricultural Research System Congress and subsequent commodity workshops were based on broad objectives of national agricultural development needs. PCARRD recognized the need to make the national research program responsive to the regional development thrusts, and vice-versa. Thus, PCARRD worked closely with NEDA to develop a mechanism for identifying regional research needs. PCARRD and NEDA planned and fleshed out the national economic development plan through regional congresses. In close cooperation with the regional and provincial agencies and with the strong support of the NEDA regional development office, PCARRD focused more sharply on regional needs by taking into consideration the peculiar agro-climatic and socio-economic environments of the various regions in the country.

At the First Bicol Regional Agricultural Research Congress held on 1-3 October 1975 at Legaspi City, Moseman, who had continued to take an active interest in PCARRD since serving as consultant for the Technical Panel of 1971, highlighted the significance of regional consultations in these words:

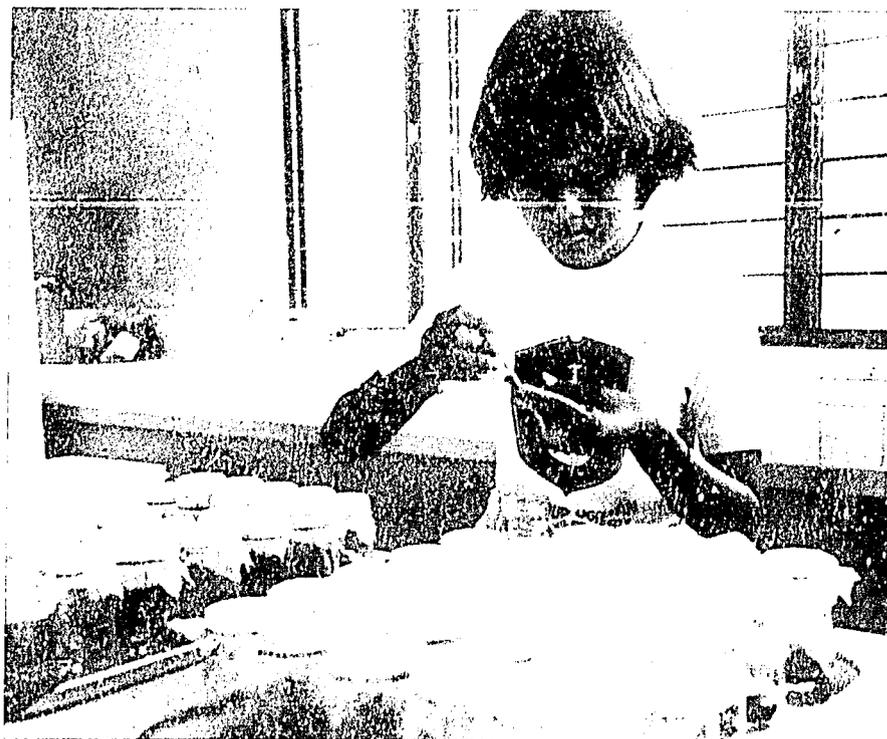
"The importance of having NEDA in the PCARR program planning and evaluation cannot be overestimated because I think the real critical factor in any research program is the extent to which it helps to achieve national development goals and, of course, regional goals. The

problems and the needs for research will vary by region... they will vary by time. You will have new pest and disease hazards. I think the strong regional efforts you're starting, this being the first such program, will be a real effective means of keeping your national and regional programs in focus."

After the Bicol Agricultural Research Congress, seven more regional congresses were held covering all of the twelve regional development areas of the Philippines. The Second Regional Congress was held in Cebu City on 24-26 November 1975 to focus on the regional research and development requirements of the Central Visayas and Eastern Visayas regions.

Similar regional congresses were held in Iloilo City on 25-28 February 1976 for Western Visayas; in Aborlan, Palawan on 19-20 April 1976 for Palawan; in Bauang, La Union on 1-5 May 1976 for Northern Luzon; in Davao City on 16-20 June 1976 for Northern and Southern Mindanao; in Zamboanga City on 22-25 June 1976 for Western and Southwestern Mindanao; and in Metro Manila on 23-29 July 1976 for Southern and Central Luzon.

In the conduct of the series of regional research congresses, efforts were made to ensure that participants represented a cross-section of the region. Invited to participate in the Congress were government development officials and staff, specialists from research centers and stations, small farmers, and representatives of the private sector. To make sure that both national and regional perspectives were taken into account, national and regional participants were made members of the task forces assigned to develop the regional research programs and prepare capsule research proposals. Participants from the region were involved in the



development of a regional mechanism, while those from national agencies provided the national level inputs -- ensuring the vital linkage between national and regional goals.

Keeping On-course

To keep the national research program attuned and apace with the needs of the times, it has to be constantly updated. Thus, PCARRD initiated commodity meetings and sectoral congresses to assess commodity status and priorities in the light of new developments.

The period from December 1975 to April 1976 saw the review and revision of a number of commodity research programs. Members of the national commodity research teams did the following:

- assessed ongoing projects to determine whether or not they were meeting desired objectives;
- revised and updated commodity priority research areas;
- evaluated the relevance of commodity research programs relative to

The critical factor in any research program is "the extent to which it helps achieve national and regional development goals." Nationwide research congresses made sure that both national and regional perspectives were taken into account in the formulation of the national research program.

current national industry needs; and

- established a mechanism for the continuous flow of extension information and immediate use of research results by the end-users.

Some of the new or revised research programs during the period covered the following commodities: four forestry commodities (Timber Products, Non-Timber Products, Fiberboards and Paper Products, and Parks and Wildlife); five livestock commodities (Pork, Poultry, Beef/Chevon, Carabeef, and Dairy); one crop commodity (Forage, Pasture and Range Resources); Farming Systems; and Macroeconomics and Applied Rural Sociology.

This series of commodity meetings and workshops was highlighted by the holding of the Second National Research System Congress on 10-13 November 1976 which coincided with PCARRD's fourth anniversary celebration.

Impressed with the way Pollisco had coordinated the First Congress, Madamba re-appointed Pollisco as coordinator of the Second Congress. Over-seeing an activity involving some 600 participants from different parts of the country, divided into 31 working groups distributed among 11 different venues in Los Baños was no mean feat. Of course, Pollisco had the "can-do" batch of PCARRD staff behind him rendering 24-hour support.

The Second Congress came more than three years after the First Congress. It was preceded by regional congresses, a conference among PCARRD national commodity team leaders and NEDA regional executive directors, and a pre-congress meeting of all commodity teams under the PCARRD research divisions.

The Second Congress came up with the following tangible results: updated national commodity priority research areas which took into account regional development needs; an updated network

of research centers and stations for each commodity; quantified research goals for each commodity on both the national and regional levels; and an inventory of research commodity manpower requirements.

The Second National Research System Congress achieved what it had set out to do and thus marked the "completion of the first cycle in PCARR's young life."

After the Second Congress, PCARRD injected a new tempo into its activities — this time more confident and well-armed with the lessons of yesteryears. Elaborate activities like congresses were no longer necessary. Instead, yearly meetings of commodity teams, commodity workshops and consultations were enough to update commodity research programs. These changes were made possible because the foundation of a strong research program had been laid out in the past. Regional consultations were made an integral part of the total effort in setting the directions for research.

DEFINING PRIORITIES

To set research priorities is to pinpoint where resources need to be channeled. Setting priorities influences the direction of research by encouraging researchers and institutions to focus their efforts on areas identified as having top priority.

Priorities Among Commodities

The process of establishing priorities is inherent in research program formulation. During the First National Agricultural Research System Congress, the different teams identified priority research areas within commodities. The teams considered three major factors in establishing the priorities: objectives of the national development plan, status of knowledge and level of technology, and requirements of national development

programs. There was, however, no attempt then to establish priorities among commodities. It was during the Second National Agricultural Research System Congress that Madamba expressed such a need. An *ad hoc* committee headed by Valmayor, then Deputy Director General for Research, was formed to study and formulate recommendations on priority commodity research program rankings.

The committee agreed on a set of criteria to be used in ranking the 29 commodities. These were:

- the research needs of the commodity;
- the relative importance of the commodity industry to the overall development of the country, i.e., as a major source of food and foreign exchange earner; and
- the manpower available to conduct research.

The committee gave more weight to research needs as a factor in ranking commodities. Thus, high priority was given to those commodities where substantial research gaps existed. For commodities with an existing high level of technology, emphasis was given to research on constraints to adoption of technology rather than on discovering new knowledge.

Commodities and disciplines with major research gaps but no trained manpower or essential equipment to undertake research were not given high priority ranking. However, these commodities were accorded highest priority in manpower development.

The recommendations of the committee headed by Valmayor were approved by the Governing Council on its 48th meeting on 18 May 1977. The Council stipulated that the rankings be reviewed every three years. However, it carefully added that appropriate changes should be made when the need arises such as when a scientific breakthrough

occurs in a certain commodity.

Since the commodity approach used in the ranking was not applicable to the Applied Social Sciences, the Governing Council made the following provisions:

- For all studies on agricultural economics and rural sociology involving any or a number of commodities, ranking would be based on that of the commodity involved.
- National studies cutting across commodity lines deemed by the Governing Council as critical to agriculture and natural resources, such as credit policies, irrigation policies, employment and income situation, would be given special funding.
- A portion of the research budget would be set aside for emergency research projects.

Setting Priorities

From 1978 to 1979, several requests were presented by various technical divisions for the elevation of rankings of a number of commodities. This prompted the TAC to form another *ad hoc* committee, this time under Dr. Aida R. Librero, Director of the Socio-economics Research Division, to review and update the set of criteria used for ranking commodities.

Librero's group came up with the following system of defining priorities to effectively assign priority rankings to commodities. Commodities were classified into two groups: agricultural and natural resources commodities and macrocommodities, which included those that do not belong to the former but nevertheless cut across several commodities. Macrocommodities included soil resources, water resources, farming systems, agricultural engineering, applied rural sociology, and macroeconomics.

Priority Ranking Among Commodities

Priority ranking/commodity	Budget allocation
Priority I	80%
1. Coconut 2. Corn and sorghum 3. Fiber crops (abaca, cotton) 4. Legumes (soybean, mungo, cowpea, peanut, beans, peas) 5. Plantation crops (rubber, coffee, cacao) 6. Root crops (sweet potato, white potato, cassava) 7. Sugarcane 8. Vegetable crops (tomato, melons, garlic, onion) 9. Aquaculture 10. Marine fisheries 11. Forage, pasture and grasslands 12. Carabeef 13. Dipterocarps and lesser-used species 14. Pines and other softwood species 15. Mangrove and beach-type forests 16. Forest plantation and agro-forestry 17. Bamboo, rattan, forest vines and medicinal plants 18. Metallic minerals 19. Agricultural engineering	
Priority II	10%
1. Fruit crops (banana, mango, pineapple, papaya, citrus and cashew) 2. Rice and other cereal grains 3. Tobacco 4. Beef/Chevon 5. Inland waters 6. Molave-type forests 7. Farming systems 8. Soil resources 9. Water resources 10. Non-metallic minerals	
Priority III	3%
1. Fiber crops (ramie, jute, kenaf, sericulture) 2. Ornamental and medicinal crops 3. Plantation crops (sunflower, african oil, castor oil species) 4. Root crops (gabi, yam) 5. Vegetable crops (eggplant, pepper, pechay, cabbage) 6. Dairy 7. Pork 8. Poultry 9. Parks, wildlife and forest range	
Socio-Economics and Emergency Research	7%
1. Applied rural sociology 2. Macroeconomics	

Two sets of criteria were identified, namely, basic criteria that apply to both major commodity groupings and specific criteria that apply only to individual groups.

The basic criteria were:

- actual and potential contribution to sectoral value added,

- relevance to the socio-economic programs of the government,
- contribution to improved policy formulation and implementation,
- links with and support to other commodities,
- contribution to employment,
- contribution to improvement of labor productivity,
- availability of research manpower and facilities, and
- availability of appropriate technology.

The specific criterion used for agriculture and natural resources was contribution to export earnings and import substitution; for the macrocommodities, the criterion was contribution to data base.

Each basic criterion carried a maximum of 10 points while each specific criterion carried 5 points for agriculture and natural resources and 10 points for macrocommodities.

Considerable statistical data was required to enable PCARRD to assign priorities. The set of criteria included both quantitative and qualitative variables. Data for some of the quantitative variables were available, e.g. value added and export earnings. For others, projections had to be based on statistics generated by research projects.

For the qualitative variables, the TAC members' basic knowledge, inclination, and opinions were considered in addition to the data, justifications, and projections provided by the technical departments of PCARRD. This in effect provided the socio-political input in the decision-making process.

Process for Assigning Priorities

The PCARRD Secretariat prepared a preliminary list of commodities classified as Priorities I, II and III. Then the individual members of the TAC ranked the various commodities. The process,

therefore, incorporated the inputs of the TAC, which included scientists, administrators, and members of the academic and private sector.

Commodities that were given priority by the TAC were submitted to the Governing Council. The 34 commodities were classified as Priority I, II or III.

Because rural sociology and macroeconomics encompass all other commodities and are considered important in agriculture and natural resources development, these were classified as Priority I but given a special group status. Hence, socio-economics and special projects was included as a category.

It was also recognized that special projects and urgent research may need to be implemented immediately because of the discovery of a potentially important non-traditional commodity, new development programs to be implemented by the government, or unexpected natural catastrophes like typhoons or the outbreak of an epidemic. Allowances were made for such projects.

As expected, when the commodity classification was submitted to the Council, commodities were moved from one group to another depending on the programs, interests, and other justifications of the members of the Council. This was all part of the "political input" in the process. In fact, even at the TAC level, some political considerations were taken into account.

The commodity priority rankings were approved by the Governing Council on 17 July 1977.

Priority setting is the primary basis for resource allocation. Of the total research budget, 80 percent is allocated for Priority I commodities, 10 percent for Priority II commodities, 3 percent for Priority III commodities, and 7 percent for socio-economic and emergency researches.

Admittedly, the present process of allocating research funds needs improvement. PCARRD, in the near future, will have to devise a mechanism which best suits the interest of the national research system (Drilon and Librero, 1981).

CORPORATE PLANNING: A HIGH POINT IN DIRECTION SETTING

When PCARRD organized the Program Development Office (PDO, now the Planning and Development Department, or PDD) in late 1981, Valmayor gave the office its first big assignment — the preparation of PCARRD's Corporate Plan (CORPLAN). The first PDO Director Ponciano A. Batugal took major responsibility for developing the CORPLAN.

Most people did not understand the need for such a plan. "Why a corporate plan for PCARRD?" they queried, "PCARRD does not operate in the world of business."

Certainly, corporate planning belongs to the world of business. Corporate entities differ substantially from institutions like PCARRD in terms of mandates but there are marked parallels in terms of overall targets. Both systems are interested in higher productivity, wise allocation of resources, the widest possible range of participation, effective controls, and greater attainment of goals. Some of the basic concepts applied in the management of business are thus applicable to the management of research.

The CORPLAN was another first in the life of PCARRD. While planning in the past had provided top-level management with an effective tool for determining courses of action, several aspects needed improvement. PCARRD believed that a corporate plan would enhance its effectivity in generating

additional resources for research.

The CORPLAN defines PCARRD's long- and short-range targets within the framework of its mission and mandate. Moreover, the exercise of corporate planning helped PCARRD assess the performance of the research system vis-a-vis target objectives. The CORPLAN also compelled PCARRD to spell out strategies and action packages required to attain its objectives and to identify the various resources required to implement these strategies.

Scope of the CORPLAN

Several Directors' Council meetings were spent discussing and resolving the nature and scope of the CORPLAN. Approved by the Governing Council on 29 April 1983, the CORPLAN includes the following elements:

- Commodity Directional Research Plans. These plans spell out research thrusts and the strategies and resources needed to achieve these.
- Institution Building Plans. The CORPLAN outlines changes to be executed within the system in terms of scope, function, structure, and improvements in facilities, equipment and working conditions.
- Changes in Systems and Procedures. The CORPLAN also projects changes in administrative processes such as program planning, internal audit, accounting, budgeting, and information management.

Consistent with the tradition of participative and consultative planning, all levels in the system participated in consolidating the CORPLAN. At the Secretariat, top management provided valuable inputs, setting goals and limits and pointing out certain areas of concern to be dealt with.

The various research departments, working closely with the commodity

teams, prepared their respective plans following a suggested format and process.

The Directors' Council served as the venue for testing and sounding out tentative ideas, identifying key areas of concern and validating specific plans. A Steering Committee, composed of several directors, was appointed by Valmayor to map out the strategies and methodologies for developing the CORPLAN.

Key Areas of Concern (KACs)

Early in the preparation of the CORPLAN, PCARRD identified Key Areas of Concern (KACs) based on the following criteria:

- relevance to national and regional development programs,
- potential for economic and social impact,
- existence of knowledge gaps,
- relevance based on available and potential resources and competence, and
- degree to which the KAC poses as a limitation or problem to the system.

Selected members of the Secretariat were then requested to develop a concept paper on the KAC assigned to them. The concept papers provided a situation analysis, statement of objectives and thrusts, description of the program and its phases, strategies of implementation, and resource requirements. These preliminary outputs were presented to the Directors' Council for scrutiny and validation.

Three regional meetings were next held to gather inputs from other agencies and institutions, researchers and policymakers from different parts of the country. The heads of the different centers and consortia were briefed previously on their roles in the corporate planning process.

Program Thrusts

Based on PCARRD consultations and an analysis of the environment in which the

research and development community operates, the NEDA national development plan which is the basis for all development efforts of the different government sectors was translated into PCARRD's research and development (R & D) program for the period 1984 to 1988. This program consists of eight major thrusts:

- Food and nutrition
- Export generation
- Energy development
- Import substitution
- Income generation and distribution
- Conservation and resource management

- Socio-economics
- Countryside development

Special focus is placed on socio-economics and countryside development to serve as unifying themes for sectoral research, programming and as bottom-line parameters for effectively utilizing results of research in rural development efforts.

Priority Programs

Fourteen priority programs were identified to get immediate support for the period 1984 to 1988 (PCARRD, 1983):

CROPS

- Improvement of wheat production capability through the development of appropriate technology
- Revival of the citrus industry
- Increasing cotton production through the development of efficient varieties and effective pest management systems
- Increasing corn production through the development of pest- and drought-resistant corn varieties.
- Improvement of the primary health care delivery system of the government through the development of production technology for medicinal plants

LIVESTOCK

- Development of the carabao as a source of milk, meat and farm power through genetic improvement and proper nutrition

FISHERIES

- Increasing fish production for local consumption and export through the development of efficient aquaculture technology
- Improvement of marine fishery production through the development of efficient fish capture technology

FARMING SYSTEMS

- Increasing production and farm income through the development of viable farming systems technologies for irrigated, rainfed, and coastal areas

FORESTRY

- Development of effective agroforestry technology for marginal lands

MINES

- Increasing mineral production through the development of efficient primary processing and extraction techniques especially for high grade small-scale mineral deposits

SOCIOECONOMICS

- Development of effective mechanisms to make usable research results available to extension agents and end-users
- Development of effective organizational and management systems at the community level as a tool for efficient technology transfer
- Formulation of appropriate recommendations on policies for agriculture and natural resources

With priority programs spelled out for the period 1984 to 1988, PCARRD is optimistic the national research system will stay on-course. The CORPLAN, as the product of more than a decade of enriching relationships with various agriculture and resources research sectors, stands as the system's veritable guide to the future.



Growth performance trials on RRIM 600 at the University of Southern Mindanao (USM) in Kabacan, North Cotabato. The USM is host agency for the Southern Mindanao Agricultural Research Center (SMARC), the center for rubber research.

Establishing the Research Network

People in the know of setting up structures fully recognize that it is easier to build a new structure from scratch rather than make a new one from old materials. When PCARRD was given the mandate "to establish, support and manage the operation of a national network of centers of excellence for the various research programs in crops, livestock, forestry, fisheries, soil and water, mineral resources, and socio-economic research related to agriculture and natural resources," its young leadership took on the challenge to build a network of research centers and stations out of existing ones.

LAPPING EXISTING RESOURCES

Early Problems and Initial Recommendations

While other developing countries lament the lack of research stations, the Philippines, during the pre-PCARRD days, had too many stations, albeit ill equipped and poorly managed. In fact, the 1971 Executive Panel identified the proliferation of experiment stations, very few of which were adequately manned and equipped for productive research, as one of the constraints to effective conduct of research. Hence, the Technical Panel, after an in-depth evaluation of the situation, strongly recommended the establishment of a national network of selected agricultural centers and stations to operate within the PCARRD mechanism.

The panel envisioned a national network with the UPLB research complex as the nucleus, serving as the national center for agricultural research. Peripheral stations would be linked with the national agricultural research center at Los Baños through a program designed to ensure that research programs on various commodities would be adapted to suit the varying ecological and market situations throughout the country.

The Technical Panel recommended further that some of these stations be developed by upgrading their research facilities and training their research manpower.

Another problem faced the PCARRD leadership. The research stations were then under the direct administrative jurisdiction of either the DANR, state colleges and universities, or commodity research institutes. It was necessary to work out a mechanism to draw these stations into the new set-up.

Memoranda of Agreement with DANR and ACAP

Initial working relationships between PCARRD and other institutions and agencies involved in agricultural research were primarily based on cooperation. The terms of cooperation were carefully spelled out in memoranda of agreement drawn up by the parties concerned.

Fully aware of the significance of a strong research structure, PCARRD and five agencies under the DANR, namely,

"PCARRD has welded . . . a national research network that saw the operationalization of a scheme that forged research centers and stations in close proximity to one another into coordinative regional research consortia. This cardinal network of research centers and stations constitutes the backbone of the national research system and is the very essence of PCARRD."

RAMON V. VALMAYOR



PCARRD and ACAP forge an agreement to pool research resources and facilitate the entry of agricultural colleges into the national research system. Signing the memorandum of agreement on 29 October 1973 are (seated, left to right) ACAP President Fernando A. Bernardo, NSDB Chairman Medina, and PCARRD Director General Madamba.

the Bureau of Plant Industry, Bureau of Animal Industry, Bureau of Fisheries, Bureau of Forest Development and Bureau of Soils, signed a memorandum of agreement on 7 June 1973.

Another memorandum of agreement, this time between PCARRD and the member institutions of the ACAP, was signed on 29 October 1973. These two events were vital to the building of a national research network because these agreements made the resources and facilities of these institutions available for research under the PCARRD system.

With these initial efforts, agricultural research centers in various parts of the country began to take shape.

CONSOLIDATION AND GROWTH

The Need for Research Centers and Basis for Selection

Spending 19 of his 40 years of government service in various research stations of the Bureau of Plant Industry, no one could better appreciate what an appropriately located research center

could do to enhance the output of research than Francisco "Tatang" B. Tetangco, PCARRD's first Deputy Director General for Station Development.

Tetangco (1974) once emphasized that "it is through this network of agricultural research centers and stations that PCARRD hopes to make impact projects and problem-oriented research to provide immediate solutions to problems in the various regions where these stations are strategically located. The vital role that these centers and stations play in the development of agriculture may be seen in the face of problems specific for each region and in view of the fact that there are areas where climate, topography and environmental conditions lend themselves to more efficient research on certain commodities."

Discussing developments in research management in the Philippines before a group of Asian research managers, Madamba (1976) forwarded that with the "national research program finally crystallized on a commodity basis, the next . . . step was to identify a national research center and an appropriate number of cooperating research stations in which the commodity industry research programs were to be implemented."

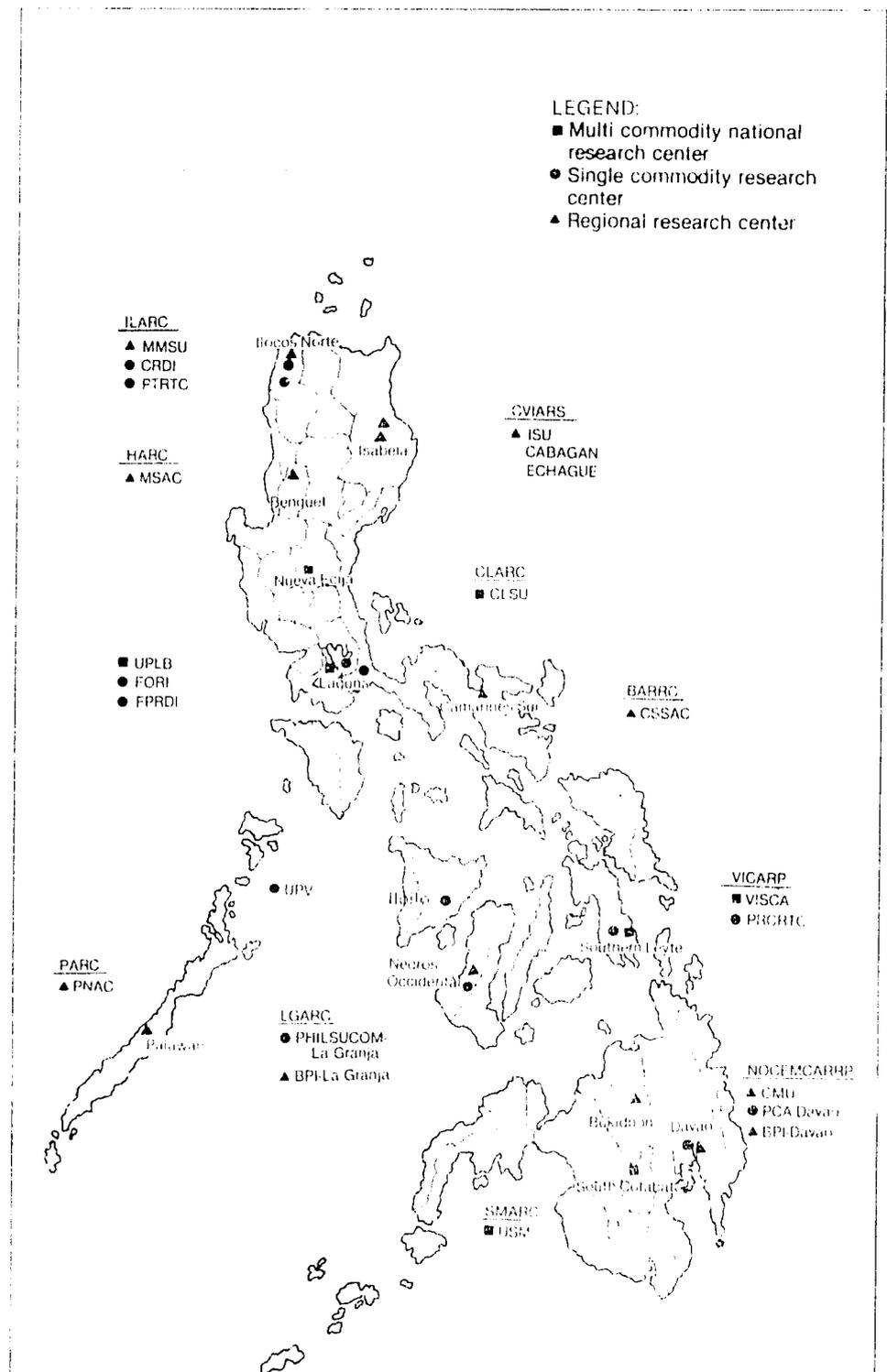
Madamba rationalized the identification and selection of the national centers and cooperating stations on the basis of agro-climatic suitability of the area (where the center or station is located) to the production of the commodity; accessibility of the center or station to the commodity industry and target clientele; availability of research expertise in the area; and other industry-oriented considerations.

Operationalization of a Center

To make a center operational, a memorandum of agreement was signed among the heads of agencies concerned. In the case of La Granja Agricultural Research Center (LGARC) at La Carlota, Negros Occidental, the first center organized by PCARRD in 1975, three stations were integrated to comprise the Center. These stations were the Bureau of Plant Industry La Granja Experiment Station, Bureau of Animal Industry La Carlota Stock Farm, and the Philippine Sugar Commission (PHILSUCOM), then Philippine Sugar Institute (La Granja Sugar cane Experiment Station). Four years later, the UPDP which operates a Land Grant in the area joined the Center, thus, completing the family of stations in the region.

The heads of the member institutions recognized the practicality and economy of pooling the resources of these experiment stations to upgrade their efficiency and raise their research productivity.

LGARC's creation called for a policy-making body which would establish guidelines and broad policies for the management and operation of the Center. To answer this need, a Research Center's Coordinating Committee (RCCC) was established. During the initial years, the LGARC RCCC was chaired by the PCARRD Deputy Director General for Programs and Operations; its members were the Directors of the Bureau of Animal Industry and the Bureau of Plant Industry, PHILSUCOM's General Manager and the NEDA Regional Director. The leadership and composition of the committee was changed later with the formation of the consortium.



National Network of Research Centers in Agriculture and Natural Resources

PCARRD Director General Dilon and RCCC heads sign the supplementary memorandum of agreement on 19 December 1960. Seated from left to right are Dilon, MSAC President Bruno Santos, ViSCA President Fernando Bernardo, FORI Director S. Pollisco, (partly hidden) and NSDB Chairman Magno (center foreground). Standing from left to right are BPI Baquio Experiment Station Director Crispin Ancheta, HARC Research Coordinator William Dar, and Valmayor who was then PCARRD Deputy Director General for Research.



The RCCC was to select and recommend the directorate of the center and approve the research program and budget which would serve as basis for the projects to be implemented. It was also expected to determine the manner of disposition of completed researches ready for publication.

The day-to-day operations of the research center were managed by the directorate which was composed of a field research director, an assistant director for operations, and an assistant director for research.

Membership in the Center and Relationship with Mother Agencies

The establishment of a center did not in any way impair, diminish or reduce the rights, powers, duties and functions of the member stations. In fact, the members remained under the jurisdiction of their respective mother agencies. However, their operations were integrated as a single government agricultural research center. Under this arrangement, they shared with the research center all their land resources,

buildings and other structures, vehicles, farm machinery, laboratory and office equipment, and all other properties in the stations.

The mother agencies continued to provide funds for the operations of their respective stations. PCARRD provided additional funds and other resources to supplement whatever was made available by the member agencies in order for the center to carry out their research programs more efficiently. The researchers and the agencies concerned, however, received full credit for the results of all researches they undertook.

As members of the network, the institutions can avail of funding support from the grants-in-aid program of PCARRD or through budget recommendations made by PCARRD to OBM. Member agencies also benefit from the manpower development program for researchers, infrastructure development; provisions for acquisition of equipment and farm implements, books, scientific journals and other PCARRD publications; and administrative assistance.

Changes in the Management of Research Centers

To encourage stronger regional cooperation and in recognition of the leadership and potentials of academic institutions, PCARRD initiated some shifts in orientation and changes in the management of the research centers.

On 27 July 1977, the PCARRD Governing Council, on its 50th meeting, reclassified the established 16 agricultural research centers into 4 national multi-commodity research centers, 3 national single-commodity research centers, and 8 regional research centers.

All four national multi-commodity research centers are based in academic institutions, namely, UPLB in Los Baños, Laguna; Central Luzon State University (CLSU) in Muncie, Nueva Ecija; Visayas State College of Agriculture (VSCA) in Baybay, Leyte; and University of Southern Mindanao (USM) in Kibacan, North Cotabato.

These national research centers were selected not only on the basis of the strength of their existing facilities, strategic location and availability of research expertise but also on the basis of their potential capabilities. As a matter of policy, the Governing Council decided that a national research center need not be an academic institution and that additional national research centers may be identified as the need arises.

Under the new management set-up, the head of the institution selected as the national multi-commodity research center exercises direct responsibility over such a center. This arrangement altered the initial plan of PCARRD to appoint full-time PCARRD field research directors to manage the center. However, the coordination and monitoring mechanism continues to be provided by PCARRD, through its Secretariat.

Responsibilities of Network Members

To guide the members of the national research network in fulfilling their responsibilities, the Governing Council, in its 51st meeting on 14 August 1977, spelled out the functions of national research centers, regional research centers, and cooperating stations

A national research center, whether multi-commodity or single-commodity in scope, is responsible for conducting basic and applied research across a broad range of disciplines. A national research center also packages generated technology appropriate for specific commodities and dominant farming or production systems, after successful technology verification trials in regional and cooperating field stations.

The center is responsible for the conduct of research on basic disciplines such as breeding and genetics, systematics, physiology, biochemistry, and others. It also conducts applied research in pathology, entomology, silviculture, ecology and other fields which require strong support from the basic disciplines. A national research center is therefore expected to have a core of scientists backed by adequate research facilities and with easy access to scientific publications.

A regional research center concentrates on applied research on commodities of major importance to the region. The idea is to provide more location-specific information needed within the various agro-ecological zones of the country. The regional research center verifies the output of national research centers and fine-tunes the packages of mature technology to suit regional conditions.

Cooperating field stations are selected stations of the MAF and the MNR, state colleges and universities, or private agencies that provide facilities or sites for field experiments. Here, adaptive trials

are conducted to take into account micro-differences in environment.

Only the most promising stations are considered for PCARRD support.

To show how functions and this hierarchy of membership in the network relate, the following example is cited: In rice breeding, the original breeding and selection work is done at the national research center where adequate facilities and support disciplines are available. The selected lines are then further evaluated at the regional level to determine how they perform under a different set of edaphic and climatic conditions. This is done by selected cooperating stations that are located in important rice-growing areas in the country.

Present Membership in the Network

The national research network for agriculture and natural resources consists of 4 national multi-commodity research centers, 8 national single-commodity research centers, 8 regional research centers and 130 cooperating stations.

Admission of New Members

As a developing system, the Philippine agriculture and resources research system expects to grow qualitatively and quantitatively to cope with the needs of a changing economy and a dynamic environment. Various agencies and institutions have indicated their interest in joining the national research network. To avoid the pitfalls of having too many research stations, the PCARRD Governing Council set guidelines for the admission of new cooperating agencies and stations.

To qualify for membership in the national research network:

- the agency should have an existing and regular research budget;

- the agency must meet the minimum requirements for technical capability, manpower resources, land and water resources, and physical facilities for research on specific commodities assigned to it; and

- the area where the agency is located should benefit highly from the agency's research activities.

Once admitted as a member of the national research system, the agency is expected to align its current research thrusts with national research priorities and the needs of its service area. As a recipient of public funds for research, the agency must submit to PCARRD its research program and budget for recommendation to the OBM and for proper coordination and monitoring.

Private research institutions can become members of the national research network and avail of grants-in-aid, provided their research projects are attuned to priority research areas and results are made public.

THE CONSORTIUM: A MANAGEMENT STRATEGY

An organizational arrangement which PCARRD instituted in 1978 marked a significant step towards building up regional responsibility. The move found a strong ally in the person of Valmayor.

As Deputy Director General for Research from 1973 to 1981, Valmayor had a direct hand in the organization of regional centers and stations into consortia.

As envisioned, a consortium would serve as a mechanism for programming, developing and utilizing the resources of participating agencies in conducting research at the regional level.

The consortium arrangement resulted in changes in the management of regional centers. In their book *ViSCA: History and Analysis of Institution Building*,

Bernardo and Bernardo (1985) acknowledged that these changes fostered regional cooperation. Firstly, there was a change from a single-center approach to that of a consortium approach wherein participating institutions were given greater responsibility in charting the direction of the research program in the region. Secondly, instead of the PCARRD Deputy Director General (now the Deputy Executive Director) for Research serving as chairman of the RCCC, the head of the lead institution in the region was designated as chairman. The PCARRD Deputy Executive Director now serves as vice-chairman. Under the new set-up, the challenge of regional research coordination rests heavily on institutions within the region. This is a recognition of the development and growth of regional institutions toward which PCARRD has directed considerable effort and resources.



The Bicol Agricultural Research Complex (now the Bicol Agriculture and Resources Research Consortium) was formally established on 25 January 1976. Signatories to the memorandum of agreement were Fr. Lynch of Ateneo de

Naga, Superintendent Alvaro Rabina of CSAC, NSDB Chairman Medina, PCARRD Director General Madamba, Bureau of Plant Industry Director Domingo Panqanban, and Ricardo Arcalla of Bicol University.

Since the consortium concept among centers and stations was introduced in 1978, eight consortia have been organized. Two centers, namely, Palawan Agricultural Research Center (PARC) and Southern Mindanao Agricultural Research Center (SMARC) remain as single-institution research centers.

The eight consortia and their respective lead agencies are as follows:

- Bicol Agriculture and Resources Research Consortium (BARRC) --- Camarines Sur State Agricultural College (CSSAC)
- Central Luzon Agricultural Research Center (CLARC) - Central Luzon State University (CLSU)
- Cagayan Valley Integrated Agricultural Research System (CVIARS) --- Isabela State University (ISU)
- Highland Agricultural Research Center (HARC) --- Mountain State Agricultural College (MSAC)

National multi-commodity research centers, single-commodity research centers, regional research centers and their commodity responsibilities at national and regional levels

Center	Commodity Responsibility	
	National	Regional
National Multi-Commodity Research Centers		
University of the Philippines at Los Baños (UPLB), Los Baños, Laguna	<ul style="list-style-type: none"> • Legumes • Ornamental and Medicinal Crops • Rice and Other Cereals • Vegetable Crops • Beef/Chevon (small-farm operation) • Carabeef (small-farm operation) • Dairy • Forage, Pasture and Grasslands • Pork • Poultry • Agricultural Engineering • Farming Systems • Soil Resources • Water Resources • Applied Rural Sociology • Macroeconomics 	<ul style="list-style-type: none"> • Coconut • Corn and Sorghum • Fiber Crops (Abaca) • Fruit Crops • Plantation Crops • Root Crops • Sugarcane • Tobacco • Bamboo, Rattan, Forest Vines and Medicinal Plants • Dipterocarp and Lesser-used Species • Forest Plantation and Agro-forestry • Pines and Other Softwood Species • Non-metallic Minerals
Central Luzon State University (CLSU), Muñoz, Nueva Ecija	<ul style="list-style-type: none"> • Carabeef (ranch operation) • Chevon (large-scale operation) 	<ul style="list-style-type: none"> • Fiber Crops (cotton, sericulture) • Vegetable Crops • Plantation Crops (sunflower)

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National multi-commodity research centers, single-commodity research centers, regional research centers and their commodity responsibilities at national and regional levels

Center	Commodity Responsibility	
	National	Regional
	<ul style="list-style-type: none"> • Aquaculture (freshwater pond culture) 	<ul style="list-style-type: none"> • Dairy (water buffalo, goat) • Poultry • Agricultural Engineering • Farming Systems • Soil Resources • Water Resources • Applied Rural Sociology • Macroeconomics
Visayas State College of Agriculture (ViSCA), Baybay, Leyte	<ul style="list-style-type: none"> • Fiber Crops (abaca) • Root Crops 	<ul style="list-style-type: none"> • Coconut • Corn and Sorghum • Vegetable Crops • Beef/Chevon (small-farm operation) • Forage, Pasture and Grasslands (small-farm operation) • Poultry • Agricultural Engineering • Farming Systems • Soil Resources • Water Resources • Applied Rural Sociology • Macroeconomics
University of Southern Mindanao (USM), Kabacan, North Cotabato	<ul style="list-style-type: none"> • Corn and Sorghum • Fiber Crops (kenaf, jute, ramie) • Fruit Crops • Plantation Crops (rubber, coffee, cacao) 	<ul style="list-style-type: none"> • Legumes • Rice and other Cereals • Root Crops • Sugarcane • Beef/Chevon • Carabeef (small-farm operation) • Pork • Poultry • Farming Systems • Soil Resources • Water Resources • Applied Rural Sociology • Macroeconomics
National Single-Commodity Research Centers		
Cotton Research and Development Institute (CRDI), MMSU Campus, Batac, Ilocos Norte	<ul style="list-style-type: none"> • Cotton 	
Philippine Tobacco Research and Training Center (PTRTC), MMSU Campus, Batac, Ilocos Norte	<ul style="list-style-type: none"> • Tobacco 	
Forest Products Research and Development Institute (FPRDI), College, Los Baños, Laguna	Forest Utilization Research on: <ul style="list-style-type: none"> • Bamboo, Rattan, Forest Vines and Medicinal Plants • Dipterocarps and Lesser-used Species • Pines and Other Soft-wood Species 	

- Ilocos Agricultural Research Center (ILARC) – Mariano Marcos State University (MMSU)

- La Granja Agricultural Research Center (LGARC) – Philippine Sugar Commission (PHILSUCOM)

- Northern and Central Mindanao Coordinated Agriculture and Resource Research Program (NOCEMCARRP) Central Mindanao University (CMU)

- Visayas Coordinated Agricultural Research Program (VICARP) – Visay State College of Agriculture (ViSCA)

Organization and Management of the Consortium

The Research Consortium Coordinating Committee (RCCC) enunciates broad policies and guidelines for the management and operation of the consortium, in the context of existing policies laid down for the organization and operation of the Philippine agriculture and resources research system.

The RCCC is composed of representatives from each member agency, including the PCARRD Deputy Executive Director for Research. The head of the lead agency in the consortium serves as chairman of the RCCC. Likewise, the lead agency head appoints the research coordinator from among his staff.

The RCCC is expected to:

- lay down broad policies, guidelines and plans for the agriculture and resources research program of the region

- review and approve the research program of a consortium which is the basis for identifying research projects and specific studies to be undertaken by the consortium research staff;

- review and approve the budget for research programs;

- formulate policies and plans related to the dissemination of useful research information through publications, workshops, seminars, symposia, and other means of communication; and

- devise ways and means of improving the research capability of the centers and cooperating stations in the region, through the acquisition of better equipment and infrastructure, staff development, and provisions for incentives.

Emerging Models of Consortium Arrangements

Since the advent of the consortium concept, a significant degree of decentralization of powers has evolved. Consortia leaders are given a free hand in the management of their respective consortia. From experiences gained in the past seven years, two models of consortium management have emerged. These are the program-oriented consortium as exemplified by VICARP and the center-oriented consortium as embodied by LGARC.

Organized on 17 November 1978, the VICARP is composed of member agencies scattered among the islands of the Eastern and Central Visayas regions. Although the geographical distribution of member agencies may not be conducive to the sharing of physical resources, the VICARP agencies worked deliberately to form a strong consortium based on a coordinated agricultural research program which the member agencies developed together. Guided by a common philosophy, participating agencies have defined their respective roles and responsibilities and agreed on the objectives of a collaborative program.

National multi-commodity research centers, single-commodity research centers, regional research centers and their commodity responsibilities at national and regional levels

Center	Commodity Responsibility	
	National	Regional
Forest Research Institute (FORI), College, Los Baños, Laguna	Forest Production Research on: <ul style="list-style-type: none"> • Bamboo, Rattan, Forest Vines and Medicinal Plants • Dipterocarps and Lesser-used Species • Forest Plantation and Agro-forestry • Parks, Wildlife and Forest Range • Pines and Other Soft-wood Species 	
Philippine Sugar Commission (PHILSUCOM), La Granja, La Carlota City	<ul style="list-style-type: none"> • Sugarcane 	<ul style="list-style-type: none"> • Agricultural Engineering
University of the Philippines in the Visayas (UPV), College of Fisheries, Miag-ao and Leganes, Iloilo	<ul style="list-style-type: none"> • Aquaculture (brackish-water pond culture) • Marine Fisheries 	
Philippine Root Crops Research and Training Center (PRCRTC), Baybay, Leyte	<ul style="list-style-type: none"> • Rootcrops 	
Philippine Coconut Authority (PCA), Bago Oshiro, Davao City	<ul style="list-style-type: none"> • Coconut 	
Regional Research Centers		
Mariano Marcos State University (MMSU), Batac, Ilocos Norte		<ul style="list-style-type: none"> • Fiber Crops (cotton, sericulture) • Legumes • Rice and Other Cereals • Tobacco (Virginia, Burley and Turkish) • Vegetable Crops • Beef/Chevon (small-farm operation) • Farming Systems • Soil Resources • Water Resources • Applied Rural Sociology • Macroeconomics
Mountain State Agricultural College (MSAC), La Trinidad, Benguet		<ul style="list-style-type: none"> • Fruit Crops (strawberry, apple) • Root Crops (white potato, gabi) • Ornamental and Medicinal Crops • Plantation Crops (coffee) • Vegetable Crops • Pork • Forest Plantation and Agro-forestry • Farming Systems • Soil Resources • Applied Rural Sociology • Macroeconomics

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National multi-commodity research centers, single-commodity research centers, regional research centers and their commodity responsibilities at national and regional levels.

Center	Commodity Responsibility	
	National	Regional
Isabela State University (ISU), Echague Campus, Echague, Isabela		<ul style="list-style-type: none"> • Fiber Crops (cotton) • Root Crops • Vegetable Crops • Pork • Poultry • Water Resources • Applied Rural Sociology • Macroeconomics
Cabagan Campus, Cabagan, Isabela		<ul style="list-style-type: none"> • Legumes • Tobacco (cigar filler) • Beef/Chevon (ranch operation) • Dipterocarp and Lesser-used Species • Forest Plantation and Agro-forestry • Parks, Wildlife and Forest Range • Forage, Pasture and Grasslands
Palawan National Agricultural College (PNAC), Aborlan, Palawan		<ul style="list-style-type: none"> • Coconut • Fruit Crops (cashew) • Legumes • Root Crops • Vegetable Crops • Beef/Chevon (small-farm operation) • Carabeef • Pork • Poultry • Farming Systems • Soil Resources • Applied Rural Sociology • Macroeconomics
Camarines Sur State Agricultural College (CSSAC), San Jose, Pili, Camarines Sur		<ul style="list-style-type: none"> • Root Crops • Vegetable Crops • Beef/Chevon (small-farm operation) • Pork • Poultry • Applied Rural Sociology • Macroeconomics
Bureau of Plant Industry (BPI), La Granja Experiment Station, La Granja, La Carlota City		<ul style="list-style-type: none"> • Corn and Sorghum • Legumes • Vegetable Crops • Agricultural Engineering • Farming Systems
Central Mindanao University (CMU), Musuan, Bukidnon	<ul style="list-style-type: none"> • Beef (ranch operation) • Forage, Pasture and Grasslands (ranch operation) 	<ul style="list-style-type: none"> • Corn and Sorghum • Legumes • Plantation Crops (cacao, coffee and rubber) • Rice and Other Cereals • Carabeef (ranch operation) • Chevon (ranch operation) • Dairy • Agricultural Engineering

The center-oriented consortium is exemplified by LGARC. One feature of LGARC, not found in many centers, is that its member agencies occupy contiguous areas. Physical proximity makes it easier for the consortium members to share their laboratory facilities, farm equipment, irrigation systems, staff housing, library materials and other resources.

Although there were informal relationships among member agencies before the formation of the consortia, the arrangement institutionalized working relationships through dialogues during periodic meetings of agency heads and coordinators. These meetings became venues for discussing solutions to common problems and providing feedback on member agencies' respective activities. Another major feature of the consortium, something that had never happened before, was that researchers belonging to different agencies were brought together to work alongside each other and reside in one housing area, an arrangement that further fostered closer relationships and cooperation among the staff of the center's member institutions.

As evidence of improved relationships, LGARC member agencies have worked jointly to prepare guidelines for the occupancy of PCARRD-constructed housing facilities and the use of service buildings, the administration-conference building, and the guest house. The agencies have also cooperated in the compilation of abstracts of completed researches and in the integration of annual reports.

Several factors have contributed to the manner in which the various research consortia are presently organized and managed. Foremost among these are physical distance of member agencies from each other, historical relationships, and leadership styles. These elements have influenced, in varying degrees, the emergence of a constellation of research centers and stations in different parts of the country — diverse in certain ways but united in purpose.

Admittedly, a few centers still need strengthening and support in some respects. Nevertheless, the national research network, as it stands today, is a solid testament to the unwavering decision of the nation's leaders, research administrators and scientists to develop a network that is firmly anchored on cooperation and a collective mission to support national development goals and fill the need for location-specific knowledge and technology.

The strategy to harness and build on existing resources has proven to be a valid one.

National multi-commodity research centers, single-commodity research centers, regional research centers and their commodity responsibilities at national and regional levels

Center	Commodity Responsibility	
	National	Regional
Bureau of Plant Industry (BPI), Davao Experiment Station, Bago-Oshiro, Davao City		<ul style="list-style-type: none"> • Applied Rural Sociology • Macroeconomics • Corn and Sorghum • Fiber Crops (abaca, kenaf, ramie, jute) • Fruit Crops • Legumes • Ornamental and Medicinal Crops • Plantation Crops (coffee and cacao) • Vegetable Crops • Farming Systems



A fifty-hectare experimental farm at the Palawan National Agricultural College (PNAC) in Aborlan, Palawan. The PNAC is host agency for the Palawan Agricultural Research Center (PARC).

CHAPTER 8

Research Capability Development

In its identification of the centers and stations that would comprise the national research network, PCARRD chose to build on existing strengths and potentials rather than start wholly anew. This move was perceived by many as a difficult, if not unorthodox path. As the team from the International Agricultural Development Service wrote in their 1980 corporate review of PCARRD: "It is sometimes easier, and often more attractive and interesting to build new institutions than to improve existing ones. A strong leader frequently can translate a perceived need into the founding of a new organization."

Aware that capability rests on the people conducting the research, the facilities and methodology for research, PCARRD drew up a plan that would arm the national research system with "the right mix of man, method, and materials" (PCARRD, 1974).

On 11 November 1974, on the occasion of its second anniversary celebration, PCARRD announced the formulation of a Research Capability Development Plan for the Seventies. This Plan was based on a thorough investigation and analysis of research requirements and resource gaps.

THE RESEARCH CAPABILITY DEVELOPMENT PLAN

Initial Steps

In the first quarter of 1973, PCARRD initiated a study to determine the total

requirements to fully develop Philippine research capability. PCARRD Deputy Director General for Station Development Tetangco, together with teams of agricultural scientists and station development experts, began a round of visits to selected research centers and stations to determine their existing research capabilities, needs and potentials.

The teams reckoned research capability in terms of manpower and physical resources. Tetangco and his staff conducted extensive surveys to obtain details on general station layout which included buildings, roads, fences, and other fixed structures; irrigation and drainage facilities; and water and power requirements. Even the types of soil in the stations were surveyed and analyzed by the Bureau of Soils to obtain benchmark information for future field experiments.

The study proved to be a logical step in assessing the development requisites of research centers and stations identified during the First National Agricultural Research System Congress. Using the results of the survey, Tetangco and his staff prepared a set of designs for facilities and cost estimates for developing the research centers and stations. These documents later played a critical role in the initial negotiations for a research loan that would provide the national research network with much-needed facilities and equipment, as well as funding for an expanded manpower

"Very few developing countries have fully exploited the potential of a dynamic agricultural research system. Strong agricultural research systems and institutions possessing high scientific competence and endowed with requisite physical facilities are therefore urgently needed in these countries to generate new technology for achieving rapid increases in production."

BELLAGIO CONFERENCE, 1977

development program.

Even as Tetangco was completing the inventory of existing resources, PCARRD commissioned the UPLB and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) to undertake a study "Toward Developing an Effective Agricultural Research System in the Philippines." Completed in June 1974, the UPLB-SEARCA study presented recommendations that largely echoed those of the Technical Panel of 1971. Two of these recommendations pointed out specific needs: the need to implement a station development program and the need to develop a program for training researchers and research administrators.

An Overview of the Plan

The seven-year Research Capability Development Plan was calculated to bring about full development of national research capability to support expanding programs in agriculture and resources research. It was founded primarily on strengthening the research system with fixed and long-term inputs in the form of infrastructure and manpower development.

The Plan required an estimated ₱224 million in long-term and non-recurring development inputs, broken down as follows: ₱151 million (67%) for infrastructure, ₱43 million (19%) for equipment and machinery, and ₱30 million (14%) for manpower development (PCARRD, 1974). In drawing up the Plan, PCARRD took into account present and potential capabilities in terms of staff, leadership, and resources; industry requirements; and commodity assignments and expertise.

PCARRD's primary objective was to provide research centers with initial assistance to build up their research capability, especially those that did not have any significant sources of funding to

speak of. There were a few, however, like the UPLB, CLSU and ViSCA, that had initiated research capability development plans of their own and succeeded in acquiring substantial funding for these. In such cases, PCARRD and the center together worked out a scheme wherein both PCARRD's plan and the center's own blueprint for development would complement each other.

The requirements for capability development identified by PCARRD naturally required huge budgetary support that would impose a heavy strain on the country's tight financial resources. These requirements, however, did not seem "too formidable," according to Madamba, but would simply require proper phasing.

PCARRD was confident that the plan would be partly supported by soft loans or grants from external sources. It was also aware, however, that the government would have to exercise its political will in according the national research system the funding and priority it deserved.

Based on the Research Capability Development Plan for the Seventies, PCARRD packaged several loan proposals for various funding agencies. These efforts bore fruit in the form of two RP-USAID loan agreements that provided the most comprehensive and significant support for the development of the national research system.

AGRICULTURAL RESEARCH DEVELOPMENT PROJECTS I AND II

In early 1974, NEDA Director General Sicat requested the USAID for the services of consultants to assist PCARRD in formulating a development loan proposal to support agricultural research in the Philippines. USAID Washington sent a team composed of Dr. Francis Lebeau and Dean James Cobble in

October 1974 to assess the feasibility of extending a loan to support the country's research capability development plan. Together with Tetangeo, Cobble and Lebeau visited the different stations in Central Luzon, Visayas and Mindanao.

PCARRD had earlier invited Moseman, then a Rockefeller Foundation Consultant who had also served as one of the consultants for the Technical Panel of 1971, to conduct a detailed review of the first 18 months of PCARRD operations.

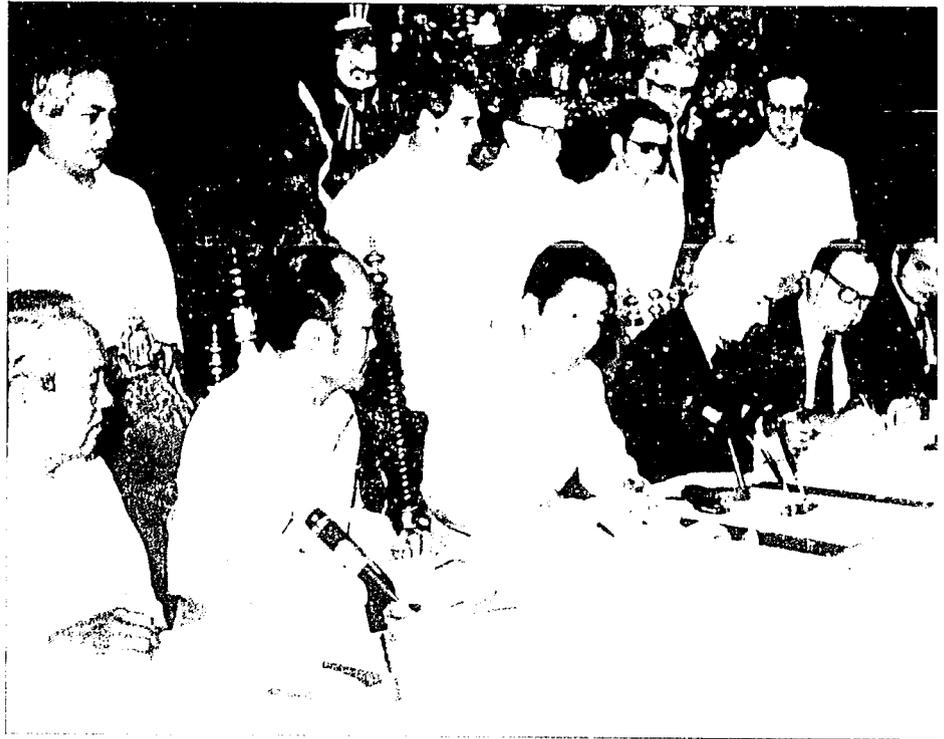
Moseman's review and that of Lebeau and Cobble helped convince USAID of the need to support PCARRD's development loan proposal.

On 23 December 1975, a \$5 million (P30 million) RPL USAID loan agreement was signed at the Malacañang Palace by President Marcos, NEDA Director General Sicat, US Ambassador to the Philippines William H. Sullivan, and USAID Director Garnett Zimmerly.

This agreement signalled the opening of a new economic resource gate for the country's research capability development program: the first Agricultural Research Development Project (ARDP I).

The USAID's willingness to extend assistance to PCARRD's research capability development plan made the highest officials of the land realize the value of research in national development. It also buoyed the government's confidence in PCARRD's capability. Subsequently, the national government took on the lion's share of the financial burden of building the national research system. The Government of the Philippines (GOP) extended a counterpart fund equivalent to US\$15 million (P113 million) which amounted to 75% of the total project cost of ARDP I.

The ARDP I was programmed for implementation over five years: three



years for infrastructure construction and equipment acquisition and five years for manpower development. The project was set into motion in April 1976 and completed in December 1980.

Less than four years later, PCARRD negotiated with the USAID for another loan to cover the period 1979 to 1984. On 16 July 1979, a second loan agreement was signed by former Philippine Minister of Economic Planning and NEDA Director General Sicat and then Acting USAID Director Dennis P. Barrett at the USAID office in Manila. This loan was tagged as the second Agricultural Research Development Project (ARDP II).

The ARDP II was expected to terminate in June 1984. However, due to unforeseen setbacks in the Philippine economy, it was extended to December 1985 in order to complete some infrastructure projects.

On 23 December 1975, President Marcos and US Ambassador William Sullivan (third and fourth from left, respectively) sign the agreement on a \$5 million loan for ARDP I. Other signatories were NEDA Director General Sicat (second from left) and USAID Director General Garnett Zimmerly (second from right). Other Filipino officials present were Medina (seated, extreme left) and Madamba (standing, extreme left).

On 6 July 1979, USAID Acting Director Dennis Barret and NEDA Director General Sicat (second and third from left, respectively) sign the loan agreement for ARDP II. USAID Agriculture Division Chief Lane Holdcroft is seated extreme left.

PHILSUCOM Chairman Roberto S. Benedicto and Valmayor sign the memorandum of agreement turning over research equipment and infrastructure to LGARC.

The responsibility for implementing the ARDP I and II was given to PCARRD through the Office of the Deputy Director General for Operations which was later renamed Office of the Deputy Executive Director for Development and Financial Management. A project management group with highly technical expertise was formed to assist in monitoring the day-to-day implementation of the project and also in maintaining strong liaison with the agencies concerned, such as, the

USAID, OBM, NEDA and the recipient institutions.

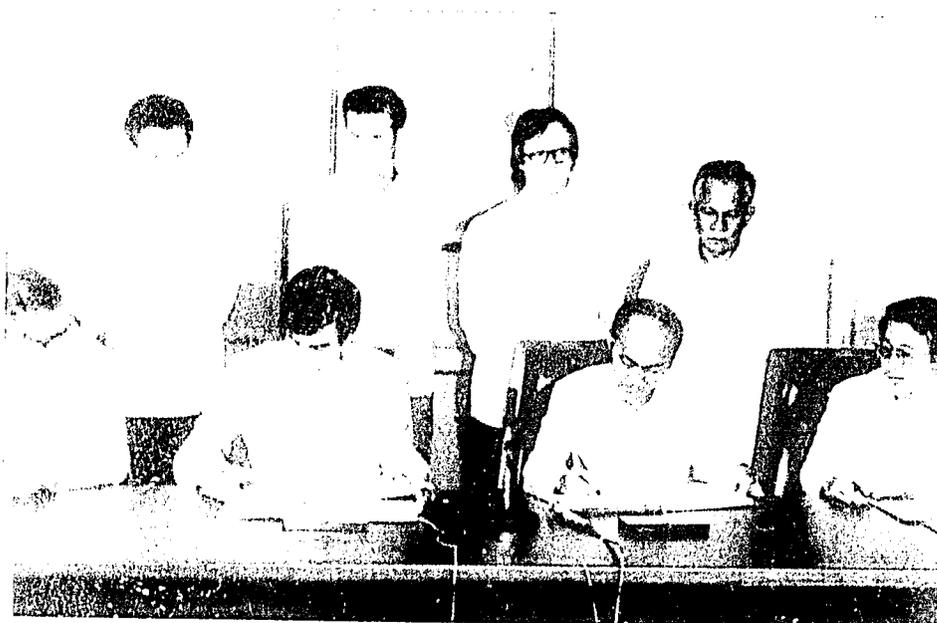
Project Objectives

The primary objective of ARDP I was to develop and improve the research capability of four major research centers in the country. The ARDP II provided support for the capability build-up of six other research centers and extended additional grants for two centers that were recipients under ARDP I. The ARDP I and II also provided more funds for research operations through bigger grants-in-aid allocations.

The recipient centers were provided with research facilities, manpower development opportunities through in-country or international trainings, technical assistance on research administration and specific agricultural problems, and funds for the operation of research projects.

A secondary objective of the ARDP I and II was to strengthen the leadership role of PCARRD in the administration and management of the national research system. While PCARRD had made "much progress" in organizing research, the proposed loan would provide PCARRD with the "confidence, flexibility in decision making, recognition and credibility" needed to establish its position in the face of resistance that often arises whenever a system deviates from the traditional order of things (PCARR, 1975).

The ultimate objective of ARDP I and II, however, was to increase agricultural productivity and boost the income of small farmers who comprise 80% of the country's farming populace. Immediate benefits would be measured in terms of improved capability to conduct research, i.e., adequately equipped centers and stations manned by a strong cadre of agricultural scientists, capable of developing new and adaptable



technology. On the long-term basis, the benefits of these projects would be measured in terms of new or improved technology adapted to the needs of small farmers.

Recipients of ARDP I and II

The recipients of project assistance under ARDP I and II are the following:

— ARDP I — Central Luzon Agricultural Research Center (CLARC)

— Biol. Agriculture and Resources Research Center (BARRC)

— Laguna Agricultural Research Center (LAGARC)

— Southern Mindanao Agricultural Research Center (SMARC)

— ARDP II — Marikina-Marcos State University (MMSU), lead agency of ILARC

— Isabela State University (ISU), lead agency of CVIARS

— Central Luzon State University (CLSU), lead agency of CLARC

University of the Philippines at Los Baños (UPLB)

Forest Research Institute (FORI)

Palawan National Agricultural College (PNAC), host agency of PARC

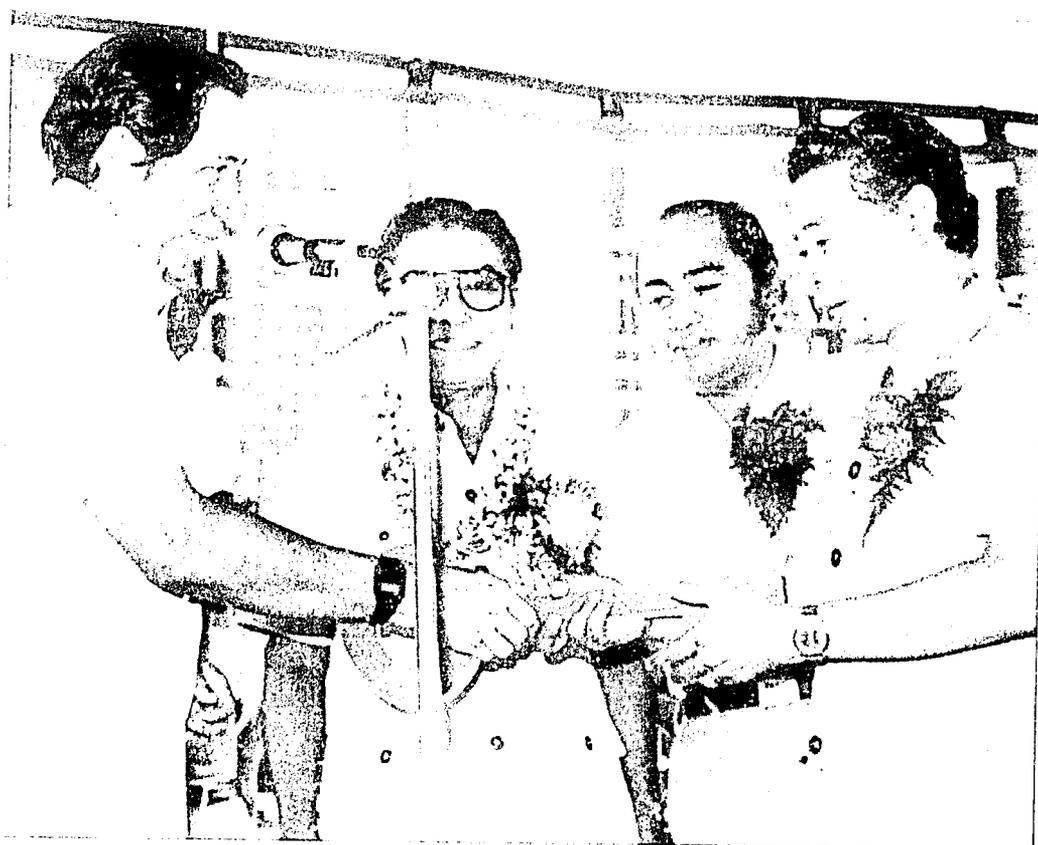
Visayas State College of Agriculture (VISCAR), lead agency of VICARP

University of Southern Mindanao (USM), host agency of SMARC

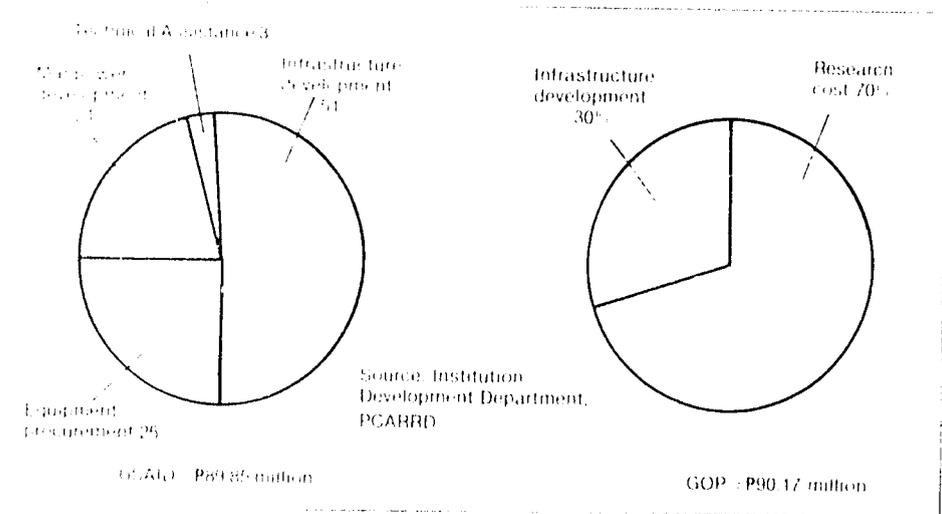
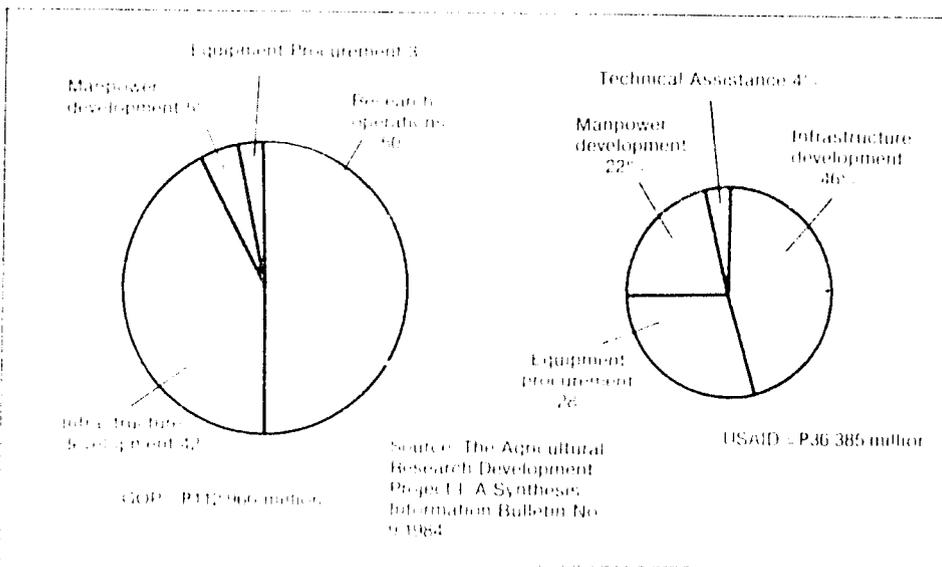
Other Recipients The ARDP II also provided funding for some of the development requirements of the PCARRD Secretariat. This included the construction of additional conference facilities, a guest house and staff houses; procurement of equipment; and training of staff.

Project Components and Costs

The ARDP I and II extended financial support for infrastructure development, equipment procurement, research operations, technical assistance, and manpower development.



Valmayor presents the symbolic key of responsibility to ISU President Felipe Cachola in ceremonies marking the turnover of research infrastructure and facilities to CVIARS.



Upper Figure

Fig. 1. ARDP I five-year development costs

Lower Figure

Fig. 2. ARDP II development costs as of 30 June 1985

Infrastructure development. Although most of the centers had enough land available for research, they did not have adequate facilities to enable them to conduct research effectively. Thus, the bulk of the total project costs for both ARDP I and II was channeled towards building and improving badly needed research facilities such as laboratories, screenhouses, greenhouses, service buildings, field structures, irrigation and water and power distribution systems. Most centers also received grants for the

construction of staff houses to enable them to recruit and retain top-caliber researchers.

A total of P64.04 million was spent for infrastructure built between 1976 to 1980 under the ARDP I, while a total of P73.44 million was programmed for infrastructure developed under ARDP II.

Equipment procurement. Under ARDP I, this component was directed largely towards the improvement of laboratory and field research facilities through the acquisition of equipment, farm machinery and tools. Researchers were provided with vehicles to speed up the pace of research operations.

The project also enriched the holdings of libraries in the various centers by providing for more reference books and scientific journals.

A total of P13.84 million pesos was spent for equipment acquisition from 1976 to 1980, under ARDP I.

As of 30 June 1985, a total of \$2.80 million had been provided by ARDP II for the purchase and maintenance of laboratory and field equipment including vehicles for researchers, as well as library references, journals and other materials.

Research operations. Once the centers and stations have been provided with infrastructure, equipment, and manpower, the government must provide these centers and stations with funds so that they can operate on a higher level. The bulk of appropriations under the research operations component was allocated for grants in aid to allow centers and stations to implement research projects.

This component was shouldered solely by the government counterpart fund. A total of P56.33 million was programmed for research operations under the ARDP I; and a total of P62.78 million was allotted under ARDP II.

As of the end of June 1985, P39.74 million had been utilized to support the

research projects implemented by the different centers under ARDP II, ₱5.14 million for the operation of the research centers, ₱9.84 million to support the center's development, and ₱8.07 million for administrative cost, amounting to a total of ₱62.78 million.

Technical assistance. Under the technical assistance component, consultants were tapped to help catalyze research and development activities in various commodities and disciplines. Specialists were tapped for short-term assistance in the formulation and implementation of research and development programs for specific commodities and in the review of organizations and operations within the national research system.

Among the major activities of the technical assistance component under ARDP I were the ex post evaluation of ARDP I and the corporate review of PCARRD by a team from the International Agricultural Development Service.

Under ARDP II, PCARRD engaged the services of both Filipino and foreign consultants for such varied areas as project development; research on farming systems and goat, strawberry, and foliage plant production; equipment maintenance; and external evaluation of systems. These services were categorized into individual and group consultancies. Specialists were also tapped as resource persons in workshops, conferences and symposia.

For ARDP I and II, the total cost of consultancies was 50.43 million.

Manpower development. The staff development program under ARDP I and II was meant to complement the development of facilities in the recipient centers. The program included in-country and overseas scholarships for masteral and doctoral degrees; short-term upgrading or refresher courses at

international research centers and universities; and observation or study tours.

The ARDP II likewise afforded the participation of Filipino scientists in symposia, workshops and conferences outside the country. These gave Filipino scientists the opportunity to share their research findings with their colleagues in the international community, visit research facilities abroad and strengthen linkages with other scientists working in the same field.

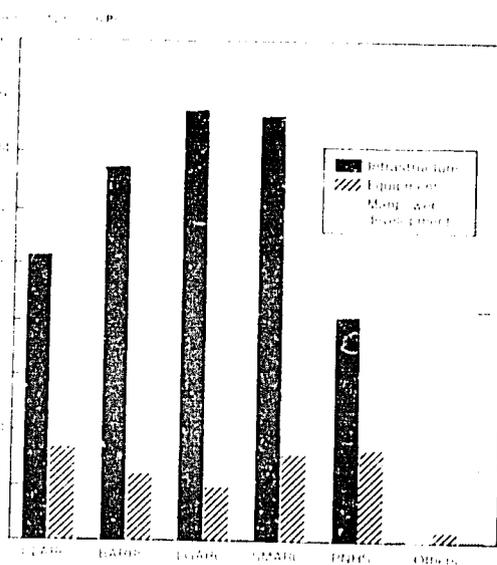


Fig. 3. ARDP I Investment Distribution by Center/Consortium

Source: The Agricultural Research Development Project I: A Synthesis. Information Bulletin No. 9/1984.

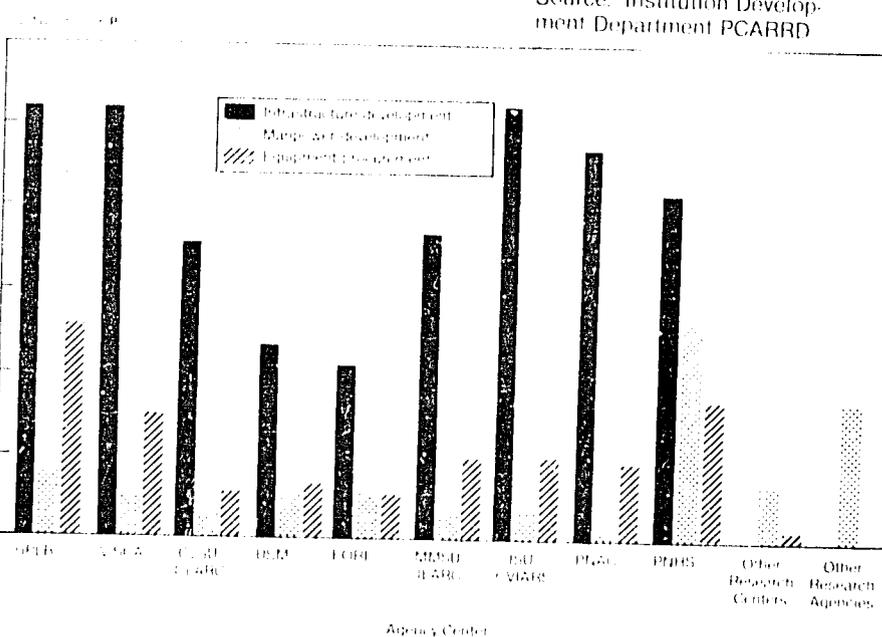


Fig. 4. ARDP II Investment Distribution by Center/Agency
Source: Institution Development Department PCARRD

While the scholarships provided by ARDP I and II were primarily for the recipient centers, other agencies within the national research system also benefited from this program.

The manpower training component, both local and international, cost a total of ₱13.54 million under ARDP I and ₱18.73 million under ARDP II.

PCARRD'S OVERALL MANPOWER DEVELOPMENT PROGRAM

The most critical input in research is well-trained and highly motivated researchers. It is not enough to have an overall research agenda nor a body deciding on the allocation of resources. Investment in physical resources cannot be expected to yield high dividends unless there is concomitant investment in research manpower development in the centers.

PCARRD's manpower development program was conceived to lessen the disparity in trained manpower among institutions and regions of the country; to prepare the regional and local research stations for a more active role in rural development; and to ease the country's heavy dependence on agricultural colleges and universities for research manpower.

The program seeks to enable researchers to play a more active role in the technology transfer process and to make more efficient use of scarce research resources. It provides training and ensures that research workers are capable of doing quality research.

The PCARRD Manpower Development Program has two components: degree and non-degree programs.

The degree program provides researchers, research administrators, and their support staff opportunities to get higher formal training from identified colleges and universities in the Philippines or abroad. Selected scholars may pursue masteral or doctoral degrees under the program.

The degree program started with nine awardees at the UPLB during school year 1973 to 1974 — seven candidates for the master's degree and two for the

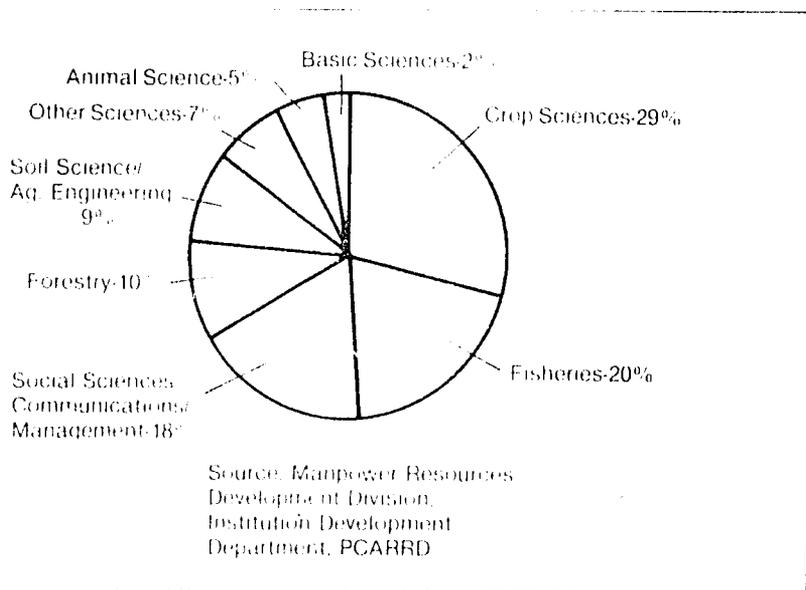


Fig. 5. Percent Distribution of Graduated PCARRD Scholars (n = 579) by Field of Specialization

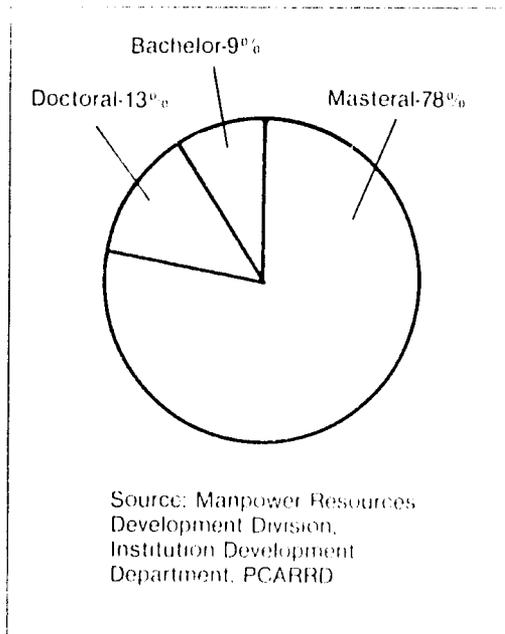


Fig. 6. Percent Distribution of Graduated PCARRD Scholars (n = 579) by Degree Programs

Ph.D.degree.

The national research system today boasts of a total of 57⁹ scholars graduated under PCARRD's manpower development program.

These graduated scholars are now back in the service of their mother agencies, doing research or research management duties with a broader perspective and fresh enthusiasm.

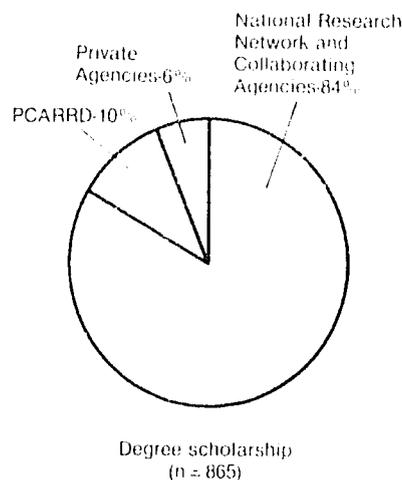
The non-degree training program of PCARRD began in May 1974. As of 1985, the program has sent a total of 1,636 researchers and research administrators from the network and the PCARRD Secretariat to short-term trainings, conferences, and study tours within the Philippines, Asia, the Americas and Europe.

PCARRD has also coordinated and hosted training conferences on research management and related subjects. These were held at research centers in different parts of the country.

Resources available for manpower development are distributed among the national research network, the PCARRD Secretariat, support agencies and private agencies.

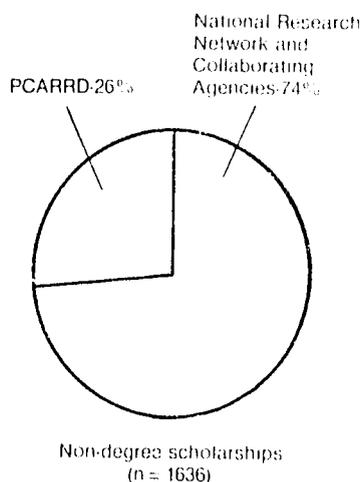
The number of scholars chosen from each research institution or agency is based on the specific set of guidelines and on the program's state of finances during the year.

The PCARRD Manpower Development Program has been largely supported by the ARDPI and II. There have been contributions from the ministries and, more recently, additional support from the government. The national research system also benefits from training opportunities offered by IARCs, like CIP, CIAT, CIMMYT and IDRC.



Source: Manpower Resources Development Division, Institution Development Department, PCARRD

Fig. 7. Percent Distribution of PCARRD Degree Scholarship Awards by Sector



Source: Manpower Resources Development Division, Institution Development Department, PCARRD

Fig. 8. Percent Distribution of PCARRD Non-degree Scholarship Awards by Sector



PCARRD's research capability development program is geared towards the proper phasing and complementation of manpower and infrastructure development and equipment acquisition.

National and Regional Centers of Excellence

Before the establishment of PCARRD, only a few research institutions had the equipment, facilities and high-level manpower needed to undertake quality research.

The development of the national research system and its complementary program to improve research capability spurred the growth of national and regional research centers whose research capabilities now equal or even surpass that of the older and well-established institutions. These centers are now doing a creditable job of serving both national and regional research and development needs.

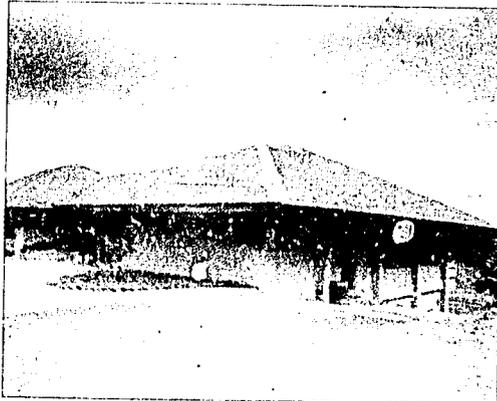
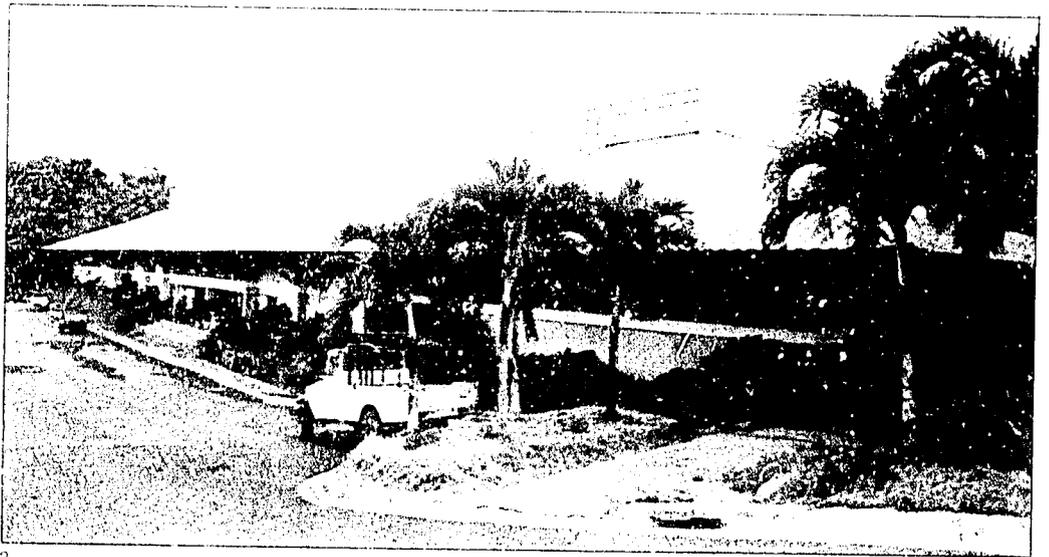
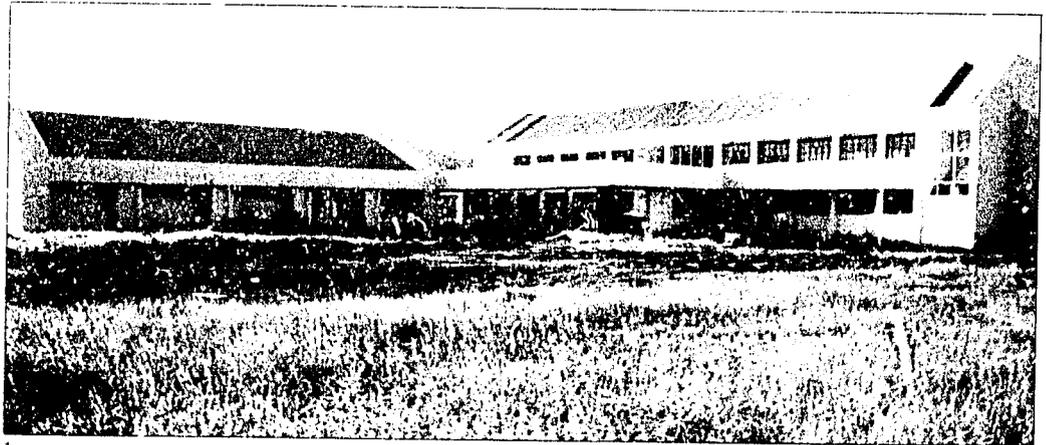
The following folio of photographs features some of the major contributions of ARDP I and II to research capability development, along with facilities and infrastructure built through funding generated by the various centers themselves.

1. The plant genetic resources laboratory at the UPLB Institute of Plant Breeding houses a convron for long term storage of valuable germplasm.

2. The AVRDC building, just a stone's throw from the PCARRD national headquarters, overlooking th BPI Economic Garden complex in Los Baños, Laguna

3. The new PCARRD annex building which features an auditorium, the SLS library, function rooms and a cafeteria.

4. The FORI staff housing, built close to the Institute within the UPLB complex.



3

4

W

Centers of Excellence

1. Fiberglass tanks for tilapia fry used in genetics experiments at the CLSU Freshwater Aquaculture Center

2. Tilapia fry culture in hapa nets, one of four hatchery systems commonly practiced by Filipino fishfarmers

3. Water distribution canal for the rice-fish farm or palayisdaan

Central Luzon Agricultural Research Center (CLARC)

Established:

22 December 1978

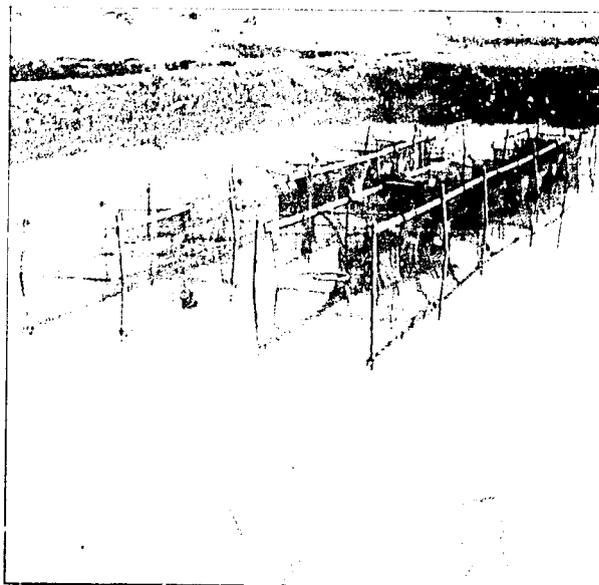
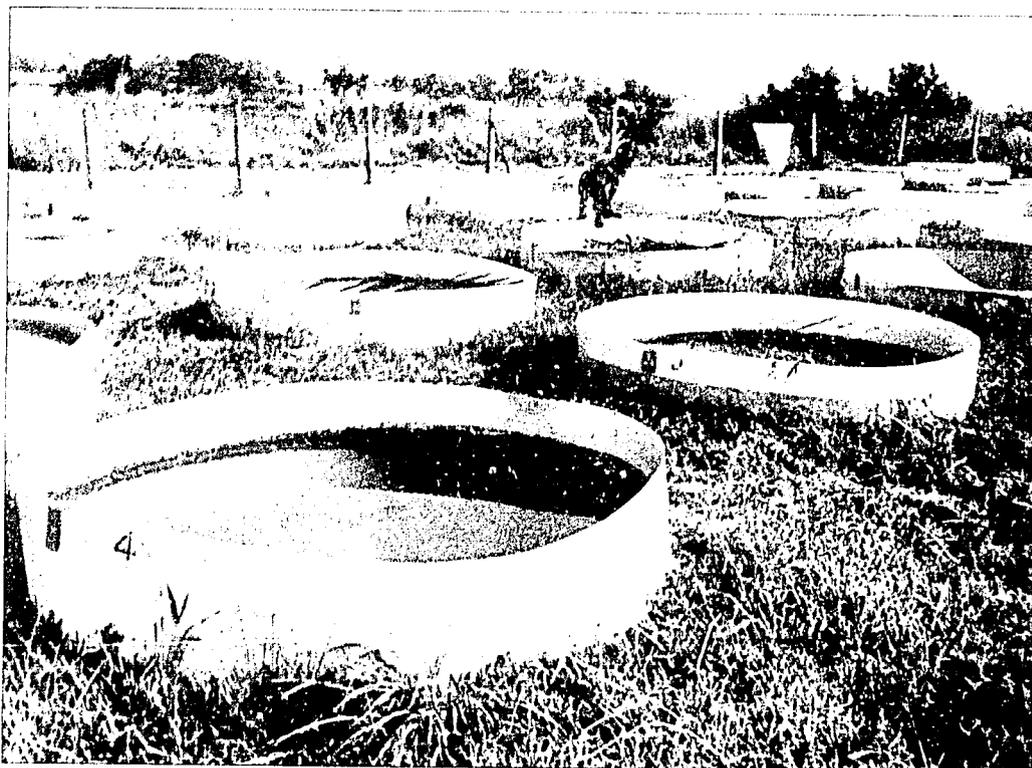
Lead Agency:

Central Luzon
State University

Member Agencies:

- BPI-Maligaya Rice Research and Training Center
- National Irrigation Administration Upper Pampanga River Integrated Irrigation System
- FORI-Carranglan Forest Research Experiment Station
- Pampanga Agricultural College
- Tarlac College of Agriculture
- Western Luzon Agricultural College

CLARC holds national responsibility for carabeef, chevon, and aquaculture. The CLSU Freshwater Aquaculture Center has received the Tanglaw award for pioneering in efforts to accelerate freshwater aquaculture production.



3

Centers of Excellence

4. The CLSU general services building

5. The CLSU Technology Dissemination and Utilization System or TDUS building

6. The CLSU motorpool building

7. A one-hectare model farm at CLSU that showcases integrated farming systems



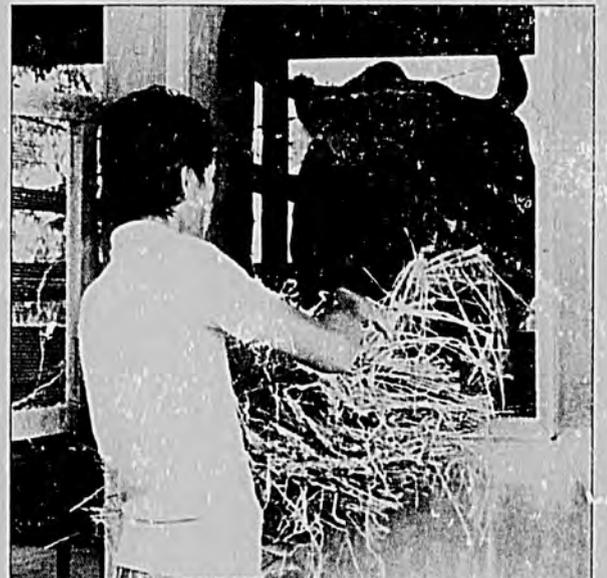
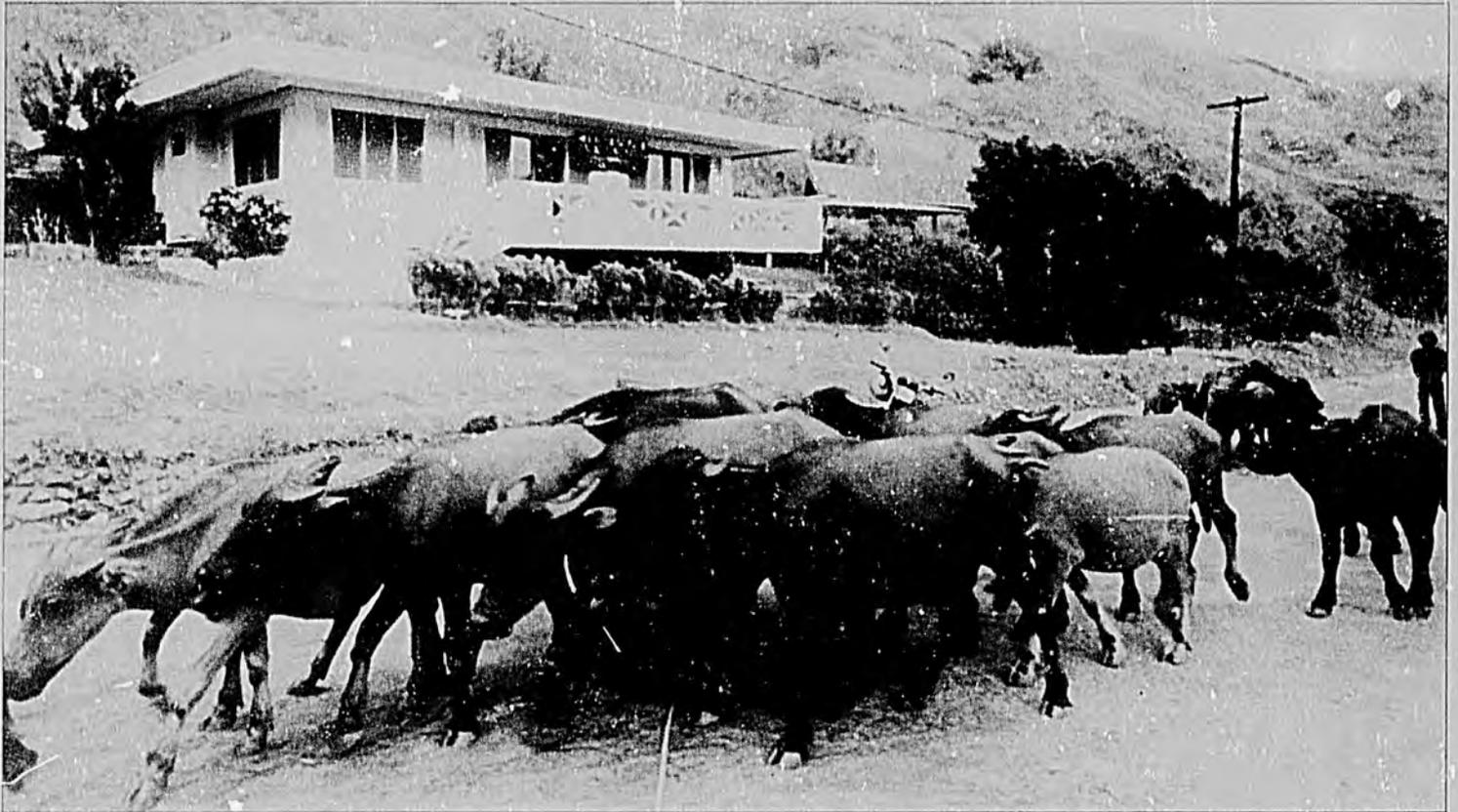
Centers of Excellence

8-10. The CLSU Carabeef Ranch and Development Utilities at Digidig, Carranglan, Nueva Ecija, 14 kilometers from the CLSU campus

8. Administration building

9. Haybarn

10. Feed stalls



9

10

Centers of Excellence

1. Crop research laboratory at ISU

2. Service engineering building

3. Forage and pasture research laboratory

Cagayan Valley Integrated Agricultural Research System (CVIARS)

Established:

17 November 1978

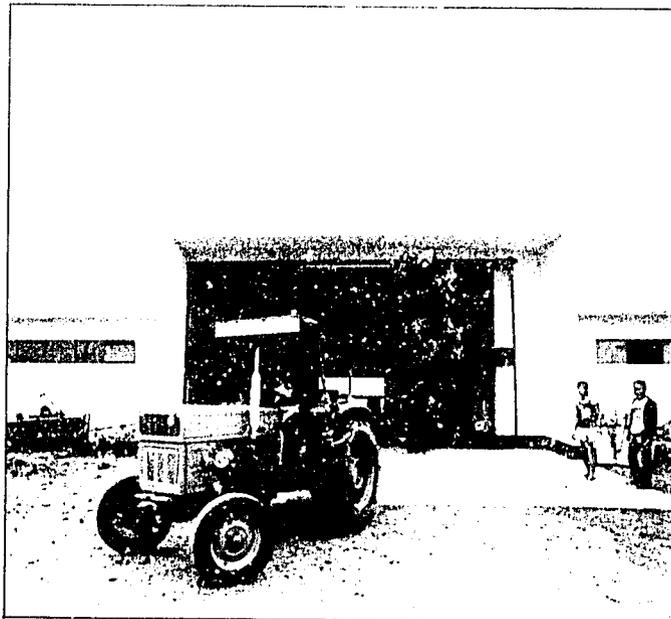
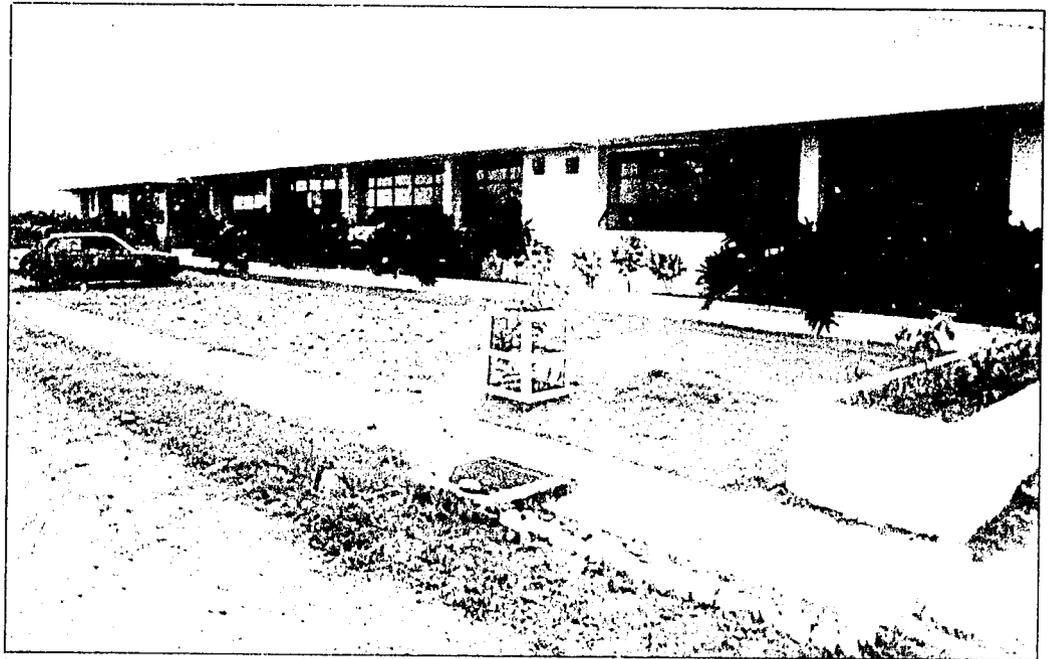
Lead Agency:

Isabela State University

Member Agencies:

- Cagayan State University, Piat Campus
- Cagayan Integrated Agricultural Development Project
- Nueva Vizcaya State Institute of Technology
- Philippine Tobacco Administration at Ilagan and Tumauini, Isabela
- NIA-Magat River Multi-purpose Project Service Areas in Isabela and Quirino

CVIARS was established primarily to set up a research mechanism for programming and developing resources involving commodities and disciplines important to the Cagayan Valley region.



Centers of Excellence

1. Power distribution lines for a five-hectare housing development area

2. PTRTC re-drying plants for tobacco

Ilocos Agricultural Research Center (ILARC)

Established:

21 December 1979

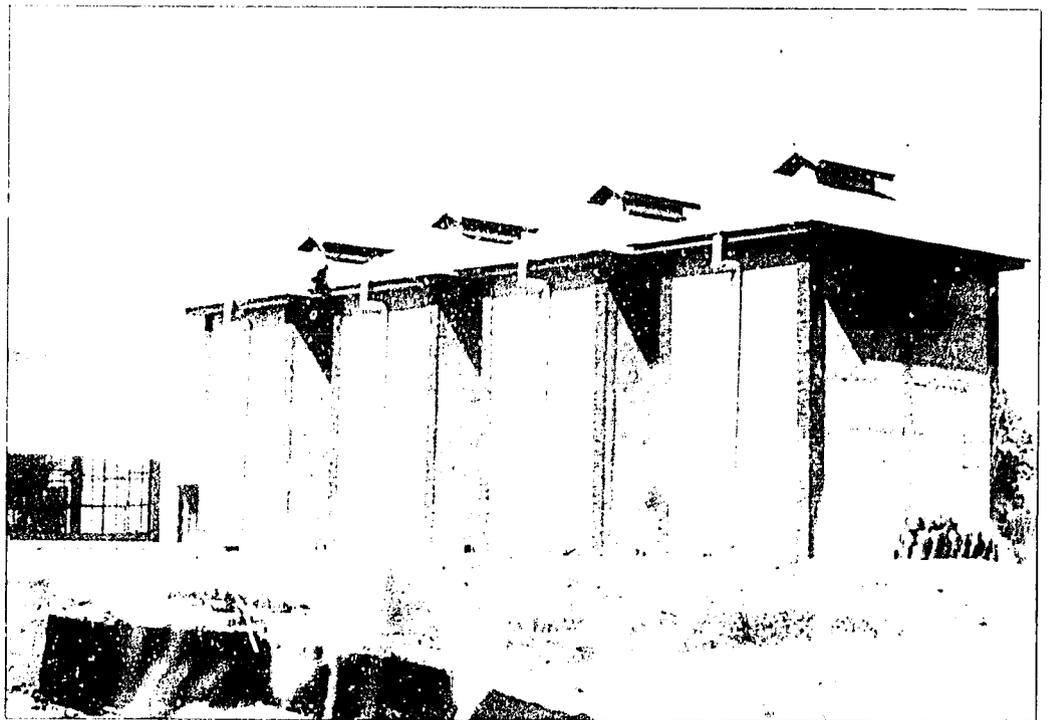
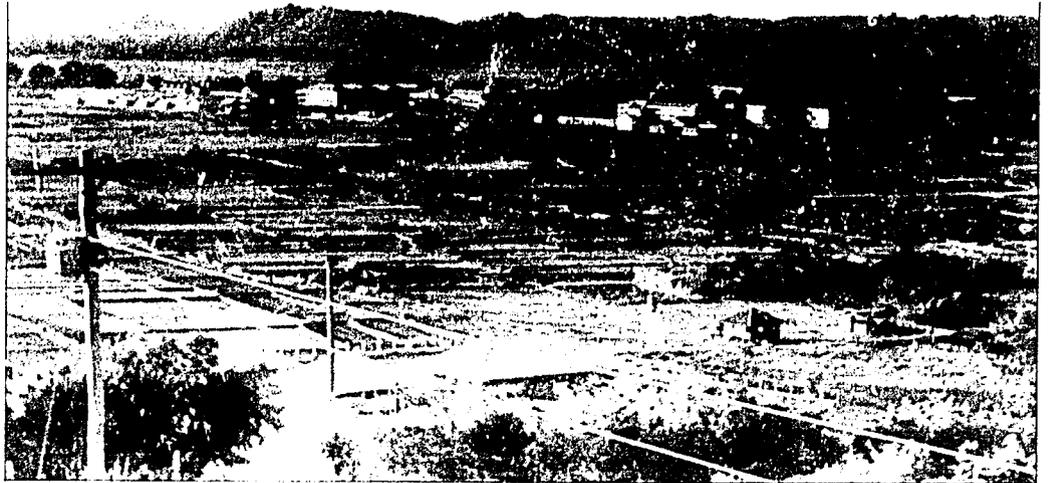
Lead Agency:

Mariano Marcos State University

Member Agencies:

- Philippine Tobacco Research and Training Center
- Cotton Research and Development Institute
- FORI-Batac Forest Station

The MMSU in Batac, Ilocos Norte holds regional responsibility for Ilocandia's major crop -- Virginia, Burley and Turkish tobacco. It also holds responsibility for other commodities like fiber crops, legumes, vegetable crops, and beefchevon.



X

Centers of Excellence

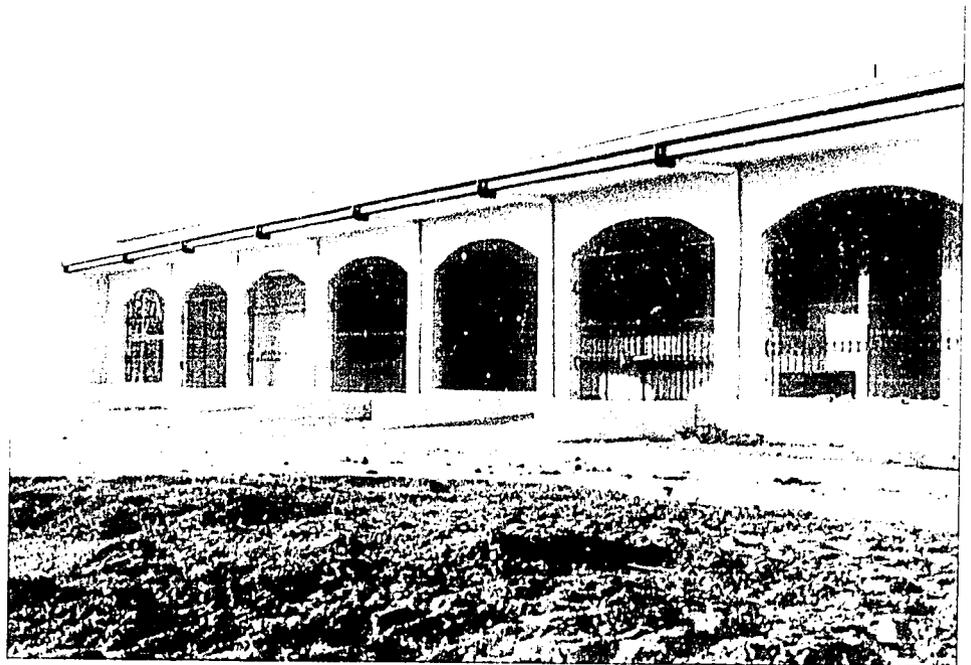
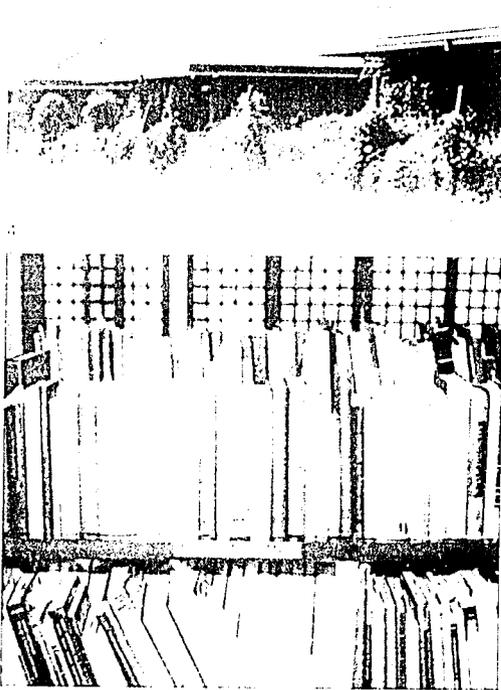
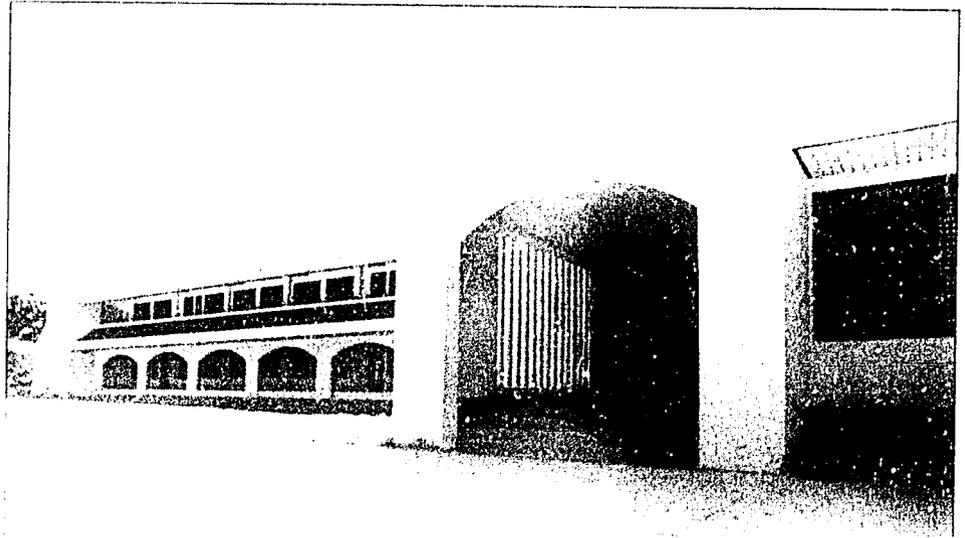
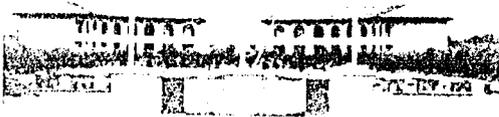
3. The MMSU set off by its distinctive architecture

4. Two bedroom staff houses designed along the lines of the old houses of Vigan

5. Publications acquired through ARDP I and II to enrich the bookholdings of ILARC as well as that of other centers.

6. The crop research laboratory at MMSU

7. The headhouse, where seeds are stored and harvests are sorted and set aside for further study



Centers of Excellence

1. The MSAC agroforestry project site embraces 325 hectares of rolling hills in Ampasit, La Trinidad, Benguet. A pond at right impounds rain water for nearly 10,000 coffee and citrus seedlings in an open nursery

2. The potato ranks first among vegetable crops grown by farmers of Northern Luzon. Development of potato production technology is one of MSAC's priority research undertakings.

Highland Agricultural Research Center (HARC)

Established:

11 November 1978

Lead Agency:

Mountain State
Agricultural College

Member Agencies:

- BPI-Baguiro Experiment Station
- BAI-Baguiro Dairy Farm
- FORI-Conifer Research Center
- UP College in Baguio-Cordillera Studies Center
- Philippine Textile Research Institute

Nestled in the valley of La Trinidad, Benguet, HARC's primary objective is to backstop agriculture and resources research and development for the Mountain Provinces and other highland regions of the country. MSAC, the lead agency, has regional responsibility for, among other commodities, fruit crops, vegetable crops, root crops, ornamental and medicinal crops, and forest plantation and agroforestry.



Centers of Excellence

1. The CSSAC auditorium
2. Two-bedroom apartments for CSSAC staff and guests
3. Ruins of the buried church of Cagsawa in Albay, a stately reminder of man's vulnerability in spite of advances in technology
4. Elevated water tank
5. Service engineering building at CSSAC

Bicol Agriculture and Resources Research Center (BARRC)

Established:

June 1979

Lead Agency:

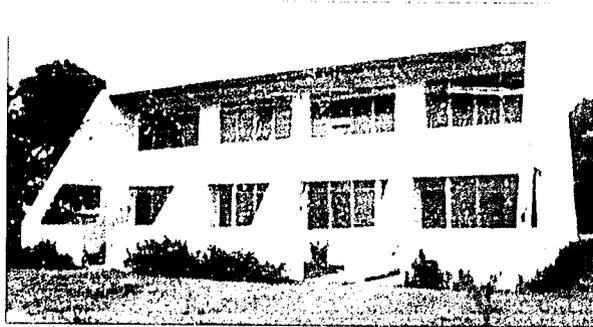
Camarines Sur State
Agricultural College

Member Agencies:

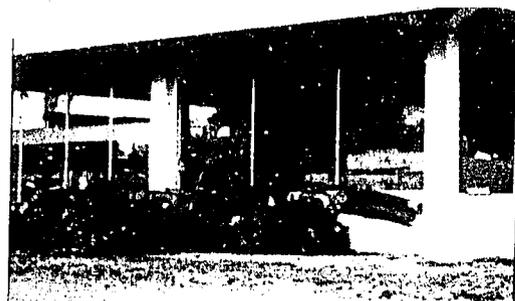
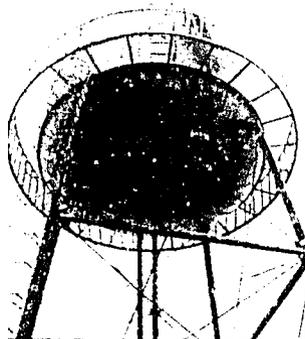
- Bicol University
- Bureau of Plant Industry
- Bicol River Basin Development Program
- Bureau of Soils and Fiber Development Authority
- Forest Research Institute

BARRC integrates, coordinates and monitors agriculture and resources research and development efforts for Region V, which is composed of the provinces of Camarines Sur, Camarines Norte, Albay, Catanduanes, and Sorsogon.

CSSAC, the lead agency, has regional responsibility for root crops, vegetable crops, and beefcavon for small farm operations.



3



Centers of Excellence

1. Screenhouse at ViSCA, where the seeds of many a technology are sown and nurtured

2. The amphitheater at the center of the ViSCA complex

Visayas Coordinated Agricultural Research Program (VICARP)

Established:

17 November 1978

Lead Agency:

Visayas State College
of Agriculture

Member Agencies:

BPL-Ubay

Experiment Station

BPL-Mandaue

Experiment Station

BPL-Abuyog

Experiment Station

BAU-Ubay Stock
Farm

FORI-Babarrigon

Forest Research
Station

From its modest beginnings as a provincial agricultural high school in 1924, ViSCA is now the strongest agricultural research complex outside of Los Baños.

ViSCA is one of the centers that was able to generate World Bank funding for its massive infrastructure and manpower development program



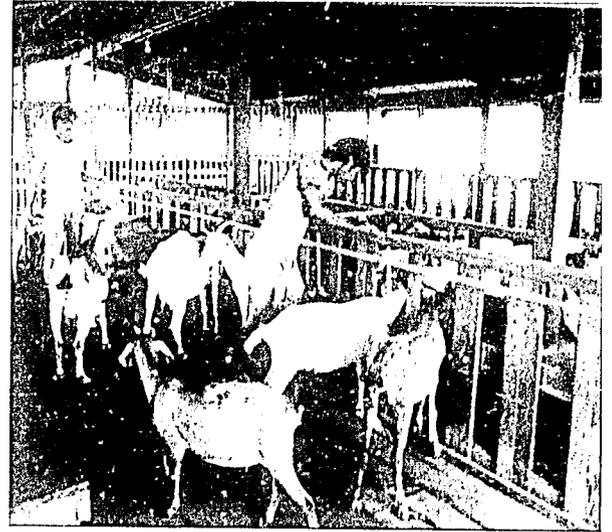
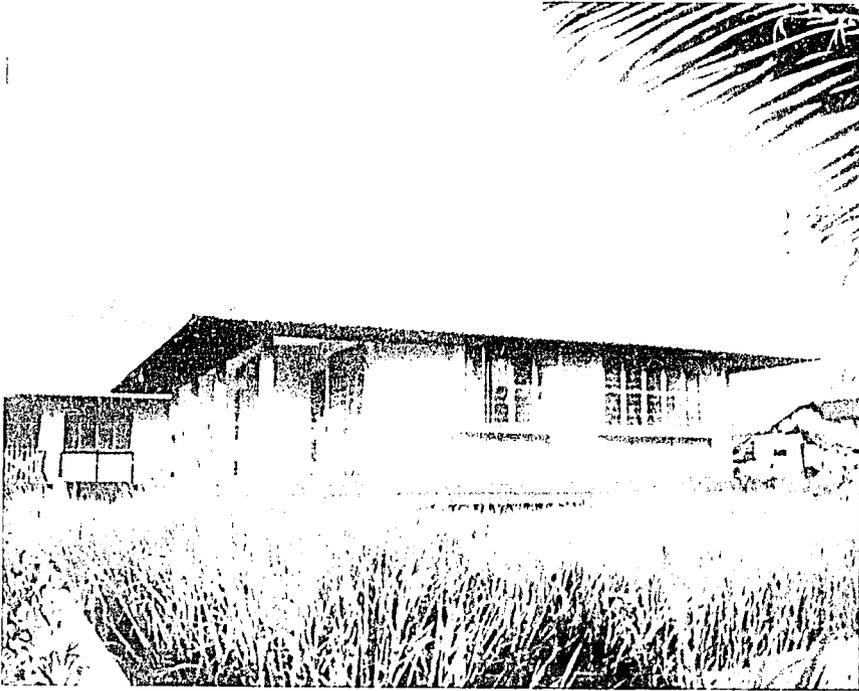
Centers of Excellence

3. *Three-bedroom stallhouse at ViSCA*

4. *Crop research laboratory*

5. *A ViSCA project that measured the effects of bottle feeding and suckling on the weight gain of kids from birth to weaning*

6. *High-yielding cassava varieties developed by the PRCRTC, based a ViSCA*



5



La Granja Agricultural Research Consortium (LGARC)

Established:

20 June 1975

Lead Agency:

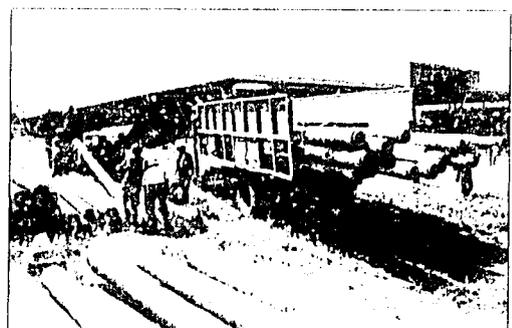
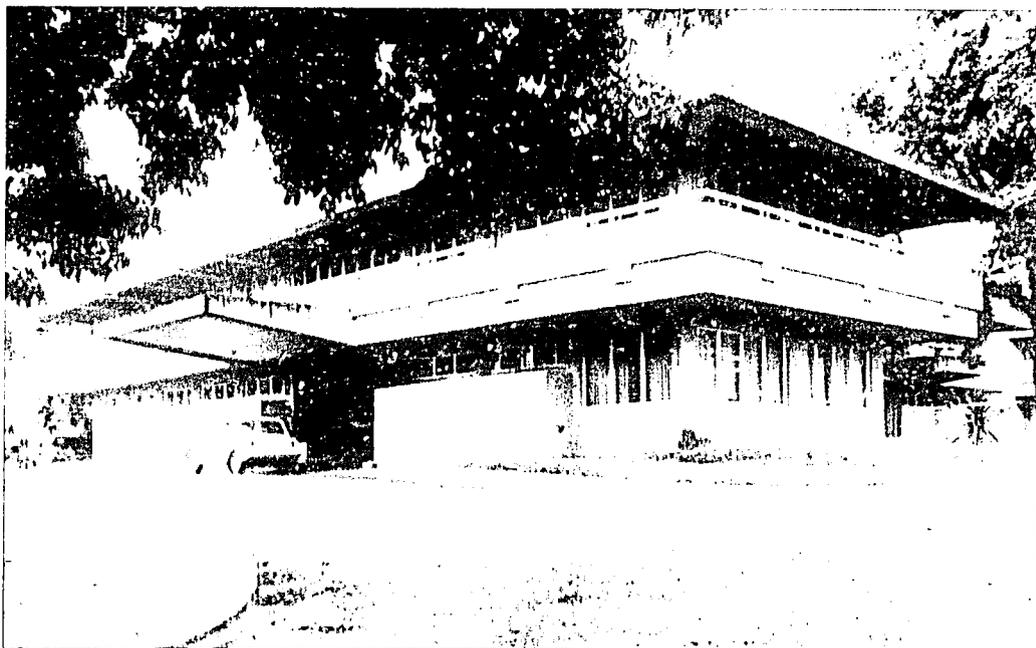
Philippine Sugar Commission

Member Agencies:

- BPL-La Granja Experiment Station
- BAI-La Carlota Stock Farm
- UPLB-CA La Granja Research and Training Station

LGARC was the first center to be organized by PCARRD. LGARC's uniqueness lies in the close proximity of its member agencies to one another, allowing them to share research facilities, staffhousing, and other resources fully.

PHILSUCOM, the lead agency, has developed high-yielding and disease-resistant sugarcane varieties that have increased sugar yield by an average of 10 piculs sugar per hectare.



Centers of Excellence

1. Screenhouse at the PNAC experimental farm

2. Elevated water tank and pumphouse for the crop research complex

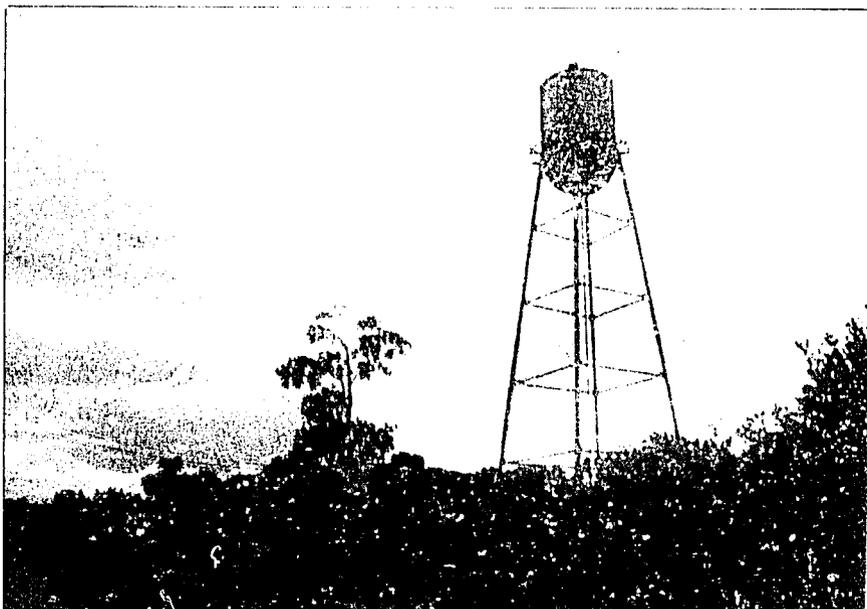
Palawan Agricultural Research Center (PARC)

Established:

17 November 1978

Host Agency:

Palawan National Agricultural College
PARC, together with SMAAC, is a single-institution center. PNAC, the host agency, holds regional responsibility for commodities like coconut, fruit crops, root crops, beef chevon, carabeef, pork and poultry.



Centers of Excellence

1. A pair of sarimanok (the symbol of Mindanao) flanking the gateway to SMARC

2. The crop research laboratory at USM, one of the first and biggest infrastructure built under ARDP I

3. Administration building and auditorium

Southern Mindanao Agricultural Research Center (SMARC)

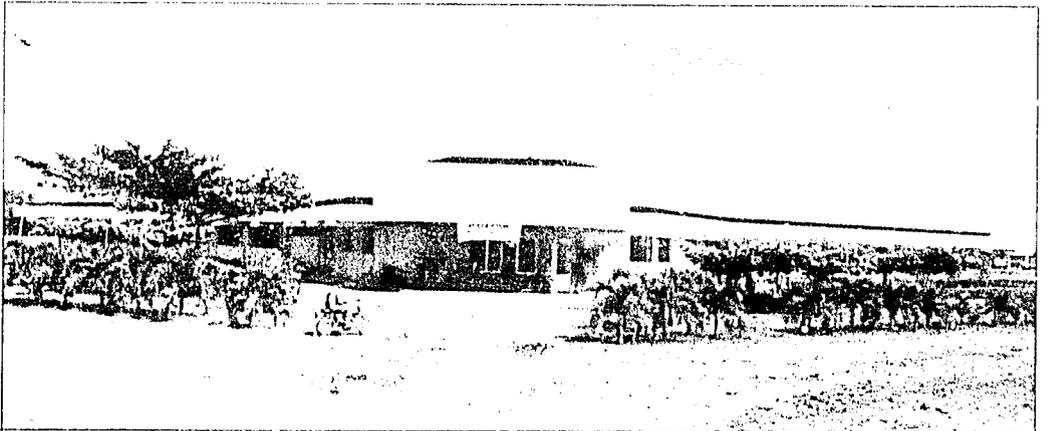
Established:

17 November 1978

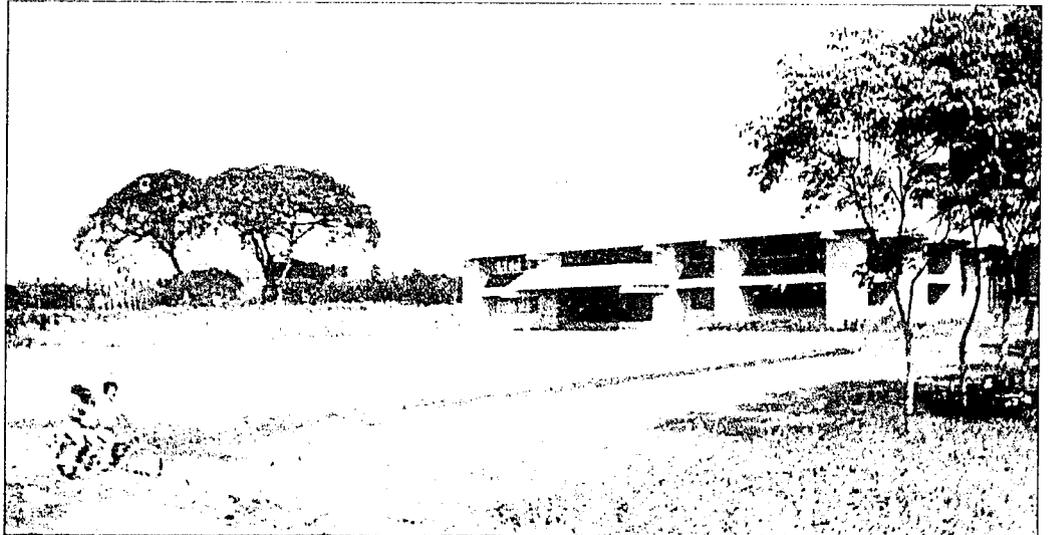
Host Agency:

University of Southern Mindanao

SMARC has grown at a remarkable rate from an insignificant center with almost non-existent resources to become one of the premier research institutions of the country. Today, SMARC is a major source of technologies, especially for the small rubber farmers of Southern Mindanao.



2



3

Centers of Excellence

4. Three-bedroom staffhouse



5. The SMARC guest house



8

6. A bird's eye view of the research facilities at USM: screenhouses at right, head house and greenhouses at center, and the animal science research laboratory in the background



6

7. An integrated service building which houses mechanical, carpentry, and motor/pool facilities



7

8. Cacao, a major commodity responsibility of SMARC

Centers of Excellence

1-2. With its rolling terrain, vast areas of improved pasture, and upgraded crossbreds, CMU is well-equipped to take on national responsibility for forage, pastures, and grasslands and beef cattle ranch operations.

Northern and Central Mindanao Coordinated Agriculture and Resources Research Program (NOCEMCARRP)

Established:

18 December 1978

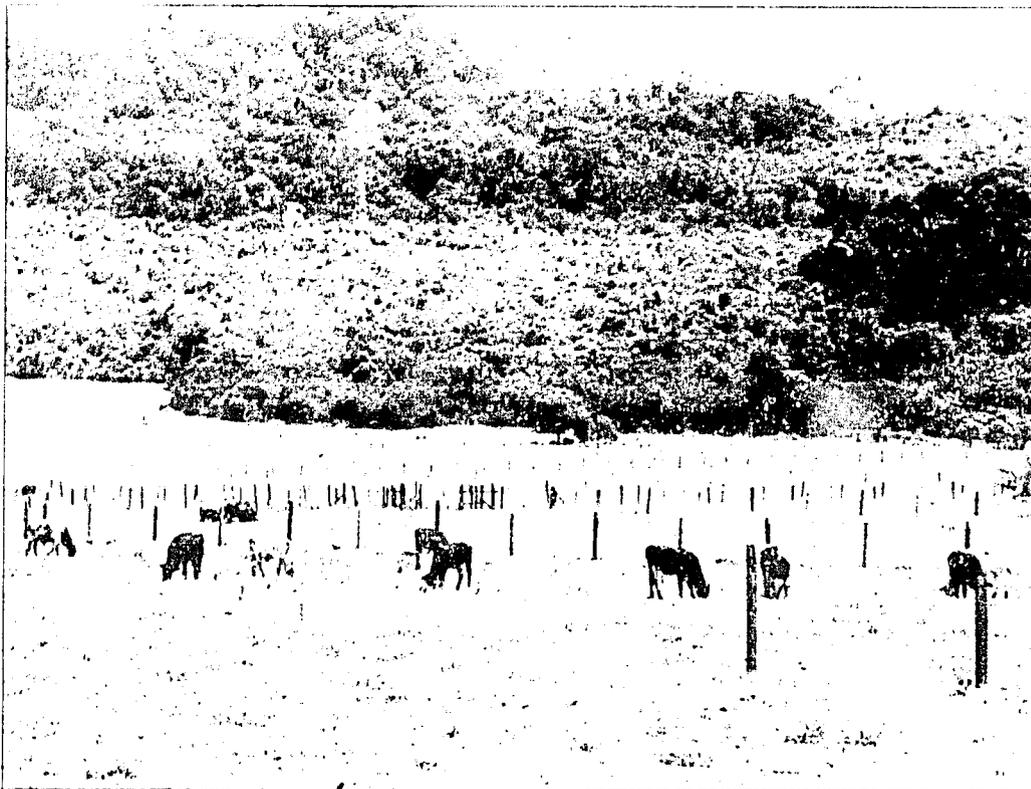
Lead Agency:

Central Mindanao University

Member Agencies:

- BPI-Misamis Oriental Horticultural Research Center
- BAI-Malaybalay Stock Farm
- FORI-Malaybalay Forest Research Station
- Bureau of Fisheries and Aquatic Resources, Region X
- National Irrigation Administration
- Xavier University

Aside from its national responsibility for beef and forage, pastures, and grasslands, CMU holds regional responsibility for corn and sorghum, dairy, chevon, and plantation crops like coffee, cacao, and rubber.



PCARRD recognizes that it must give greater attention to manpower development through an aggressive action program, including the use of innovative training schemes and through assistance to the institutions within its research network. It should continue its efforts to secure regular GOP appropriations or funds from other sources for this purpose. PCARRD's efforts have been directed along the following courses of action which were actually recommended by the 1980 ARDF I Review Team:

- That critical masses of highly trained research manpower be developed... the need for which must be jointly determined by the regional research centers and PCARRD.
- That a proper mix or balancing of manpower development to suit R and D priority needs in the regions be achieved.

- That manpower development consistent with research facilities development be properly phased.

As PCARRD pursues its task of strengthening research capability, it continually strives for balance and a proper phasing of the various components of capability development. PCARRD also works to ensure that the centers and stations participate actively in identifying their respective needs and priorities, in relation to national and regional research and development thrusts. Above all, PCARRD must make certain that once the research facilities, equipment and manpower are in place, the research centers will have sufficient support to undertake research in their respective areas of responsibility.

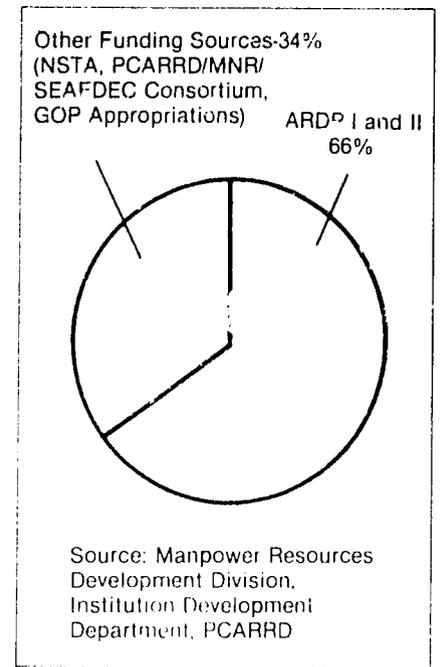


Fig. 9. Sources of Funding for PCARRD Degree Scholarship Awards (n = 865)



Tilapia samples are weighed at the
CLSU for a research project on
genetic improvement of high quality
tilapia breeders.

Forging International and National Linkages

operating in a country with limited research resources, PCARRD recognizes the value of sharing scientific information and technology and fostering collaboration in research. It realizes the benefits of tapping international donor agencies for research funds. It also acknowledges the need to reinforce indigenous knowledge by making use of technologies and expertise from international and regional research centers, national research systems, and specialized commodity institutes in other parts of the world.

In the past 13 years, PCARRD has worked collaboratively and productively with international and national agencies. This chapter discusses some of these joint undertakings and their major features such as, exchange of germplasm, provision of funds for research projects, manpower development and training, technical assistance, equipment support and exchange of technologies, research findings and methodologies.

In his paper, *Collaboration Between International Agricultural Research and the Philippines*, Gomez (1985) cited examples by which the national agricultural research system (NARS) has benefited from the country's linkage with international agricultural research centers (IARCs). Gomez mentioned that "distribution of improved germplasm, training of research staff and dissemination of new research findings are the three services of the IARC that are perceived to be the most useful to the

NARS. Elite germplasm produced by the IARC have greatly increased the genetic diversity of breeding materials in the NARS and have contributed substantially to the progress in varietal improvement."

Just as it establishes international linkages, PCARRD institutes and maintains linkage with the private sector and with national and regional agencies outside of the national research system as a strategy in directing efforts and resources towards national development.

DONOR AND LENDING INSTITUTIONS

Australian Centre for International Agricultural Research (ACIAR)

PCARRD's link with ACIAR dates back to late 1978 when a team of Australian scientists and research administrators visited PCARRD under the sponsorship of the Consultative Committee on Research and Development (CCRD). The CCRD, which was instrumental in the creation of ACIAR, was then in the process of assessing the feasibility of Australian research institutions contributing to development efforts overseas.

In less than a year after ACIAR's establishment in June 1982, PCARRD and ACIAR officials discussed the possibility of research cooperation between Australia and the Philippines.

"The value of expanding operational linkages with institutions and organizations of mutual interests lies in the pooling of firepower, the complementation of strengths, the generation of greater multiplier effects, and attraction of attention and support to multi-group efforts."

PONCIANO A. BATUGAL



Strengthening of the Philippine Carabao Research and Development Center is one of the most successful UNDP/FAO-supported projects in terms of research output.

On 1 August 1983, ACIAR and PCARRD signed a Memorandum of Understanding for Scientific and Technical Cooperation.

The memorandum spelled out the nature of cooperation between Australian and Philippine research institutions and became the basis for a number of collaborative research undertakings, which include:

- five projects falling under the Grain Storage Program —

- Long-term storage of grain under plastic covers (NAPHIRE-CSIRO)

- Drying of high moisture grains in bulk in tropical climates (NAPHIRE-UNSW-RCM)

- Integrated use of pesticides in grain storage in the humid tropics (NAPHIRE-QDPI)

- Kinetics of decay of pesticides for integrated pest control programs (NAPHIRE-CSIRO)

- Effect of controlled atmosphere on quality of stored grains (NAPHIRE-CSIRO)

- two projects under the Postharvest Technology Program on Fruits and Vegetables —

- Postharvest physiology of banana and its application to some other tropical fruits in Southeast Asia (PHTRC-CSIRO)

- Physiological, chemical and storage characteristics of mangoes (and some other tropical fruits) in Southeast Asia (PHTRC-CSIRO)

- two projects under the Farming Systems Research Program —

- Regional analysis of the transfer and performance of new technologies in rice-based farming systems in Sri Lanka and the Philippines (MAF-ARO-ANU)

- Environmental constraints to increased productivity of rainfed rice-based farming systems in the Philippines (MAC-ARO-CSIRO)

- two projects under the Animal and Fish Production Program —

- Culture of tridacnoid clams for food and restocking of tropical reefs (UPMSI-SU-JCUNO)

- Utilization of fibrous agricultural residues as ruminant feeds (UPLB-IAS-UM)

The memorandum of understanding also paved the way for the establishment of the ACIAR Liaison Office based at PCARRD. The Liaison Office, manned by a Filipino research manager, became operational in July 1983. It provides administrative, technical, and scientific support for the operationalization of the ACIAR-PCARRD memorandum of understanding.

International Bank for Reconstruction and Development-World Bank (IBRD-WB)

In collaboration with the IBRD-WB, PCARRD developed and initiated the implementation of the Smallholder Tree

Farming and Forestry Project which aims to develop alternative production systems for many "slash-and-burn" hilly land farmers in at least three regions of the country. Started in January 1980, the project is expected to generate technology packages for the small-scale production and utilization of fast-growing tree species such as *Leucaena leucocephala* (Lam.) de Wit and *Albizia falcataria* (L.) Fosb. These trees will be tapped primarily as fuel for rural enterprises.

The Agricultural Support Services Project (ASSP), which has a significant research component, also receives substantial support from IBRD-WB. The technology generation component, coordinated by PCARRD in cooperation with the MAF-ARO, aims to intensify efforts to fill research gaps in food crops and livestock, agro-based energy resources, and commodities with export potential as well as import substitutes, resource management and conservation, and socio-economics.

International Development Research Centre of Canada (IDRC)

The IDRC is one of the donor agencies that took early interest in supporting PCARRD's research programs. One of these programs is the PCARRD-sponsored ViSCA National Root Crops Research and Outreach Program for the Philippines. This program catalyzed the establishment of the Philippine Root Crop Research and Training Center (PRCRTC) at ViSCA, Baybay, Leyte in 1977.

The IDRC and PCARRD currently underwrite the National Integrated *Leucaena* Research Project in the Philippines which aims to develop *L. leucocephala* as a cheap source of protein for livestock, organic fertilizer and dendrothermal energy. The project is expected to benefit areas where costly

commercial fertilizers and livestock feeds are beyond the reach of small farmers.

Other projects which IDRC currently supports are:

- Banana-Livestock Integrated Farming (ViSCA)
- Development of an Integrated Village-Scale Biomass Energy System and Charcoal and Charcoal Briquette Production (FPRDI)
- Integrated Banana Studies for the Small Farmer (UPLB, BPI)
- Methodology for Classifying Research Resources in Agriculture and Natural Resources (PCARRD)
- National Integrated Research Project on Rattan (FORI, FPRDI, UPLB)
- Post-Production Technology Research and Development for Sweet Potato and Cassava in the Philippines and Sweet Potato Breeding Program (PRCRTC ViSCA)

United Nations Development Programme/Food and Agriculture Organization (UNDP/FAO)

The UNDP/FAO has been supportive of PCARRD's programs and activities. In 1978, the UNDP/FAO co-sponsored with PCARRD an international workshop on rainfed agriculture to crystallize research efforts for the rainfed farmers. It has also supported the attendance of a number of Filipino researchers in international trainings and scientific conferences.

In June 1980, an important project on the Philippine carabao (water buffalo), *Strengthening of the Philippine Carabao Research and Development Center*, was granted UNDP/FAO support. The project, which is coordinated by PCARRD and implemented mainly by UPLB and CLSU, aims to accelerate the development and improvement of the Philippine carabao to meet animal farm power needs of smallholder farmers and to increase meat and milk production.

The UNDP/FAO support is largely in the form of technical assistance and provisions for training, fellowships and equipment acquisition. The coordinator of the carabao R and D project is currently based at PCARRD. The project, considered as one of the most successful projects of UNDP/FAO in terms of research output, is being considered for second phase extension. The project has generated mature technologies in reproductive physiology and animal nutrition.

United States Agency for International Development (USAID)

The USAID played a pivotal role in strengthening the research capability of selected institutions of the national research system by extending two soft loan packages to the Philippines. These loans, known as ARDP I and II, amounted to a total of \$15 million covering the period 1975 to 1985. The USAID support for infrastructure and manpower development, equipment procurement, technical assistance and research operations has helped tremendously in improving the research capability of major research centers in the country.

PCARRD has worked closely with USAID in the technical assistance program. Through this program, PCARRD engages the services of international and local consultants to assist PCARRD and members of the national research system in developing research programs and strengthening key research areas. Consultants have been hired in hilly land development, marketing studies of major agricultural commodities such as winged bean, fruits and vegetables, and foliage plants; soil classification; and cotton pest, forestry and seaweed research.

PCARRD also receives from USAID substantial assistance for the research component of the Rainfed Resources Development Project (RRDP), a project aimed at improving the livelihood of rainfed farmers in selected regions of the country. PCARRD coordinates the research component which is jointly implemented by the MAF, MNR, and selected colleges and universities.

Through USAID assistance, research agencies and academic institutions in the country are now linked with American universities and programs in undertaking specific research projects. Some of these are:

- *University of Hawaii (UH)*. In 1976, PCARRD entered into a working agreement with UH to undertake a project on Crop Production and Land Capabilities of a Network of Tropical Soil Families (Benchmark Soils Project). The project aimed to determine the extent to which agricultural technology can be transferred within soil families and to correlate agronomic crop yields with land potential and capabilities in a network of upland tropical soils. This project included degree trainings at UH.

In September 1981, Nitrogen Fixation by Tropical Agricultural Legumes (NiFTAL Project) was initiated with UH. The project aimed to exploit the benefits of legumes and to further develop the rhizobium-legume production technology. Filipino scientists have trained in UH under NiFTAL.

- *International Soybean Program (INTSOY)*. An agreement was signed by PCARRD and the University of Illinois at Urbana-Champaign (UIUC) in October 1976 to cooperate under the INTSOY, a program established by UIUC and the University of Puerto Rico-Mayaguez Campus. The agreement formalized a cooperative research linkage meant primarily to promote the use of soybean as food in the country.

Among the areas of cooperation identified in the memorandum were development of research and research related activities in soybean which may be of mutual interest to both institutions and the exchange of scientists, information and materials between the two institutions.

Through this accord, INTSOY and PCARRD sponsored an international workshop on soybean rust in the Philippines in 1977. An ongoing project on varietal evaluation of soybean is being supported by INTSOY.

• *Sorghum Millet Coordinated Research Support Program (INTSORMIL)*.

Recognizing the potential of sorghum in the Philippines as source of food and feed, PCARRD and INTSORMIL entered into an agreement in March 1981 to cooperate on evaluation of germplasm for tolerance to drought, resistance to insect pests and diseases, and other agronomic characters; evaluation of the potential role of sorghum in the farming systems of Philippine small farmers from the socio-economic and agronomic points of view; and evaluation of the agronomic potential and consumer acceptability of sorghum varieties with improved protein quality.

In December 1982, a supplemental workplan between INTSORMIL and PCARRD was finalized providing for the graduate degree training of Filipino students at the University of Nebraska.

In 1984, another supplemental memorandum was signed between PCARRD and INTSORMIL providing for an opportunity to expand the program.

Some of the INTSORMIL-supported projects include:

Sorghum improvement for rice-based cropping systems (IPB/UPLB)

On-farm research in sorghum (USM)

Evaluation of new sorghum lines for suitability under Philippine conditions (USM, MAF, UPLB)

Exploration of the potentials of tannin detoxification to improve the food and feed value of high tannin sorghum:

• *Peanut-Collaborative Research Support Program (P-CRSP)*. In 1983, PCARRD and the University of Georgia as the Peanut-Collaborative Research Program Management Entity, North Carolina State University, University of Georgia, and Texas A & M University signed a memorandum of understanding to conduct collaborative research on peanut in the following areas: peanut breeding, plant pathology, and agronomy; peanut insect pest management; appropriate technology for storage and utilization of peanuts; and peanut yield maximization through the use of rhizobia and mycorrhiza.

In conjunction with this project, a training on rhizobium technology was conducted in February 1985 in cooperation with P-CRSP and UPLB. The project, which has a built-in manpower development component, will help strengthen the country's capability in peanut research.

In 1983, P-CRSP extended support to a number of research projects and provided technical assistance to research centers and stations. Some of these projects are:

Peanut varietal improvement for Thailand and the Philippines (UPLB)

Peanut varietal screening for shade tolerance and enhanced biological N-fixation under partly-shaded conditions (UPLB)

Management of peanut insect pests (UPLB)

Utilization of microbial associations in peanut production (UPLB)

Consumption of peanut as food and appropriate technology for storage and utilization (UPLB)

Performance trials of promising lines and accessions of peanut in major peanut-growing areas in the Philippines (CSU, ISU, MAF, UPLB)

INTERNATIONAL AGRICULTURAL RESEARCH CENTERS

Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT), Mexico

With a global research mandate to improve wheat and corn and serve all the major grain production areas of the developing world, CIMMYT signed a memorandum of agreement with PCARRD on 29 November 1974. The accord launched a mechanism for cooperative efforts on corn and wheat between an international agricultural research center and a national research system.

Both parties agreed to cooperate in these areas of concern: exchange of scientists, scientific literature, information and methodology; use of experimental fields and facilities of the national research network for field-testing of technologies developed by CIMMYT; establishment of mutual

relations between the scientific and technical divisions of the organizations of both institutions; and granting of fellowships to Filipino researchers.

CIMMYT has been actively sending germplasm materials to the Philippines which have beefed up corn and wheat genetic resources in the country. The Center also provides technical assistance to the National Wheat Pilot Production Program. A number of research coordinators and researchers have trained at CIMMYT in the past years.

Through its Economic Program, CIMMYT has cooperated with PCARRD, MAF, and SMARC-USM in conducting training programs on on-farm research methodology and in setting up on-farm research in Mindanao.

Stronger collaboration has been going on since the establishment of a CIMMYT regional office in Bangkok, Thailand with a team of corn and wheat specialists who provide technical assistance to national programs.

Centro Internacional de la Papa (CIP), Peru

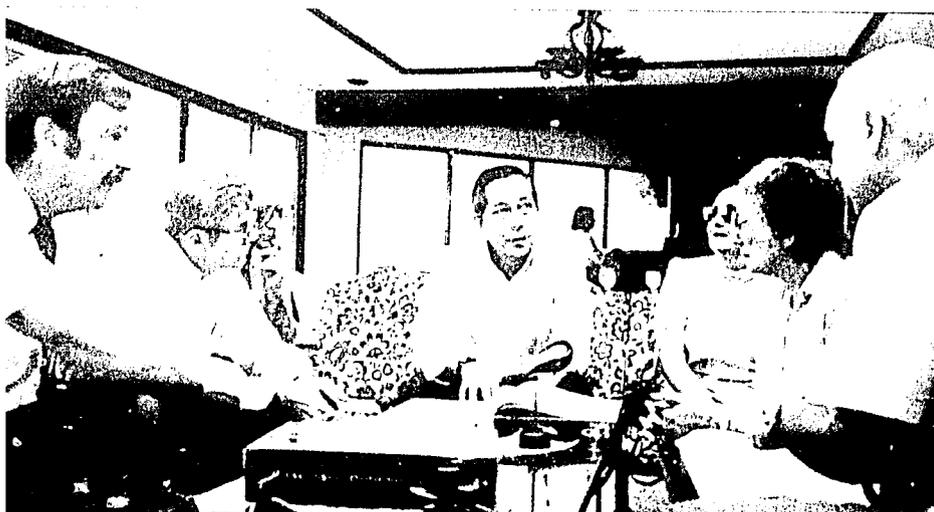
As a member of the worldwide network of centers funded by the Consultative Group on International Agricultural Research (CGIAR), CIP has a mandate to "develop, adapt, and expand research necessary for the technology to solve priority problems that limit potato production in developing countries."

With this mandate, CIP entered into an agreement with PCARRD in November 1976 to promote and accelerate progress of research and training in the scientific cultivation of the potato and the improvement of production techniques in the Philippines. This is in line with CIP's strategy to implement its outreach program through national research systems. PCARRD, in turn, linked the Peru-based CIP with the



USM-SMARC evaluation trials of maize varieties developed by CIMMYT

PCARRD Executive Director Valmayor confers with heads of various regional and international agricultural research centers at PCARRD headquarters in Los Baños, Laguna. Seated from left to right are CIP Director General Dick Sawyer, AVRDC Director General Bill Selleck, CIP Deputy Director General Pepe Valle Riestra and CIAT Director General John Nickel



various implementing agencies of the Philippine Potato Program. The linkage involves collaborative projects on:

- development of location- and situation-specific production technology packages to maximize farmer's profit;
- low-cost on-farm storage systems for seed and table potatoes in an effort to even out potato supply and avoid unstable pricing;
- the use of true potato seed to reduce cost of planting materials;
- development of methods of vegetative multiplication to make planting materials available at reasonable cost; and
- acquisition and testing of germplasm for breeding as well as development of potato for the lowland areas of the country.

In 1977, CIP's regional headquarters (Region VII) for Southeast Asia and the Pacific was established at PCARRD, Los Baños, Laguna. Based on knowledge generated at five experimental sites in the Philippines, improved germplasm and research information are extended to national programs in countries of CIP Region VII that have expressed interest in collaborative work.

Some of the important results of this collaboration are demonstrations of the feasibility of using diffused light storage for seed potatoes, a technology adopted by many farmers in the Philippine highlands; selection of numerous clones for tolerance to heat and resistance to late blight and bacterial wilt; and successful growing of potatoes in the lowlands by using heat-tolerant varieties, applying mulch and employing a strict irrigation regime, and other agronomic practices.

CIP was also instrumental in the formation of the Southeast Asian Program for Potato Research and Development (SAPPRAD), a collaborative program of five Southeast

Asian countries and CIP. Each country takes lead responsibility for a specific research and training area. The Philippines, as a member country, spearheads the project on potato breeding for the lowlands. The program which is based in the Philippines is jointly funded by the member countries of SAPPRAD and Australia.

Centro Internacional de Agricultura Tropical (CIAT), Colombia

CIAT and PCARRD formalized their ties in March 1975. Both agencies agreed to cooperate in these areas: use of experimental fields and facilities of the national research network for field-testing CIAT research results on beans, cassava, pastures and beef cattle; exchange of scientists, technologies, scientific literature, information, and methodology; establishment of mutual relations between the scientific and technical divisions of the organizations of both parties; and grant of fellowships to Filipino scientists and researchers.

CIAT, PCARRD, ViSCA and other research institutions also cooperated in the development of high-yielding cassava varieties. CIAT has, in many instances, hosted many Filipino scientists who trained in Colombia.

The extent of collaboration is expected to be strengthened with the recent establishment of a CIAT regional office in Bangkok, Thailand, under a coordinator who has shown a deep understanding of research and training needs.

International Rice Research Institute (IRRI), Philippines

IRRI was the first international research center with which PCARRD established working linkages. This is quite understandable since IRRI and PCARRD are virtually neighbors at Los Baños, Laguna.

IRRI was fourteen and PCARRD was two years old when the memorandum of agreement was formalized on 15 August 1974. By that time, IRRI had developed technologies in the form of improved varieties and cultural management practices. PCARRD had just organized a network of national research centers and stations. One of the provisions of the IRRI-PCARRD agreement is that IRRI will field test its research results through this network.

Through this linkage, the IRRI-PCAR Cooperative Applied Research Project on rainfed rice was launched in 1974. The project's main objective was to pursue further the development of the technology for growing two crops of rice in rainfed lowland rice areas. This cooperative project was responsible for the testing of the two-crop system in many locations all over the country.

In 1982, IRRI and PCARRD renewed the cooperative applied research project and expanded the area of coverage. The project, now called "Interagency Rice-based Cropping Systems Pre-production Evaluation Program," institutionalized the participation of the Bureau of Soils, URARTIP, BPI-RCPC and FTS in funding the various projects.

IRRI and PCARRD have a long list of collaborative undertakings in the form of joint workshops and consultative meetings, training of researchers, and sharing of resources. On several occasions, PCARRD and the national rice program relied on the expertise of the Institute to help solve location-specific problems, like the control of the rice black bug in Palawan and the evaluation of varieties tolerant to cold and acid and saline soils, and resistant to insect pests and diseases. The training programs provided by IRRI have considerably strengthened the national manpower capability in rice research.

International Institute for Tropical Agriculture (IITA), Nigeria

Committed to the improvement of the quality and quantity of basic food crops in the humid and sub-humid tropics, IITA forged formal ties with PCARRD in May 1976. Although IITA's major focus is on Africa, the importance of the crop under its mandate (such as root and tuber crops and grain legumes) in this part of the world moved IITA to establish linkage with the Philippines. An IITA liaison office was established at IRRI, Los Baños, Laguna in 1983.

The memorandum of agreement provides that IITA will send in consultants from among its staff to advise and assist in selected research efforts of PCARRD; share farming systems technology and genetic materials, scientific literature and publications; and grant opportunities for in-service training, post-graduate research and post-doctoral programs. On the other hand, PCARRD will extend the use of research facilities within the national research network of stations; and provide scientific and necessary support staff, logistics for cooperative projects, and genetic materials which may be useful to IITA programs.

In 1985, a project on cowpea was implemented. Several scientists from IITA met and discussed with Filipino researchers the technology available at IITA. A number of Filipino researchers later trained at IITA.

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India

The ICRISAT mandate is "to improve the yield, stability, and food quality of five crops basic to life in the semi-arid tropics and to develop farming systems that will make maximum use of the human and animal resources and the limited rainfall of the region."

The ICRISAT entered into an agreement with PCARRD in May 1975. This agreement provides the Philippines with an opportunity to make full use of the former's technological advances in sorghum, pulse crops, peanut and farming systems research. The set-up calls for the establishment of mutual relations between the scientific and technical divisions of the organizations of the respective parties through the exchange of scientists, technologies, genetic materials, scientific literature, information and methodology.

So far, a number of Filipino researchers and research administrators have visited and trained at ICRISAT. The Philippines has also been a recipient of some of ICRISAT's germplasm materials and improved lines of chickpea, pigeonpea, peanut and sorghum for testing in national programs.

REGIONAL RESEARCH CENTERS

Asian Vegetable Research and Development Center (AVRDC), Taiwan

Aware of the importance of vegetables as sources of protein, vitamins, minerals and calories for the Filipino, AVRDC and PCARRD agreed to pursue common goals in May 1975. In June 1975, the Philippine Outreach Program was established by AVRDC and the Philippine Government with funding from the Asian Development Bank.

AVRDC provides selected accessions and breeding materials of vegetables (tomato and Chinese cabbage), legumes (soybean and mungbean), and sweet potato which are tested in the Philippines under the leadership of the BPI-Economic Garden Station of MAF.

As a result of the program, a number of crop varieties have been tested in different regions of the Philippines and approved by the Philippine Seedboard

for commercial production. These are BPI Mg 2 for mungbean; BPI Sy 4 for soybean; BPI Sp 1 and BPI Sp 2 for sweet potato; and "Reyna Elena" for Chinese cabbage. Several AVRDC tomato lines are now widely used by farmers.

The training of at least 49 Filipino scientists has been a major contribution of the AVRDC to the national research system.

In May 1985, AVRDC and PCARRD penned another agreement to pilot test AVRDC technologies for soybean, processing tomato, and Chinese cabbage in selected areas of the Philippines.

Food and Fertilizer Technology Center for the Asian and Pacific Region (FFTC-ASPAC), Taiwan

An agreement signed on 22 April 1983 between FFTC-ASPAC and PCARRD called for the exchange of technical information and technical assistance between the two entities. Prior to formalization of the FFTC-ASPAC and PCARRD linkage, FFTC had co-sponsored PCARRD workshops and conferences on hilly land development; technology generation, verification and dissemination; use of artificial insemination in livestock production; goat production; rainfed agriculture; applied agricultural R and D for small farmers; and food processing.

Southeast Asian Fisheries Development Center (SEAFDEC), Philippines

SEAFDEC and PCARRD signed on 7 January 1975 a memorandum of agreement which provides for cooperation in aquaculture research through the exchange of scientists, technologies, scientific literature, information and methodology; the provision of fellowship grants; and the use of facilities and experimental sites of

the national research system for field-testing SEAFDEC technologies.

The agreement links the national fisheries research network with the regional center and with the rest of Southeast Asian nations. This strengthens the aquaculture research programs of both entities for the benefit of the Philippines and Southeast Asia.

As early as February 1975, SEAFDEC provided funds for the implementation of an interagency socio-economic survey of the Philippine aquaculture industry. A number of agencies belonging to the national research system, such as UPLB and BFAR have worked jointly with SEAFDEC in the conduct of aquaculture research.

Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA), Philippines

SEARCA, as coordinator of research and training activities in agriculture in Southeast Asia, formalized its tie-up with PCARRD on 4 March 1976. Since then, PCARRD and SEARCA have undertaken cooperative and complementary studies on research administration and regional planning. Both institutions have joined hands in research management training and evaluation.

The SEARCA-PCARRD linkage was further strengthened with the signing of an amended memorandum of agreement on 30 January 1985. Among the provisions of the latest agreement are:

- that SEARCA, in its researches in the Philippines must support the priority research thrusts formulated by PCARRD;
- that SEARCA's researches should be undertaken within the national research network and must be in consonance with the commodity assignments and mandates of the agency where the

activity is to be undertaken; and

- that PCARRD be a part of the manpower development program of SEARCA.

NATIONAL RESEARCH SYSTEMS AND SPECIALIZED COMMODITY INSTITUTES

PCARRD has established formal linkages with the Malaysian Agricultural Research and Development Institute (MARDI) on crops and livestock research; with the Bangladesh Agricultural Research Council (BARC) on crops, livestock and fisheries research; and with the Indian Council for Agricultural Research (ICAR) on research and training in the fields of agriculture, livestock, fisheries and soil and water resources.

Liaison is being maintained and strengthened with the national research systems of Indonesia, Thailand, Pakistan and other Asian countries.

An agreement between PCARRD and the Rubber Research Institute of Malaysia (RRIM) in 1979 enabled the Philippines to acquire RRIM rubber clones for field trials in the Philippines.

NATIONAL AGENCIES

National Council for Integrated Area Development (NACIAD)

PCARRD and NACIAD signed a memorandum of agreement in December 1979 which called for PCARRD's research backstopping of the integrated area development projects (IADPs) of the country. The agreement was based on IADP's philosophy of interdependencies of systems which recognizes the indispensability of research as a developmental input.

As a strategy, PCARRD has selected a number of areas to comprise its sphere of activity and resource concentration.

Some of these IADPs are the Japan assisted Cagayan Integrated Area Development Project, the Australian assisted Northern Samar Integrated Area Development Project, the ADB-supported Palawan Integrated Area Development Project, and the Philippine-Australian Development Assistance Program (PADAP, also known as the Zamboanga del Sur Development Project). These areas were selected on the basis of potential for success and strategic geographical location.

The collaborative efforts between NAICAD and PCARRD strengthened PCARRD's involvement in research proposal development and programming for socio-economically depressed geographical areas. PCARRD's linkage with NAICAD also led to the development of a mechanism by which PCARRD can directly involve itself in specific countryside development activities such as the Technology Packaging for Countryside Development Project (TECHNOPACK). Through this project, technologies from the national research network relevant to the needs of the area are packaged in the form of *Technoguides* for extensionists' and farmers' use.

National Economic and Development Authority (NEDA)

PCARRD, in more ways than one, has maintained close association with NEDA and its programs. For instance, NEDA is represented in the technical advisory body of PCARRD. Both agencies have worked together in developing regional research programs. In addition, NEDA's development plans have always been the principal basis for the formulation of national R and D programs.

This association was reinforced with the signing of a memorandum of agreement on 26 April 1984 that included the following provisions:



- NEDA and PCARRD shall collaborate in research and development planning for agriculture and natural resources by generating data needed for planning at national and regional levels.

- NEDA and PCARRD shall study policy issues affecting the development of agricultural and natural resources industries at national and regional levels. Both agencies shall then recommend steps to resolve these issues.

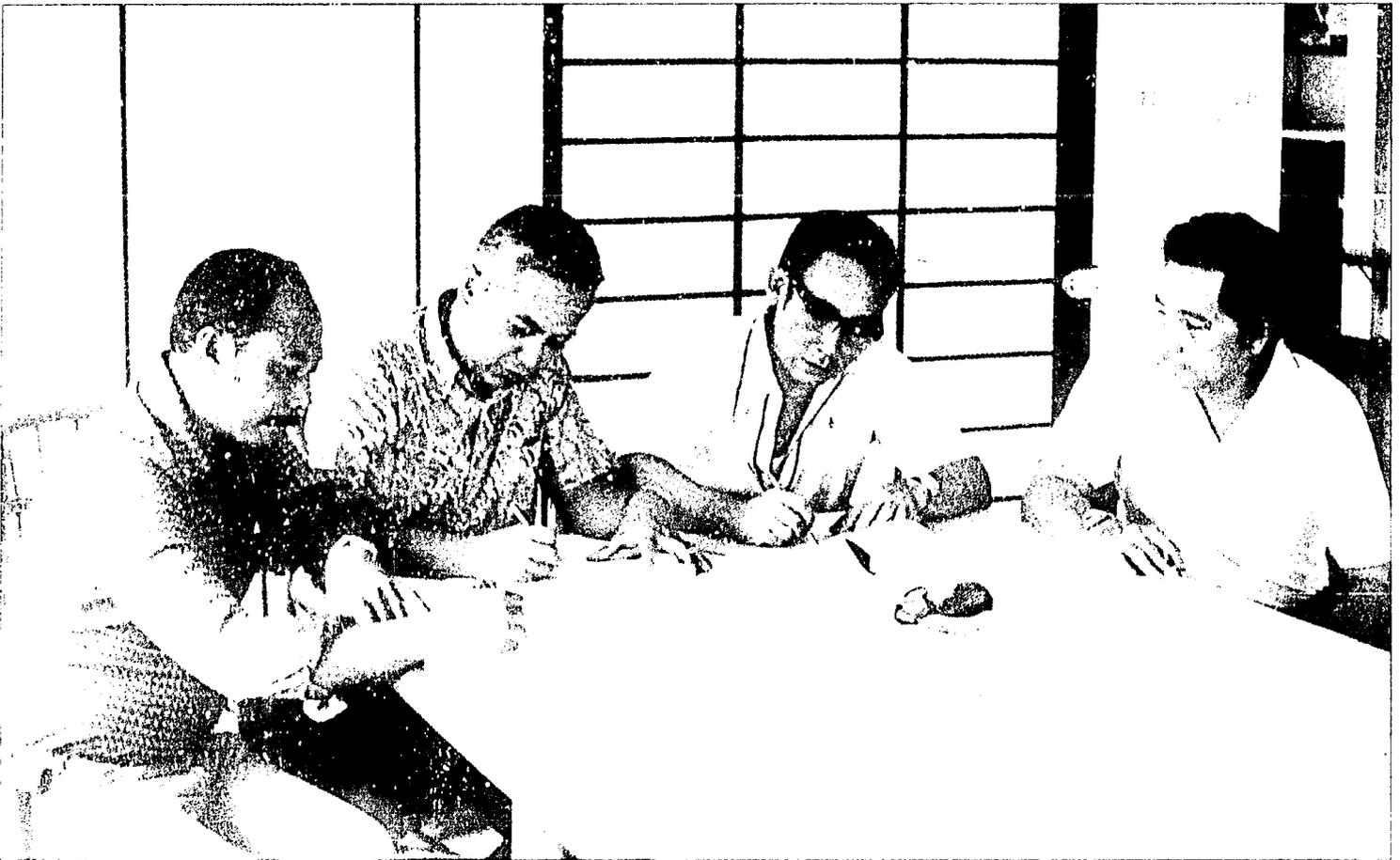
- PCARRD will generate technologies through research and development programs. NEDA will accelerate adoption of these technologies in whatever way it deems proper.

- NEDA will consult PCARRD on all R and D proposals in agriculture and natural resources presented to NEDA for external funding.

The development plans of NEDA have always been the principal basis for national R and D programs. The NEDA-PCARRD memorandum of agreement signed in April 1984 calls for close consultation between NEDA and PCARRD on all R and D proposals presented to the former for funding. Signing the agreement are (left to right) NSTA Director General Javier and NEDA Deputy Minister Vicente Valdepeñas, while Valmayor (center) and other NEDA officials look on.

PRIVATE SECTOR

PCARRD has purposely involved and collaborated with the private sector in research planning and project implementation. The private sector is represented in the policymaking and technical advisory bodies of PCARRD in



PCARRD and the Twin Rivers Research Center at Tagum, Davao del Norte sign a memorandum of agreement to conduct joint research on export crops and import substitutes. The signatories (from left to right) are Hijo Plantation superintendent David Gorres, PCARRD Director General Madamba, TRRC Vice-president Jesus V. Ayala, and Valmayor, then Deputy Director General for Programs and Operations.

recognition of its critical role in the adoption of technologies. PCARRD also encourages the participation of the private sector in commodity planning and programming activities by ensuring that representatives of the private sector sit in as members of the national commodity research teams.

As early as 1974, efforts were made to identify private institutions with research facilities that could be made a part of the national research network. Through these efforts, the Twin Rivers Research Center (TRRC) was made a cooperating research station for fruit and plantation crops. The TRRC is a private organization located in Tagum, Davao del Norte that renders a variety of technical research services to agricultural enterprises in Southern Philippines.

PCARRD has also recognized and solicited the collaboration of other private organizations whose research findings have helped improve the country's crop and livestock production. Examples of these agencies are the ANSA Cattle and Crop Farms in South Cotabato, Virginia Ranch in Zamboanga del Norte, Ayala Corporation, San Miguel Corporation, Victorias Milling Company, Incorporated and Planters Products, Incorporated.

PCARRD has also sought the cooperation of a number of private entities to fund research projects, scientific conferences, meetings and workshops. Foremost among these private agencies are the Philippine Coconut Research and Development Foundation (PCRDF) and Agricultural



Investors, Incorporated (AII). PCRDF finances a number of research projects on coconut implemented by UPLB, ViSCA and other members of the national research system. On the other hand, AII granted the national research system, through a memorandum of agreement signed with PCARRD in October 1983, about P5 million to fund an eight-year project on regional testing of promising coconut hybrids and cultivars. The project is being implemented by UPLB, PCA, TRRC, CSU and ViSCA. The agreement between AII and PCARRD marked the first and the biggest collaboration between the private sector and the government as far as coconut research and development is concerned.

The agreement between PCARRD and Agricultural Investors, Incorporated (AII) is the first and biggest collaboration between the government and the private sector. Present at the signing of the agreement were (seated, left to right): Dr. Edilberto Reyes (then UPLB Director of Research), PCARRD Executive Director Valmayor, AII President Enrique Cojuangco, PCA Administrator Col. Felix Dueñas, Jr., ViSCA President Bernardo, and Eduardo Cojuangco.

PART III
Managing the System



A checkerboard of vegetable plots in La Trinidad, Benguet, home of the Mountain State Agricultural College (MSAC). The MSAC is lead agency for the Highland Agricultural Research Center (HARC).

Program Planning and Budget Process: Cycles in Congruence

ital authorities related to research budget management enable PCARRD to perform its designated tasks effectively:

- the authority to coordinate, review and approve research proposals of agencies within the national research system;
- the authority to recommend to the OBM only those proposals that are attuned to priority research needs; and
- the authority to monitor the progress of fund releases for approved research projects.

The first authority is exercised through a review process which starts with the commodity teams and culminates with the approval of the Governing Council. These reviews determine which proposals will be forwarded to the OBM for funding.

The second authority of PCARRD is recommendatory in nature since it is the OBM which allocates appropriations for research.

The third authority allows PCARRD to determine whether approved research projects are pursued according to plan and have complied with accounting and auditing rules.

In exercising these authorities, PCARRD must synchronize its program planning activities with the country's budget cycle, otherwise the necessary budget recommendations cannot be included in the national budget.

THE RESEARCH BUDGET CYCLE

In the research system, the budget process starts with the development of plans for the preparation of budget estimates for a given fiscal year. During the budget preparation phase, estimates and recommendations on the funding level required for agriculture and resources research among the participating agencies are drawn up. These recommendations are then presented as key budgetary inclusions (KBIs) in the appropriations bill.

The amount recommended by PCARRD is based on budget dialogues with the agencies, held in October of each year. Each agency appropriation covers overhead costs of research and direct costs of regular agency-funded projects and ongoing projects transferred from PCARRD grants-in-aid. PCARRD then forwards its recommendations to the OBM in December of each year in time for the regional budget hearings and the technical hearing for agriculture and natural resources research.

KBIs are maintained to control major financial commitments so that funds are not misappropriated or juggled. KBIs also allow the government to track down mandatory obligations, ensure funding of priority projects, and obtain a clear picture of expenditures.

Any changes in the list of research projects and corresponding budget that result from the technical hearing are

"The scientific community must face the reality that the planning of S & T programs is a political process. This is necessarily so because ultimately the S & T plan will call for social resources. The political process has a rationality of its own which is alien to most scientists. The scientific community should learn to accept the oftentimes seemingly irrational compromises."

CELSO R. ROQUE

incorporated into the proposal by the agencies' budget officers. The revised proposals are then submitted to the OBM, together with the agencies' other budgetary requirements, in March.

At this time, PCARRD submits to the OBM its requests for funds for new and directional researches. These amounts are requested as grants-in-aid for future allotments to implementing agencies. Grants-in-aid are allocated according to priorities earlier set by the national research system. As a matter of policy, funds for the second and subsequent years of the research projects are transferred from PCARRD to the implementing agency's appropriation.

Budget Process

The budget process, as applied to the national government, consists of four major steps, namely, budget preparation, budget authorization, budget execution and budget accountability. The process takes the following route:

Budget Preparation. Budget preparation is the formulation of the estimates of expenditures in accordance with the programs and policies set forth by the Cabinet or other authoritative bodies. It involves all ministries and government agencies. The OBM prescribes standard methods and procedures for the preparation of the estimates and specifies the deadline for submission of these estimates.

These policies, program guides and technical instructions are contained in a budget circular commonly known as the *Budget Call*. Within these limits and other supplementing internal policies, PCARRD spells out its requirements and submits its recommendations to the OBM. The latter reviews all allocations in the light of estimated revenues, the soundness of the proposals made and their conformity with government policy. The OBM then recommends

action to the President who reviews the decisions.

The approved allocations, along with appropriate analyses and statements indicating the budget status of the government and the estimated impact of the budget on various aspects of national life, are then presented by the President to the legislative body as appropriation proposals.

Budget Authorization. Budget authorization refers to the review of the President's budget proposals, as contained in the Appropriations Bill, and the enactment of the bill into an Appropriations Act by the *Batasang Pambansa* (the Philippine legislative body).

Budget Execution. Budget execution covers the operational phase of budgeting. It involves the allotment and release of appropriations to PCARRD and the incurrence of expenditures. At this stage, plans for the use of appropriated funds are adopted and budgetary controls put into force to direct and limit the spending of funds according to plans.

Budget execution serves as one of the principal tools of management. Plans and programs envisioned during the preparation stage are put in effect. To secure planned performance through sound use of resources made available, PCARRD programs its expenditures and work quarterly. To prepare for the release of allotments and incurrence of expenditures, PCARRD, as early as the completion of the appropriations bill, finalizes its work and financial plan.

Shortly after the issuance of such allotments, PCARRD, through the NSTA, submits its work and financial plan to the OBM. This plan serves as the operating budget of PCARRD by which expenditures and work performance are controlled.

Once the proposal is approved and

translated into an Appropriations Act (usually in September), PCARRD conducts budget dialogues with the agencies in order to reprogram the research budget based on the approved amount.

Reprogramming the agency research program based on appropriations usually involves a realignment of activities and reduction in the number of research projects, considering national and institutional priorities. The result of the reprogramming is integrated into the work and financial plan which is submitted to OBM for the release of funds.

Funds for regular agency-funded projects and ongoing projects transferred from PCARRD grants-in-aid are released quarterly directly to the agencies concerned. Directional funds (grants-in-aid) are released to PCARRD on the basis of the approved Special Budget.

Budget Accountability. Budget accountability concerns the reporting of actual performance against plans. More specifically, it consists of the following:

- periodic reporting of performance under the approved budget;
- review of government activities and the fiscal and policy implications thereof on management at all levels; and
- the actions of the audit in assuring the fidelity of officials and employees with regard to handling of government receipts and expenditures.

While audit may emphasize the legality of actions taken during budget execution, i.e., whether funds are spent as authorized by the legislature, management review is concerned primarily with programs and performance.

Thus, the techniques of budget accountability concern reporting and interpreting the meaning or significance of data as reported. Each official entrusted with public funds is

accountable to top management not only for the use of the funds but also for the effectiveness of the programs under his jurisdiction.

Through critical review and evaluation, officials can redirect budgetary efforts to necessary programs in terms of economy, efficiency and productivity. Budget accountability affords the management, ministry heads, the Cabinet and the legislature a means for evaluating progress and determining the future direction of government activities.

PCARRD monitors the execution of ongoing projects through field visits and submission by agencies of technical and audited financial reports. Data on funds used provide evidence on the implementation of the activities for which appropriation was intended. Such data also serves as major basis for budget preparation and evaluation for the next year. To ensure that funds are utilized for the purpose for which they were appropriated, copies of the reprogrammed research budget are forwarded to the Budget and Accounting Offices of the research agency and its Commission on Audit (COA) Unit.

PCARRD Director General Drilon presents the national research budget to OBM Minister Manuel Alba and OBM division chiefs. Seated from right to left are: Marcos Caugma, Raymundo Tomas, Maximo Domingo, Jr., Minister Alba, and Nieves Amagna. Domingo is Director of the National Government Budget Operations Office.



PROGRAM PLANNING CYCLE

PCARRD's program planning operates in tandem with the national budget cycle. Within a 14-month cycle, project proposals in capsule form are initially submitted every November and approved for implementation the following year. The cycle involves two major phases: Phase A or the program formulation phase and Phase B or the program implementation phase. (PCARRD, 1981)

Phase A — Program Formulation

Phase A takes into account the environment wherein the research program will be implemented as well as linkages with other agencies. It encompasses socio-political, managerial, technical, organizational, financial and economic aspects. An important step in Phase A is the establishment of contacts with the sectors of society interested in a particular research program not only to reflect their wishes and needs, but also to obtain their cooperation and support.

Studying the Environment. The environment consists of the forces, conditions and institutions relevant to the research program. Planning starts out with benchmark data on various aspects of the environment, such as population, physical resources, and manpower capabilities; availability of improved technology, roads and transportation; marketing conditions; social conditions; past difficulties and trends; political forces; etc. An important part of the environment are government policies, laws and procedures.

To be studied also are the development programs of the MAF and MNR as well as the variables which indicate the nature of human needs that have to be answered. These in turn are classified based on needs which are customarily met by market or administrative

processes.

In studying the environment, the past and present conditions are assessed for a more desirable future.

Setting Priorities. In agriculture and resources research, as in other fields of research, there is a need for efficient utilization of human and physical resources according to set priorities. Not everything can be done in all places for all people at the same time. There is a need to investigate the best options and the best strategies that will increase agricultural and resource output at minimum cost. PCARRD, in the role of strategist, finds ways to relate one course of action to another to achieve objectives within the shortest time possible.

Defining Objectives and Plans: Research Framework. PCARRD's research framework charts the direction in which the Council wants research to be at some time in the future. In moving toward general objectives, plans and strategies of action are developed. The best alternatives are chosen.

Several levels of objectives are established in the national research program. The first level defines the overall thrusts of the national research program in agriculture and natural resources. The second level defines the commodity research areas that will contribute to the achievement of national research thrusts. The third level describes the research project's output in relation to commodity research areas and national research thrusts.

The ultimate decision on objectives is the prerogative of the Governing Council in close consultation with the TAC, commodity teams, and the Secretariat's research directors. Objectives are apt to change as more information is obtained on problems, cost, and social and political effects, but cooperation among the concerned groups must be sustained.

Identifying Research Projects for Implementation. PCARRD translates broadly defined policy statements and development plans issued at the political levels into more specific research programs, taking steps to provide the necessary budget, legal action and institutional infrastructure. Agencies identify research projects and formulate capsule research proposals within the framework of the national research program in agriculture and natural resources.

Inclusion in Research Projects in the National Research Plan and Budget. Proposals of agencies responding to the need for research in areas identified within the framework are included in the National Research Plan and Budget, together with the plans and requirements of agency research projects. The National Research Plan and Budget embodies three major components: the national research thrusts, priority research areas or commodities corresponding to research thrusts, and research projects operationalizing the research areas.

Recommendation and Presentation to the OBM. Budgetary requirements, after scrutiny by the Directors' Council, the TAC and the GC, are summarized and recommended to the OBM for approval. The Governing Council then grants authority to proceed with the preparation of detailed proposals and technical appraisal strategies.

Phase B -- Program Implementation

Phase B involves activities conducted to ensure effective and efficient implementation of research projects. In this phase, a technical review of research proposals is conducted and proposals are modified accordingly. One important aspect in post-authorization planning is the recommendation for fund release to the OBM.

Reprogramming the Research Budget. In a developing country like the Philippines, funding is one of the limiting factors in the full implementation of research programs as approved. With so many sectors needing financial support from the government, and a number of commodities vying for priority, agriculture and resources research must make optimum use of available funds.

More often, budget appropriations are much less than the minimum requirements to support the national research program. Such conditions compel PCARRD to sustain operations within its means by working with a considerable degree of flexibility.

Budget reprogramming is the alignment of research proposals taking into account available funds. It is at this stage that constant dialogues between PCARRD and the research agencies are necessary.

Recommending Fund Releases to the OBM. Recommendation for fund release is one key issue in the PCARRD program planning cycle. With the cooperation of the OBM and in close coordination with the budget staff, PCARRD makes a final recommendation for release of the agency's research budget appropriation. The work and financial plan of the agency's research budget needs PCARRD's endorsement before the fund is released by OBM to the agency concerned. Once the recommendation for fund release has been made and agencies concerned are informed of this, PCARRD's program planning has completed a cycle.



Cattle grazing on the mountain slopes of Bukidnon are a landmark of the Central Mindanao University (CMU), lead agency for the Northern and Central Mindanao Coordinated Agriculture and Resources Research Program (NOCEMCARRP). The CMU has national responsibility for forage, pastures, and grasslands and beef cattle ranch operations.

CHAPTER 11

Policies and Procedures for Research Operations

uring the early days of PCARRD, many felt that centralized planning, evaluation and monitoring of research would stifle the enthusiasm of scientists in pursuing research activities. This situation, they believed, would impede rather than enhance the growth of agricultural research in the country. The sentiment stemmed from the notion that PCARRD carried too much power in pursuing its mandate of research planning, coordination and management. Having enjoyed relative freedom over the years, the research community was understandably wary of such an authority.

PCARRD was entrusted with sufficient power to pursue its functions as a national research coordinating agency. In exercising its powers, however, PCARRD's guiding principle has always been to strike a keen balance between effective coordination and excessive control.

Over the past 13 years, PCARRD has evolved policies governing research operations of the national research system through constant consultation with researchers and research administrators.

In formulating these policies, PCARRD's main concern is to safeguard public investment in research. PCARRD, therefore, ensures that research funds are spent for priority projects; that projects are implemented according to plans and set objectives:

and that research results are translated and disseminated to the intended clientele. Any policy related to proposal evaluation, project implementation and monitoring must necessarily be viewed in this context.

RESEARCH PROPOSAL PREPARATION

Early Forms and Guidelines

Even before proposals get into the "mill" for processing and evaluation, an important requisite of the PCARRD Secretariat is that proposals be well-planned and well-prepared.

The Technical Panel of 1971 noted in its report that most agencies lacked guidelines and a standard format for the preparation of research proposals. In fact, some agencies did not evaluate proposals at all; if ever evaluation was done, it was done inefficiently and inadequately.

Hence, one of the first things that the PCARRD Secretariat did was to design a *Pro Forma* for research project proposals (PCAR Form No. R-3). This form was approved by the PCARRD Governing Council on its 7th meeting on 17 May 1973. PCAR Form No. R-3 was to serve as basis for succeeding forms for research proposal preparation. Related to this, PCARRD published in October 1973 a handbook entitled *Guidelines for Preparation and Submission of Research Proposals*.

"Indeed, power is needed to continue the welding of the national research system into a cohesive machinery for technology generation in agriculture and natural resources, but it must be utilized with a unique sense of statesmanship that tempers central coordination with substantive productivity."

JOSE D. DRILON, JR.

A Well-designed Proposal: What It Can Do

PCARRD recognizes, based on thirteen years of experience, that carefully planned proposals facilitate research program formulation, technical review, monitoring and evaluation.

Having a well-planned proposal is advantageous to both researcher and management. For the researcher, a proposal serves as a medium through which one can define clearly the objectives of the study, establish the time frame and strategy of action, and specify the resources required to attain the objectives of the proposed investigation. More importantly, a proposal is a means of highlighting the merits of the research study to warrant support from public funds.

A well-planned proposal therefore minimizes red tape, particularly the time-consuming process of revision and re-evaluation which is necessary for a basically good but ill-prepared proposal.

For management, a proposal is a vital document in planning, monitoring and evaluation. Specifically, the proposal contributes immensely to ensuring that objectives of specific studies are in consonance with broad national development goals. The proposal facilitates evaluation and appraisal and provides information on manpower and budgetary requirements which is necessary for allocation of limited research funds.

Gittinger once justified the need for a well-prepared proposal: "...careful project preparation in advance of expenditures is, if not absolutely essential, at least the best available means to ensure efficient, economic use of resources/funds and to increase the chances of on-schedule implementation. Unless projects are carefully prepared in substantial detail, inefficient or even wasteful expenditure

of money is almost sure to result — a tragic loss in capital-short nations."

Forms

Because of developments in program planning and the budget process, PCARRD designed two forms to be used by researchers in proposal preparation. The first is the capsule research proposal form (PARRS Form IA, now NSTA Form IA) that is used for preliminary evaluation of research projects during Phase A of program planning. The second is the detailed research proposal form (PARRS Form I, now NSTA Form IC) which is accomplished after the different commodity research programs have been packaged. However, the researcher may use the detailed form even during Phase A if he wishes to.

The use of the capsule research proposal form was approved by the PCARRD Governing Council in its 97th meeting on 28 July 1981 to minimize waste of efforts and avoid disappointment on the part of the researcher who has to wait for the budget cycle to be completed before he knows for sure if his project will be funded or not. With this measure, the proponent need not waste time and energy in preparing detailed proposals until he is assured that his proposal has been incorporated into the research program for possible funding. The proponent is requested to prepare a detailed proposal only when the capsulized research proposal is included in the national commodity research program and endorsed to the OBM for funding. The use of the capsule research proposal, however, demands that the researcher express himself clearly, concisely, without ambiguity, in a minimum of space.

PROPOSAL EVALUATION

Levels of Evaluation

The PCARRD mechanism for proposal assessment operates on two levels. The first level or initial evaluation is done during Phase A. All submitted proposals, whether in capsule or detailed form, are screened by the various national commodity research teams based on the following criteria:

- likely contribution and relevance to national research thrusts,
- priority ranking based on priority research areas identified in the commodity research program, and
- possible duplication of either an ongoing or a completed project.

The second level evaluation is done by a technical review panel composed of experts in their own fields of specialization. Appointed by the Executive Director, the membership of the review panel varies according to the scope of the project.

The second level evaluation focuses on the technical soundness of the research proposal. The technical review panel examines the proposal on the basis of the following criteria:

- non-duplication based on personal knowledge, *State of the Art* reports on specific commodities, and lists of completed and ongoing research 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; and
- availability of researchers and capability of the proponent based on his *curriculum vitae*.

Technical review is done either by the referral system or by *en banc* evaluation.

In the referral system, a research proposal is referred to members of the review panel who are given two weeks to review the proposal. Comments of the review panel are submitted to the PCARRD Secretariat and integrated by the Program Specialist or commodity team leader. These comments are then forwarded to the proponent who has two options: he can either revise his proposal based on the review panel's comments or defend the points in his proposal that are under question.

The referral system is particularly useful because it enables the proponent and members of the review panel to discuss the proposal without the expense of travel and difficulty of working out a schedule so that they can come together and meet. This arrangement, however, is time-consuming. It may take some time before the proponent and the reviewer agree on a certain point.

On the other hand, in an *en banc* evaluation, the proponent and members of the review panel meet at a time and place set by PCARRD Program Specialists. Members of the review panel are given copies of the proposal well in advance to enable them to study and review the proposal.

PCARRD experience shows that this evaluation system facilitates processing of many research proposals at one time. In some cases though, the quality of assessment suffers especially if the members of the technical review panel come to the meeting unprepared. As a remedy, only conscientious evaluators are chosen to do this function.

Changes and Improvements

For more efficient evaluation, PCARRD has made changes in several aspects of proposal evaluation. In 1977, the old system of submitting research project proposals anytime during the year was

discarded. Agencies were required to submit all research proposals during a specific period.

This new procedure has considerably reduced the time needed to process proposals. Synchronizing the submission of proposals encourages research agencies to submit integrated research programs and projects rather than isolated studies. More importantly, this procedure synchronizes program planning with the budget cycle of the OBM, thus, enabling the OBM to make more realistic research appropriations.

To ensure adherence to the new system, the PCARRD Secretariat in cooperation with the Economic Development Foundation (EDF) produced a manual explaining the new system's procedures, forms and working guidelines. This manual was used as basis for orienting key personnel involved in planning, budgeting and monitoring research in agriculture and natural resources. A series of seminars for research administrators, coordinators and project leaders was held in research centers and stations throughout the country.

Another significant development in the mechanics of proposal evaluation came during the first year of Valmayor's term as PCARRD Director General. National research centers were given the authority to conduct their own technical review of research proposals in areas where they had achieved strong research capability. This first major policy change in the research review mechanism was explained by Valmayor thus: "As PCARRD begins to disperse function and authority at the national level through the national research centers, building up responsibility and achieving a certain degree of decentralization, it must gradually shed off some of its original role as policeman and move

towards the more mature role of partner."

With the new procedure, PCARRD now concentrates on evaluating proposals on a higher plane — that of evaluating for relevance and priority and ensuring that there is no duplication of efforts.

Reviewing Emergency Research

There are always times in a country's history when emergency research has to be conducted in response to national crises. In these critical periods, a research system should respond with dispatch.

The need for emergency research is identified and certified by the President or Prime Minister of the Republic, the Minister of Agriculture and Food, the Minister of Natural Resources, or the Minister of Science and Technology, providing the basis for the scope of research that must be done and the rationale behind its immediate implementation.

Urgent research projects are justified in cases wherein the research proposed is to be implemented in the current year. These proposals are reviewed to determine their viability without passing through the usual evaluation procedures. Upon approval, funds earmarked by PCARRD for this purpose are released to the implementing agencies.

MONITORING MECHANISM

PCARRD's First Attempts at Monitoring

Using the national research program formulated during the First National Research System Congress as a guide, the PCARRD technical divisions embarked on a national evaluation of ongoing projects. By February 1974, PCARRD had evaluated 1,100 ongoing research projects of different government agencies

with an original allocation of ₱37.9 million. These were trimmed down to 658 studies with a total budgetary requirement of ₱19.2 million. Thus, PCARRD earned for the government a savings of ₱18.7 million. These savings were used to fund high priority research projects.

What PCARRD did was to integrate studies of similar scope and objectives to do away with duplicatory projects. It terminated 171 studies that were not within the scope of research priorities or were not actually implemented. PCARRD also eliminated studies for which results were already known and established previously.

After this initial evaluation, PCARRD updated its list of ongoing projects and conducted yearly field visits to research centers and stations.

Present Monitoring

PCARRD presently employs a system 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 and in the required amounts;
- promoting coordination among participating agencies by disseminating information on the scope, schedules and problems of ongoing projects;
- providing feedback necessary in project control involving the institution of prompt corrective measures when required; and
- providing feedback necessary in project planning and evaluation of ongoing projects.

Regular Field Evaluation

Field evaluation consists of visits to project sites at specific dates. The

schedule of field visits is prepared by the research department director in consultation with the commodity team leader and center or station coordinator. The program specialist coordinates these field visits. For most crop commodities, field visits are usually made during the cropping season, but for non-seasonal commodities, field visits are conducted in conjunction with coordinated reviews.

The purposes of field visits are four-fold: to observe the actual conduct of the experiments; to verify information contained in Project Progress Reports (NSTA Form 2) and Financial Reports (NSTA Form 6); to recommend alternative courses of action to improve performance; and to consult with researchers on the possibility of undertaking other priority projects.

Field evaluation is usually conducted by the research department director, commodity team leader or designated member of the commodity team, plus representatives of the funding and/or implementing agency and the commodity program specialist.

Coordinated Review

Launched in June 1981 under the leadership of Dr. Alfonso N. Eusebio, who was then the PCARRD Deputy Executive Director for Research, the coordinated review and evaluation of ongoing projects became an integral part of PCARRD's regular monitoring system. It is now an annual activity conducted through a series of visits to all the research centers/consortia.

The coordinated review is undertaken jointly with national single-commodity research institutions like the Cotton Research and Development Institute (CRDI) and Philippine Tobacco Research and Training Center (PTRTC) during their annual in-house review and planning workshop.



Field evaluation of ongoing projects is an annual activity of the national research system. Results of the field evaluation serve as basis for recommendations on the continuation, termination, or suspension of research projects.

During the review, research leaders present the results of their studies before their peers in the region and a panel of evaluators composed of commodity team leaders or designated commodity team members, research directors or senior staff from the PCARRD Secretariat and other invited members of the research community. The review serves as a forum for the exchange of scientific information not only among researchers, but also among research administrators, coordinators, extensionists and representatives from the private sector.

The coordinated review not only facilitates information exchange; it also facilitates retrieval of research

information in the form of progress and terminal reports. These reports provide the basis for the preparation of *Research Highlights from the PCARRD Network*, a series which PCARRD publishes in book form. The book highlights technologies judged as ready for verification and dissemination. *Research Highlights* also features significant research findings and useful information, including those with socio-economic implications.

The PCARRD technical departments prepare a list of technologies for verification and send these to agencies that have technology verification programs. Copies of the review's outcome are sent to agency heads,

research coordinators and budget officers to serve as reference for future agency programs. In cases where the evaluators recommend termination of a project, a dialogue is held between the PCARRD technical research director and the project leader.

Results of the coordinated review and field evaluation are used by commodity research teams as basis for recommending ongoing projects for continuance and inclusion in the national commodity research programs for succeeding years.

HIGHER LEVELS OF EVALUATION

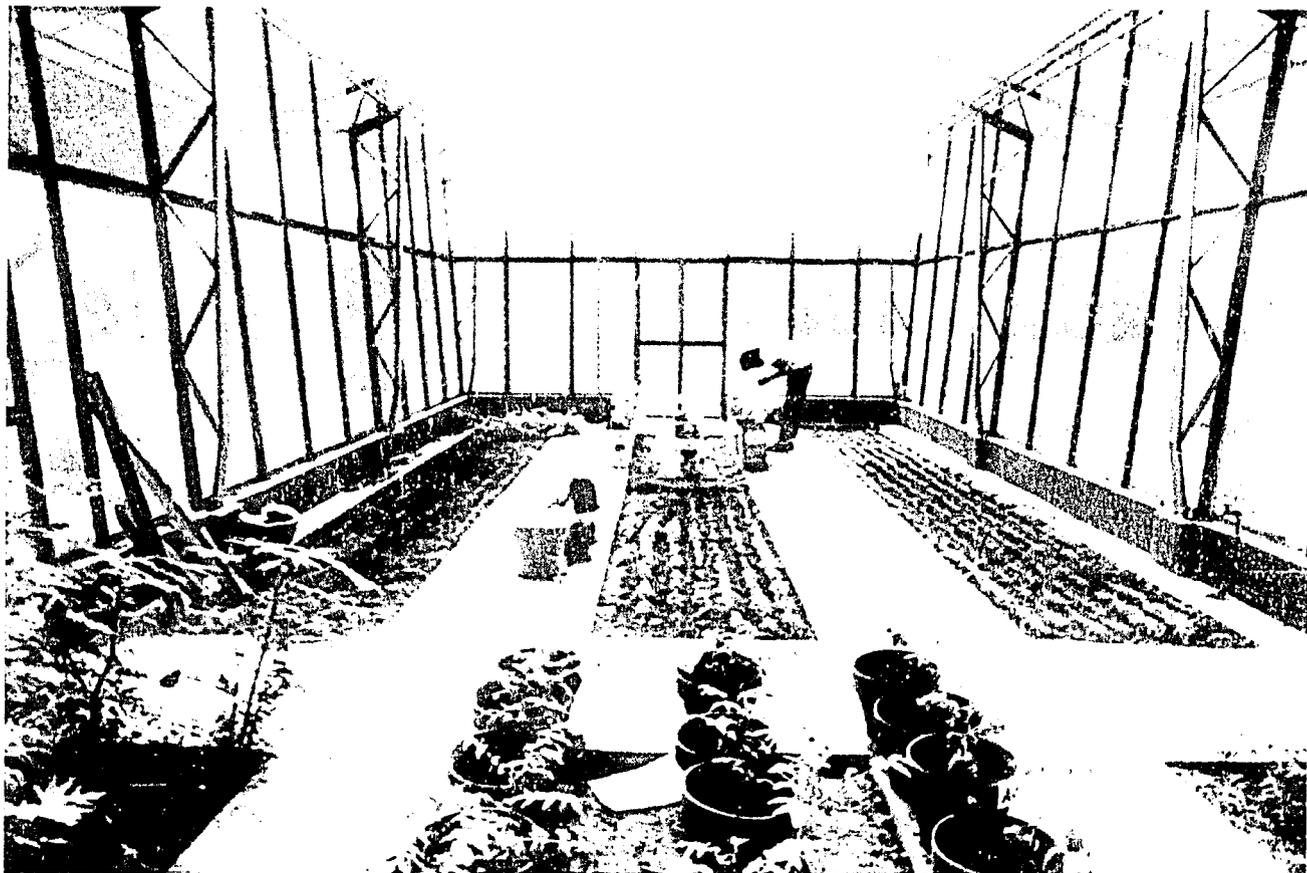
Project Evaluation by the Commodity Research Teams

Project evaluation sessions are conducted per commodity by the national research commodity teams as organized and scheduled by the PCARRD research department directors. The Project Progress Report (NSTA Form 2), Field Evaluation Report (NSTA Form 4) and Project Financial Report (NSTA Form 6) submitted to the PCARRD Secretariat beforehand serve as bases for evaluation.

Project evaluation is conducted after the coordinated review to analyze and evaluate the performance of specific projects. Based on the results of the evaluation, ongoing projects may be recommended for suspension, continuation, discontinuance or termination.

Rules and System

Having been active researchers themselves, the leaders of PCARRD are well aware of the researcher's aversion to filling up forms and preparing proposals, periodic reports and other tedious paperwork that eat up a good deal of his time and keep him away from his research work. But to a management and coordinating body like PCARRD that must account for investments in research to the public, these are vital activities. Both researchers and PCARRD must therefore heed each other's needs and objectives. Thus, PCARRD constantly seeks to temper control with dynamic flexibility to encourage researchers to do effective research. Similarly, researchers now realize that the process of evaluation and monitoring is not meant to hamper their research efforts, but to help them identify constraints and ultimately facilitate their work.



The greenhouse at Isabela State University (ISU) is among the contributions of ARDP II to research capability development. ISU is the lead agency for the Cagayan Valley Integrated Agricultural Research System (CVIARS).

Improving the Research Environment

Capable researchers are the single most important component of the research system. This was recognized early in the operation of PCARRD. Thus, attracting good researchers and retaining them within the system became one of the prime considerations in PCARRD's overall plan.

The Technical Panel which assessed research resources and formulated an overall research program for the Philippines in 1971, identified several problems with a direct bearing on the productivity of researchers. Among these problems were insufficient funding and facilities and inadequate training of researchers.

The study undertaken by UPLB and SEARCA for PCARRD in 1973 to 1974 discussed in greater detail the factors that influenced productivity of researchers. The study revealed, for instance, that productivity increased slightly with training up to the MS level, and increased dramatically with training beyond the MS level.

Recognition by peers, users of research results and the general public also motivated researchers. Forms of recognition listed as important were promotion, citation and assignment to more responsible positions.

Other factors found to influence research output were:

- release of funds based on merit and quality of research;
- extent to which superiors willingly shared with their staff information affecting the operations and development of the station; and
- number and accessibility of relevant literature.

It is interesting to note that there appears to be no correlation between adequacy of research facilities and research productivity. However, the UPLB-SEARCA team believed this was merely a reflection of the inadequacy of research facilities in almost all stations rather than a true relationship.

The findings of the Technical Panel and the UPLB-SEARCA research team influenced decisions on the creation of an environment conducive to research operations. Thus, manpower, facilities, and infrastructure development became important components of the overall plan for the national research system.

PCARRD opted for a system of establishing research priorities that involved researchers, development workers and private sector representatives. PCARRD also explored ways of providing other incentives to researchers and streamlining research administration procedures.

"I am in a position to acknowledge publicly that, in contrast to the pre-PCARR years, it is now relatively easier to obtain funds for agriculture and resources research. PCARR has really done wonders by influencing national policy to provide vigorous support for agricultural technology development."

FERNANDO A. BERNARDO

INCENTIVES

Among the incentives explored by PCARRD to motivate researchers were:

- higher remuneration,
- recognition,
- provision of fringe benefits, and
- greater availability of research funds.

Remuneration

The study undertaken by UPLB and SEARCA pinpointed the consistently low salary of government researchers compared to their colleagues in the private sector. To correct this situation, two options were open to PCARRD management:

- work for a higher salary scale for researchers; and
- provide some form of additional remuneration to those undertaking research.

The first option seemed the more logical one. However, the second option was initially explored for various reasons:

- It would take longer to get approval for an overall raise in salary because this required a much higher appropriation from the national government. In addition, a raise in the salary of researchers would pose problems for agencies with functions other than research.

- Additional remuneration would motivate researchers more effectively, in the sense that said remuneration would be given only to those actively engaged in research.

Thus began the practice of paying honoraria to those undertaking research and those involved in research planning and program or project development.

In later years, PCARRD, together with the NSTA, was to explore the possibility of establishing the Scientific Career System.

Honorarium System. The honorarium system was approved by the Governing Council in December 1973. A modified system was approved in September 1980.

The modified system identifies the various groups who can receive honoraria:

- Research leaders, with honoraria rates based on responsibility assumed and the work load the research leader is willing to undertake. Thus, a research leader willing to conduct research without an assistant qualifies for a higher honorarium rate than one with an assistant. A program¹ leader is entitled to a higher rate than a project² leader. A project leader receives a higher rate than a study³ leader.

- Committees or study groups commissioned to render a specific service to the research system

- Persons commissioned to assist in the planning and review of research activities

- Persons given special assignments such as, those requested to prepare technical papers, etc.

Scientific Career System. One of the main reasons for the movement of well-trained researchers out of active research is the relative attractiveness of administrative posts. At the time, the highest paid technical people were those in management positions.

To solve this problem, a system wherein active researchers would receive salaries as high as, or even higher than, research administrators was conceived.

PCARRD initially explored the idea of setting up an Agricultural Research

¹A program is a comprehensive interdisciplinary research involving all relevant problems and interactions about a specific commodity.

²A project is an investigation embracing all relevant problems and interactions about a specific discipline.

³A study is an investigation designed to solve a specific problem.

Service similar to that of India. Since PCARRD was part of NSTA, however, the idea of expanding the service into a Scientific Career System was born. Thus, PCARRD shares with NSTA and its other agencies credit for the development of the System. A series of meetings culminated in the filing of a bill with the *Batasang Pambansa* in 1979 by Science Minister Melecio S. Magno, advocating a Scientific Career System.

Promulgation of Presidential Decree No. 997 conferring civil service eligibilities to scientific and technological specialists was a major step towards making the Scientific Career System a reality. Executive Order No. 901 dated 19 July 1983 provided guidelines for the implementation of the System.

The System is characterized by:

- career progression based on qualifications, merit and scientific productivity;
- development of scientist's expertise without the scientist leaving his status as such; and
- incentives and rewards to attract and retain highly qualified manpower in the science and technology sector.

Recognition

In 1974, PCARRD initiated the first of two awards which recognized excellence and relevance in the research system. This move was in consonance with the researchers' view that citations are an acceptable form of recognition.

Tanglaw Award. The Tanglaw Award was first given in 1974 and has since been an important feature of PCARRD's anniversary celebrations. The awards focus public attention and confer national recognition on agencies and institutions whose dedication has resulted in outstanding achievements in agriculture and natural resources

research. Awardees are recognized for their significant contributions to the welfare and well-being of their countrymen, their communities, and the country at large. They are held as inspirational examples for other members of the national research community, as signified by the meaning of *Tanglaw*, which is *guiding light*.

Pantas Award. The first Pantas Award was given in 1976. This award is conferred on individuals who have contributed to the advancement of agriculture and natural resources research in the country. It signifies that the management of any scientific undertaking requires wisdom and foresight, as can be gleaned from the Pilipino word *Pantas* which means *sage* or *wise man*.

Publications. Publication of one's research efforts is a recognition in itself. Over and above this, however, publications pave the way for other forms of recognition for researchers.

Aware of this, PCARRD in 1975 encouraged researchers working in similar disciplines to agree on a common journal which they could use as a medium for publishing research information and which PCARRD could support. Among the publications supported by PCARRD were the *Journal of Agricultural Economics and Development*, the *Philippine Journal of Veterinary and Animal Science* and the *Philippine Journal of Crop Science*.

Fringe Benefits

Fringe benefits form an important part of the package which most private corporations use to attract potential employees. PCARRD reasoned that if the research system could provide some of these benefits, it could substantially reduce the difference between benefits received in the private and government sectors.

The benefits which PCARRD has been able to obtain for the system, even on a limited scale, are:

- scholarships to pursue degree and non-degree programs;
- staff housing, as part of its capability development program in the research centers;
- sabbatical leave privileges, to which a scientist is entitled based on the rules specifically promulgated by his institution;
- hardship or hazard allowance, which can be granted by the agencies to research, technical and support personnel engaged in research that cause hardship or pose hazards to one's health and life;
- provisions for travel expenses, which allows researchers to charge actual expenses, subject to certain limitations; and
- travel insurance for researchers and technical personnel, which provides protection for technical staff travelling on research-related activities.

Research Funds

The study on research administration undertaken by the UPLB-SEARCA team showed that provision of funding for research based on merit motivates researchers. Moreover, the Technical Panel's report cited inadequate funding as one of the problems faced by the research community.

Aware of these, PCARRD made representations with the OBM to raise appropriations for research operations. It also worked for the inclusion of a sizeable grants-in-aid fund in the yearly allocation from the OBM.

Considering the limited resources of the national government, PCARRD looked to foreign sources as a way of augmenting research funds. Thus, it entered into agreements with a number of funding agencies, technical assistance

organizations and international agricultural research centers. To facilitate such arrangements, including the donation of funds for strengthening the national research system, the exchange of research workers and consultants, and the residence in the Philippines of foreign scientists cooperating in its research programs, Presidential Decree No. 1249 was signed on 25 November 1977.

This decree, signed during PCARRD's fifth anniversary celebration, granted PCARRD the authority to plan and implement a program to generate foreign funding. The decree also empowered PCARRD to see through the maintenance and upkeep of research infrastructure and equipment with which it has armed its network of research centers and stations. Equipment or supplies procured for the conduct of research are to be exempted from payment of customs duty or other taxes.

In August 1978, PCARRD created the International Projects Division (IPD) to establish a reliable mechanism for generating and sustaining external international fund sources. The IPD, with Batugal as its first director, was also directed to catalyze the development of projects of local importance and regional/global significance, in coordination with the technical research divisions.

Today, the IPD is an integral component of the Planning and Development Department.

RESEARCH ADMINISTRATION PROCEDURES

In early 1975, President Marcos called on all government agencies concerned to undertake a comprehensive review and drastic revision of existing state policies that might have caused the slow growth of science. He pointed out that one complaint echoed over the years by

Presidential Decree No. 48 to support
this contention. In response, the

... findings by tax officers and
auditors. The new manual superceded,
supplemented or otherwise restated



THE REVISED AUDITING MANUAL FOR RESEARCH OPERATIONS

FEBRUARY 16, 1981



The *Revised Auditing Manual for Research Operations* was launched in February 1981 by Audit Commissioner Francisco S. Tantuico, Jr. Drilon and resident auditor Leticia Sarino witnessed the launching of the manual at PCARRD.

Tantuico, also known as the "Father of PCARRD" received the Pantas award in 1976

provisions of existing regulations detrimental to research management efforts to contribute to national development. The manual stressed not only propriety in financial transactions, but also speed and efficiency.

The manual was turned over by Tantuico to PCARRD Governing Council Chairman Medina on 4 March 1977.

Over the years, COA slowly came to terms with the unique needs of research. Tantuico, in particular, felt the need to make auditing a compatible partner of research management in the task of national development — positive in attitude and approach, facilitative and assistive in the performance of its function. He believed that the manual should see to it that disbursement of funds conformed with regulations and at the same time expedited research operations (PCARR, 1981).

Thus, on COA's behest, interagency and COA committees headed by Batugal and Leticia A. Sarino worked on the revision of the manual. Sarino was PCARRD's resident auditor from August 1978 to July 1982. The *Revised Auditing Manual for Research Operations* was launched on 16 February 1981 during the term of Director General Drilon.

COA Memoranda No. 505 and 505a. The COA memoranda prescribed new procedures in the procurement of supplies, materials and equipment. Among the provisions of the memoranda are:

- authority of researchers to purchase supplies, materials and equipment involving an amount not exceeding ₱ 500 for each requisition, without canvass, provided there is no splitting of requisitions and the purchase was duly authorized; and that the auditor, in case

of doubt on reasonableness of price, may conduct a canvass of the items being procured;

- inspection of deliveries in amounts not exceeding P5,000 for each requisition is dispensed with, provided that the requisitioner certifies that the items delivered are in correct quantity, in accordance with specifications, and are acceptable to the requisitioning agency; and

- supplies and materials of amounts not exceeding P5,000 in each case may be purchased without the benefit of public bidding when these are urgently needed for research projects that are certified as within the priorities of the national research program. When said purchases are made from manufacturers or their licensed distributors, the requirement of public bidding may be waived.

Presidential Decree No. 1502

Presidential Decree No. 1502 provides incentives for research personnel and revises certain administrative procedures. The provisions falling under the latter classification include:

- hiring of retired scientists and technical personnel;
- hiring through contract of other research project personnel;
- exemption from ban on the purchase of equipment;
- procurement of supplies, materials and equipment without the benefit of public bidding;
- deposit of government funds for research activities;
- expeditious procedures for the purchase of large cattle for research; and
- construction and repair of infrastructure and other facilities for research.

Revised Auditing Manual

The *Revised Auditing Manual for Research Operations* incorporates budgeting, accounting and auditing procedures which facilitate research-related financial transactions. Provisions of COA Memoranda No. 505 and 505a and of Presidential Decree No. 1502 form an integral part of the document.

Highlights of the Revised Auditing Manual for Research Operations

- Presidential Decree No. 1502 provisions for:
 - exemption from Civil Service rule on nepotism
 - hiring of retired scientists and technical personnel
 - hiring through contract of other research personnel
 - sabbatical leave privilege for scientists
 - hardship or hazard allowance
 - honoraria
- Presidential Decree No. 1146 provisions for:
 - life insurance benefits
 - optional life insurance
- Presidential Decree No. 1587 provisions for:
 - substitutionary service (also provided for by Presidential Decree No. 1177)
 - additional or double compensation of staff
- Supplies and Materials:
 - The definition includes: semi-expendable supplies below P1,000 and non-expendable property below P1,000; and large cattle and other members of the bovine family.
 - Purchases amounting to less than P1,000 do not need to be supported by canvass of prices.
 - Purchases exceeding P5,000 are subjected to public bidding, except under certain conditions
 - Purchase of animals for research purposes may be done through negotiations
- Grants, Subsidies and Contributions
 - Provisions for:
 - deposit of government funds for research activities
 - an accounting system for research funds
- Building and Structure Outlay
 - Presidential Decree No. 1502 provisions for construction of infrastructure and other facilities for research
 - Presidential Decree No. 1445, Presidential Decree No. 1594, other presidential decrees, and COA Circular provisions for pre-audit of infrastructure projects under contract.
- Furniture and Equipment Outlay
 - Provisions for:
 - purchase of locally produced or manufactured articles.
 - exemption from ban on purchase of equipment, and
 - procurement of equipment without benefit of public bidding.



The world famous Mayon Volcano in Albay serves as backdrop for abaca research plots of the Bicol Agriculture and Resources Research Consortium (BARRC).

Keeping the System Informed

The sheer bulk of administrative and research data spawned by the national research system has made the conventional information system too cumbersome and inadequate for storing and retrieving data for use by management, researchers, and technology end-users. Thus, PCARRD has developed three major components to perform the vital functions of accumulating and disseminating information. These components are the scientific literature service, management information services and print media.

SCIENTIFIC LITERATURE SERVICE

To cope with the demands of quality research, scientists must continually update their techniques by keeping abreast with the latest research findings and research methodologies. This is especially true in view of the rather fast technology turnover in recent years.

PCARRD, therefore, established the Scientific Literature Service (SLS) in November 1973 primarily to meet this need.

The SLS is a current awareness program aimed at providing researchers with information on recent findings derived from an extensive collection of scientific literature.

Coordinated by the Applied Communication Department (ACD) of PCARRD, the Service was initially offered to 30 research centers and stations and covered only Asian journal

titles in agriculture found in the libraries of the UPLB Complex. Today, a total of 98 libraries in the national research system participate in the SLS programs. The general view is that the programs are more beneficial to researchers geographically remote from libraries and other information sources.

The main objectives of the SLS are to:

- serve the information needs of researchers in the national research system through current awareness programs in agriculture and allied disciplines; and
- promote the building up of scientific literature collections in agricultural libraries in the network of research centers and stations.

The SLS regularly provides libraries in the network with lists of serial holdings. Recipient librarians consult with researchers to identify the titles of journals likely to contain articles useful to them. Titles of selected articles in the journals are sent back to the SLS to determine whether or not these fall within commodity thrusts assigned to the particular center. Articles that fall within commodity thrusts are photocopied and sent to requesting libraries. All articles received by the centers from the SLS are integrated into their collections.

PCARRD also regularly furnishes the centers with its latest publications. However, these publications are limited to the centers' respective commodity assignments.

"Experience has clearly shown that many of our larger scale projects have fallen short of their objectives for want of a missing component. That component is communication. Effective communication is essential in order to reach, to inform and to motivate the people whose involvement in a project is essential to that project's success."

BERT LINDSTROM



The SLS library at PCARRD national headquarters.

TOP PHOTO

The Los Baños Science Community Library Exchange Program was launched in July 1985. Signatories to the agreement were (from left to right) Valmayor, FORI Director Pollisco, LBCF Director Antonio Lapinid, SEARCA Director General Fernando Bernardo, FPRDI Director Florentino Tesoro, IRRI Director General M.S. Swaminathan, and BFAR Regional Director Sixto Laron (not in photo).

The SLS performs other functions to meet its objectives. It operates a library at the PCARRD Headquarters which is the central repository of all agricultural research information generated by the national research system and acquisitions from various sources. It has a Selective Dissemination of Information (SDI) program, which is directed at individuals identified as recipients of information on available library materials within the research interest of these individuals.

In 1985, the SLS modernized the storage and retrieval of its library holdings through the computer-based Research Information Storage and Retrieval System (RETRES). RETRES saves time and effort in the retrieval of information not only from SLS holdings but also from holdings of libraries within the network of research centers and stations. The implementation of RETRES involves an inventory of all completed researches in agriculture and natural resources, preparation of a national agricultural vocabulary that will comprise the systems thesaurus, and formulation of abstracting standards.

The SLS coordinated the establishment of the Los Baños Science Community Library Exchange Program (LBSC-LEP). A memorandum of agreement was signed on 10 July 1985 by the heads of seven participating agencies — Bureau of Fisheries and Aquatic Resources (BFAR), Los Baños College of Fisheries (LBCF), Forest Products Research and Development Institute (FPRDI), FORI, IRRI, SEARCA, PCARRD — to formalize sharing of information resources and facilities among libraries and documentation centers of institutions operating in the Los Baños area.

A cooperative program with scientific and technical libraries of the NSTA was also established by the SLS through the NSTA Library Consortium to provide input to the latter's National Information System for Science and Technology.

The SLS aids local researchers in drawing expertise from international sources by establishing linkages with various information systems, such as the Current Agricultural Research Information System (CARIS), International Information System for the Agricultural Sciences and Technology (AGRIS), International Referral System for Sources of Environmental Information (INFOTERRA), and Regional Network for the Exchange of Information and Experience in Science and Technology in Asia and the Pacific (ASTINFO). These linkages involve FAO for CARIS and AGRIS, UNESCO for ASTINFO, and the UN Environment Program for INFOTERRA.

These information systems operate on a global scale and the PCARRD SLS has been identified as the national center, cooperating center, focal point and associate center for these systems, respectively.

MANAGEMENT INFORMATION SERVICES

PCARRD established the Management Information and Control Services (MICS) Unit in 1976 to organize the Council's information system to provide data for decision-making and manage data processing activities to satisfy the information needs of the national research network.

Specifically, the objectives of the MICS are to:

- develop manual and computerized information systems and data bases for efficient information storage, processing and retrieval;
- act as the central Electronic Data Processing (EDP) Unit of PCARRD and provide computer processing service for researchers and scholars;
- analyze the information needs of the PCARRD Secretariat and the network of research centers and stations;
- generate and analyze management and statistical reports to support PCARRD operations and internal control activities;
- provide updated and relevant information for effective planning and decision-making;
- develop the PCARRD MIS master plan and EDP organizational plans; and
- act as liaison to various computer information centers in the country.

Renamed the Management Information Services (MIS), a division under PDD, it now serves as the nucleus that provides management with relevant and timely information to serve as the basis for decision-making. The MIS provides information required to control the use of resources for research and development and strengthens the functional linkages of research centers and stations through a systematic and effective information network.



In developing the MIS master plan, PCARRD adopted the evolutionary or bottom-up approach which sees the information system growing in response to needs expressed by management and other members of the system. Modularity is the key towards the development of the MIS in PCARRD.

Although PCARRD applies the evolutionary approach in systems development, it has also evolved a master plan which analyzes the Council's objectives, activities and functions on which crucial decisions are based.

Before PCARRD acquired its own computer system, it relied on computer service bureaus such as the National Computer Center (NCC) in Manila and the Agricultural Resource Center (ARC) Inc. at UPLB. Linkage with these bureaus, however, proved inadequate to satisfy PCARRD needs. MIS received a boost with the acquisition of its own microcomputer system through the PCARRD-USAID ARDP Loan II.

To date, the MIS has developed the following information systems:

The MIS acquired its own microcomputer system through the ARDP II. Examining the features of the system are (from left to right) Valmayor, NSTA Director General Javier, and USM President Imlan.

Research Management Information System (RMIS)

The RMIS is the information processing support for research program planning, programming and monitoring. This computer-assisted processing system creates files of proposed, new and ongoing research projects. It also supports the packaging of the national research and development program, consolidates budgetary plans and maintains a file of approved research projects for monitoring and evaluation purposes. The RMIS is capable of supporting on-line data entry for updating and inquiry on research programs or projects in the files.

Research Information Storage and Retrieval System (RETRES)

The RETRES is a joint program of the MIS and the SLS. It is, as mentioned earlier, a computerized storage and retrieval system for bibliographic information and abstracts of completed projects and related publications.

Through RETRES, research planners and administrators can review the technology level and research gaps based on available literature. Researchers and scientists can minimize time consumed in literature search and gain easy access to research bibliography and literature by using a computer terminal instead of the card catalogue.

While the RMIS deals with proposed, new and ongoing researches, RETRES concerns itself with bibliographical abstracts, research publications and technical reports of completed researches.

Equipment Infrastructure Management System (EIMS)

Based on results obtained in the Resources Surveys done in 1979 and 1982, the EIMS provides a computer-based inventory of equipment and

infrastructure resources and requirements of agencies in the national research network. These reports assist the review and accreditation of the listing of national research centers and stations.

Manpower Management System (MMS)

The MMS is a computer-based system which provides capsule *curriculum vitae* of individuals involved in agriculture and natural resources research.

The main output of the MMS is the *Directory of Research Manpower Resources in Agriculture, Forestry, Fisheries and Mines*. The system also provides information on location, distribution and specialization of research manpower resources in the country.

A component of the MMS is the Personnel Information Sub-System (PIS) which provides a data base on the PCARRD Secretariat to assist personnel planning and management.

Financial Management System (FMS)

Financial indicators to formulate operating plans and institute financial controls can be obtained through the FMS. The system aims to provide a data base for monitoring budget releases for projects supported by PCARRD. When fully operational, this system will generate comparative analyses of approved, recommended budgets vis-a-vis actual releases and liquidation.

Activity Monitoring System (AMS)

Reports on overall activities of the Secretariat as well as significant developments in the national research network are regularly prepared for submission to the Presidential Management Staff and the NSTA.

The AMS facilitates monitoring and coordination of PCARRD activities.

Publication Mailing System (PMS)

Through this system, computerized mailing labels are prepared for PCARRD publications used in disseminating research and technology information.

PRINT MEDIA

Foremost among the functions of the ACD is the production of print media for a broad spectrum of audience, particularly researchers, research administrators, policymakers and clientele groups. The information contained in these publications is put together by PCARRD subject matter specialists and selected members of national commodity research teams. Manuscripts that have been approved for publication are turned over to ACD for editing and production.

PCARRD publications are categorized as follows:

- **Technical Bulletin Series**

The technical Bulletin series includes the *Philippines Recommends*, which consists of technology recommendations on the production, processing, marketing, and utilization of important commodities.

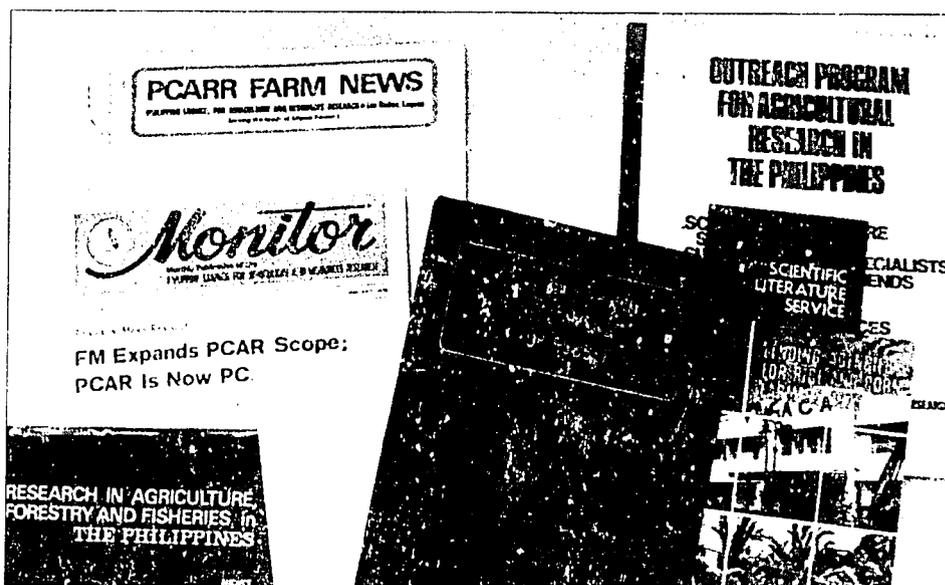
The primary targets of the series are extension workers who provide technical advice to farmers and other end-users. The technical bulletin series may also be used by enterprising farmers who have the resources to apply the recommended technology.

- **Research Highlights**

Research Highlights documents the results of the annual coordinated review and evaluation of ongoing and completed researches. The book presents the technologies which are ready for dissemination, verification, or packaging, as identified during the coordinated review.

- **Information Bulletin Series**

Guidelines and procedures that may



PCARRD publications address the information needs of researchers, policymakers, extension workers and various clientele groups.

help in the efficient management of research and information dissemination activities are published in the form of information bulletins. These bulletins address research managers and administrators as well as government workers who deal with government-funded research operations.

- *Data Series*

The data series, prepared for publication by the Socio-Economic Research Department of PCARRD, provides statistics on commodities that serve as useful background information for researchers, policymakers and agribusinessmen.

- *Book Series*

The book series consists of publications that contain reviews and compilations of research information presented by experts in various fields or disciplines during workshops and symposia. The book series may also feature compilations of basic research techniques or methodologies.

- *State of the Art and Abstract Bibliography Series*

The *State of the Art* provides researchers with a picture of the current status of research in their respective fields of interest and updates decision-makers on research trends.

Accompanying each *State of the Art* volume is a *State of the Art Abstract Bibliography of Researches* which documents in capsule form researches done on particular commodities, under local conditions. The latter volume serves as basis for the preparation of the *State of the Art*.

- *Technology Series*

Technology contains brief, mapped out information on a specific technology. This publication is intended for policymakers, especially budget officials and members of Parliament, who must be made constantly aware of the returns to investment in agriculture and natural resources research. The bulletin features a cost-and-return analysis for each technology.

- *PCARRD Monitor*

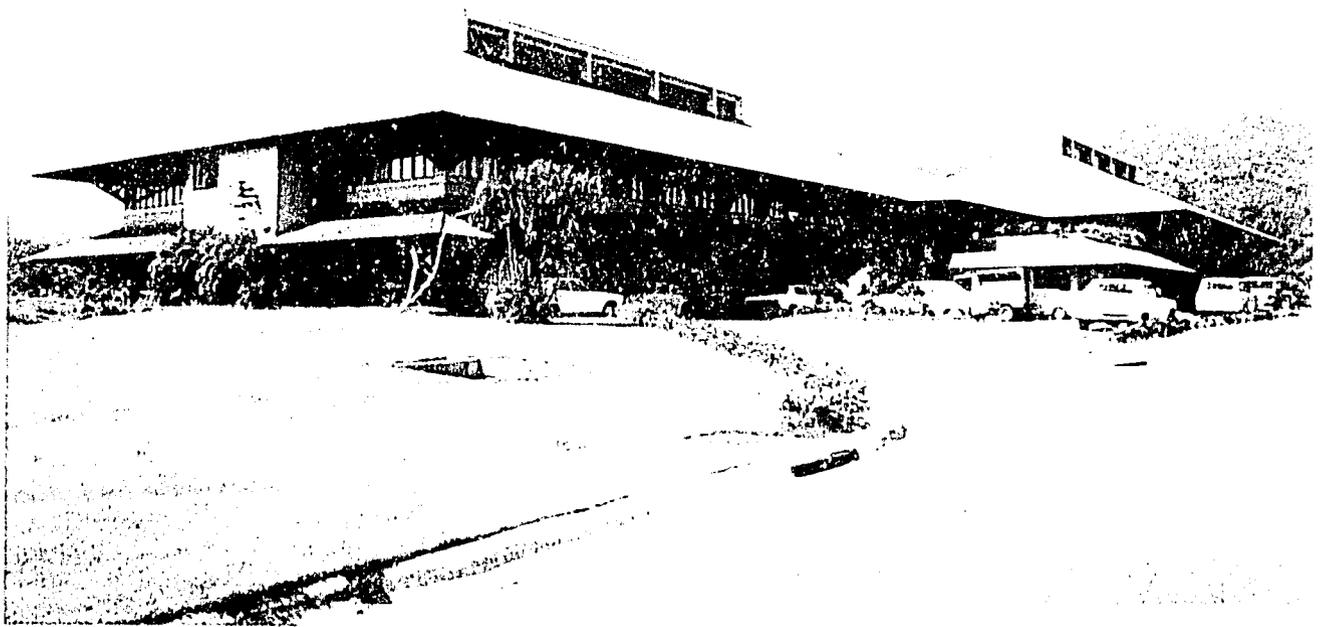
The *PCARRD Monitor* is the official monthly newsletter of PCARRD. It features information on developments and trends in agriculture and natural resources research and keeps researchers and research administrators informed on policy issues involving the national research system.

- *Scientia Filipinas*

Scientia Filipinas is an international technical magazine that features significant accomplishments of Filipino researchers in the field of agriculture and natural resources. Published yearly, the magazine caters to scientists, administrators, policymakers and decision-makers, both here and abroad.

- *PCARRD Farm News*

PCARRD Farm News is a monthly compilation of radio releases on agriculture and natural resources which PCARRD supplies to rural broadcasters nationwide. PCARRD also publishes *Balitang Pambukid*, a Pilipino version of the *Farm News*.



PCARRD national headquarters at
Los Baños, Laguna

Moving Research Results

he philosophy which holds that improvement of the lives of people provides the major legitimation for research runs like an unbroken thread and unifies changes in PCARRD's administration. As the research system develops and as new information from the network is generated, different approaches are explored but the underlying commitment to moving research results to the countryside remains constant.

By late 1974, the five major components of PCARRD's outreach program had been defined: the scientific literature service, linkage conferences, the *Philippines Recommendations* series, the media service, and the corps of subject matter specialists. These components continue to evolve as various philosophies emerge and changes in PCARRD leadership occur. Each new leader brings to his office a new vision and a new approach to the task of disseminating research results.

THE EARLY YEARS

In response to the need to make research a partner in the development effort, Dr. Thomas G. Flores organized the Technical Services Division (TSD) of PCARRD, which was to provide the mechanism for linking researchers with end-users. By July 1973, the division had the biggest complement of technical staff, equalled only by that of the Crops

Research Department, the biggest technical department of PCARRD then and now.

In retrospect, the precursor of PCARRD's research utilization system can be said to have had the following characteristics:

- It was a directive system, one that not merely disseminated information but also steered farmers in a particular direction. This was in accord with existing development programs which emanated from the top and were therefore premised on national development goals.

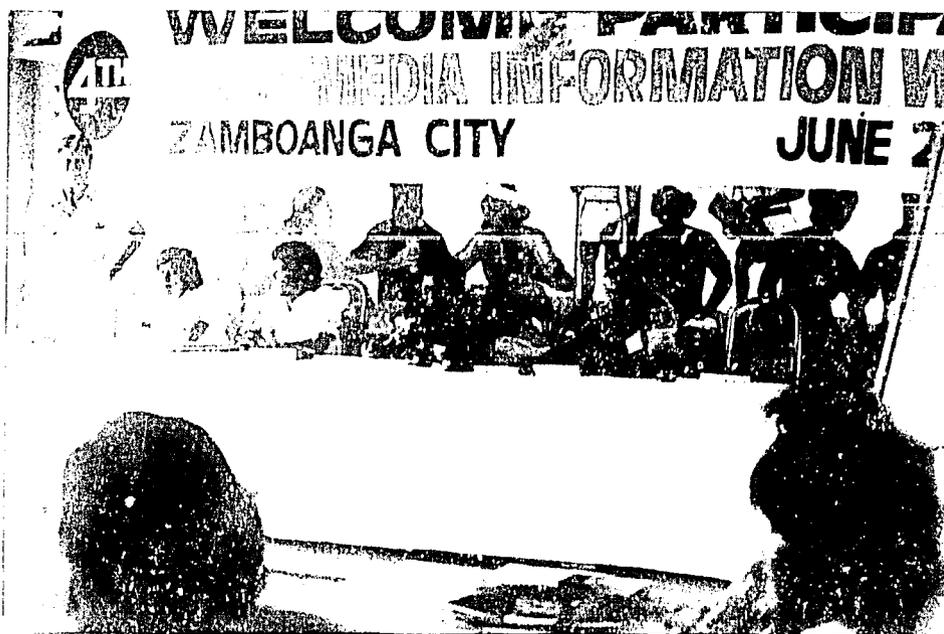
- It elicited active participation of the scientist to reach out to the end-user. During the First PCAR-Media Information Workshop, Flores (1973) spoke of "the scientist's obligation to be understood; his role as an honest broker, a go-between who can be mutually depended upon by scientists and laymen, a lucid translator and effective conveyor of information who is faithful and equally partial to both source and user."

- Its target audience was well-defined — the end-users which consisted of farmers, fishermen, forest products producers, processors, financiers, wholesalers, retailers, policymakers, and researchers.

Flores (1973) demonstrated a keen understanding of the researcher's primary audience and their limitations when he said:

"Technological development means essentially the building up of a basic capability for decision making and implementation in the generation and application of scientific knowledge in the daily lives of people and in the affairs of enterprises and the state. It is a continuous process which includes the stages of generation (research), diffusion (technology transfer), and application of knowledge (technical innovation) . . . Creation of new knowledge constitutes a 'supply' that should be followed by their application . . . Preoccupation with the supply function is a sterile exercise unless the knowledge is incorporated into the production system."

EMIL Q. JAVIER



PCARRD's link-up conferences with media sought more effective means of bringing research results to end-users.

"In a developing country, they are operating with limited resources and under constraints that usually complicate their activities and raise the risks they have to take. Relatively, particularly as producers, they are small operators. Because of this, they have a low absorptive capacity for losses, a decisive factor which determines their propensity to adopt or reject new technologies that promise increased productivity and higher income."

These factors cited by Flores would play an important role in rethinking the approach to both research and information dissemination.

- The precursor of PCARRD's research utilization system fully recognized the importance of establishing a viable working relationship with other development workers and the stumbling blocks to establishing such a relationship.

PCARRD in 1974 underscored the need to institutionalize relationships among different developmental bodies working in various sectors. The agency batted for a meeting of minds between

policymakers and researchers. Tetangco expressed PCARRD's sentiment most accurately during the Linkage Conference in 1974 when he called for the establishment of "a regular communication channel between research and extension, one which would operate effectively not so much because of the personalities involved in the research and extension organizations, but more so because an institution has been established to serve as a vital instrument in hastening the process of development, an instrument which if we fail to harness with sincerity and purpose would conspire to restrain national progress."

DISSEMINATION PHILOSOPHY RECONSIDERED

By 1976, feedback from research and extension groups in the country and from other national research systems catalyzed a rethinking of the philosophy behind PCARRD's research utilization strategy. There was increasing evidence of the discrepancy between on-station and on-farm yields and of the apparent adoption of components rather than whole technology packages. This raised the question of appropriateness of technology and added a new dimension to the dissemination approach: To backstop development, technology must be appropriate.

Such feedback eventually led to a shift from national to regional recommendations. At the Research and Extension Conference in April 1976, PCARRD outlined a mechanism for packaging regional recommendations. The reasons for this decision were presented during PCARRD's Fifth Anniversary Celebration:

"We cannot have one package of recommendations to cover the whole Philippines. The differences in climate,

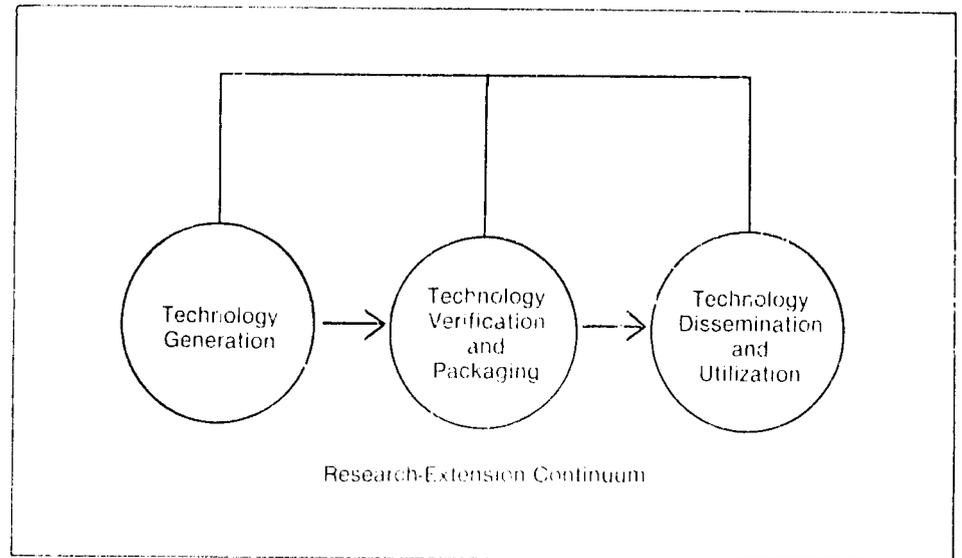
soil, topography and socio-economic conditions in the various regions militate against this. The development of appropriate technology dictates that research results coming out of investigations in research centers/stations be first tested in farmer's field conditions in order to ensure that the technology packages subsequently developed would truly be relevant to location- and situation-specific requirements" (Madamba, 1977).

The appropriateness of technology was the focus of a series of regional conferences held between early 1977 and mid-1978 and gave birth to the concept of a three-stage process in the research-extension continuum.

A more concrete expression of this preoccupation was PCARRD's involvement in the IRRI-PCAR Cooperative Applied Research Project to develop cropping systems in rainfed lowland areas. Started in April 1974 in Sta. Barbara, Iloilo with Dr. Eduvigis B. Pantastico of the Crops Research Department as lead person for PCARRD, the project was implemented jointly with IRRI and the Bureau of Agricultural Extension of MAE. It generated one of the few technologies that found rapid acceptance among farmers and became PCARRD's first pilot project in 1977, under the acronym KABSAKA.

NEW LEADERSHIP, NEW VISION

Three months after Drilon succeeded Madamba as PCARRD director general on 6 May 1978, he spelled out the major thrusts he hoped to address during his incumbency. The first of these thrusts was on action-oriented research that would clearly demonstrate the flow of research energies from technology generation to technology utilization.



Clear Flow of Technology

In an address to the Fisheries Research Society of the Philippines (FRSP) on 24 February 1979, Drilon elaborated on "a clear flow of energies from research to technology — from the time research problems are identified; proposals are made, accepted and implemented; the results packaged into technology; and the technology transferred and utilized by the clientele of PCARR." The aim of this strategy was to ensure that the right technology gets adopted and utilized by firms or people.

The Secretariat later selected technologies that could be used to demonstrate the clear flow of technology. Together with researchers, they identified promising research results, determined the various factors and groups involved and produced a primer on a system for moving technology to end-users.

Initially, six projects were identified to demonstrate the clear flow of technology:

- cropping systems in rainfed lowland rice areas;
- flower induction technology in mango;
- root crops-livestock/poultry fattening system;

- applied research projects in pasture forage-beef/carabeef production integrated with dominant farming systems;
- cage/pen culture for tilapia; and
- white potato production for the highlands.

It was envisioned that experience with these projects would be documented as basis for solving constraints to the clear flow of technology.

Applied Communication

In March 1979, Drilon appointed Dr. Rogelio V. Cuyno as Director of TSD. Cuyno established a sub-network of applied communication units in the regional centers with the division as the hub. The network was to speed up information flow and orient the PCARRD Secretariat on the information needs of extension organizations.

Cuyno's concept of applied communication held that the various activities in research information flow — generation, verification, on-farm trials, pilot testing, demonstration, and dissemination — should be planned as part of a single program with a well-coordinated organization and management system. This concept encompassed the clear-flow-of-technologies approach which Drilon espoused early in his stewardship of PCARRD.

In 1979, the TSD was renamed Applied Communication Department or ACD to reflect the change in focus. Additional publications were started and new programs instituted.

CONSOLIDATING THE OLD, EXPLORING THE NEW

When Valmayor assumed office as Director General of PCARRD on 1 April 1981, he was thoroughly familiar with existing programs and their strengths

and weaknesses. Essentially a pragmatist, he had often remarked that he would rather have few, not-so-ambitious but well-executed programs than several high-sounding but ill-designed and poorly-implemented ones.

By 1982, the focus was on action projects as a research and dissemination strategy. Likewise, the process of institutionalizing on-farm technology verification as part of the research system commenced. Later, PCARRD helped conceptualize a system that would look at dissemination of research results not merely as a function of the communication strategy but of the planning process itself.

Action Projects

The early 1970's demonstrated that adoption by farmers is fastest when a technology is shown to work successfully in farmers' fields. PCARRD's mandate, however, constrained it from trying out technology packages on a pilot scale under conditions where the farmer manages the trial of the technology.

The reorganization of the NSDB and its agencies into the NSTA in March 1982 gave PCARRD a development mandate. PCARRD took this as an opportunity to further strengthen its research utilization strategy and as a basis for implementing action programs.

The first pilot production project, on wheat, was launched in late 1982. Other pilot production projects were to follow. Essentially, the pilot projects were undertaken to:

- validate the maturity of the technology before making recommendations for MAF to embark on a full-blown national production program;
- shift the risk in trying a new technology from the farmer to the research system; and
- catalyze the dissemination of the

technology through easy access by farmers to the technology.

The Crops Research Department, under the leadership of Dr. Dely P. Gapasin, plays a lead role in the development and implementation of these action projects.

Institutionalizing On-Farm Research

PCARRD efforts to institutionalize technology verification on stations and farmers' fields as a component of the research process gained momentum with its involvement in the planning and implementation of the Agricultural Support Services Project (ASSP). Thus, between July 1979 and January 1980, the PCARRD Secretariat and the MAF spearheaded the conceptualization of a project aimed at strengthening MAF instrumentalities that formed part of the network.

By the time the World Bank Project Preparation Mission finished its work in February 1980, the concept of strengthening the technology verification capability of selected MAF stations was a firm component of the project proposal. Between March 1980 and the time the project commenced in 1982, the Regional Integrated Agricultural Research System (RIARS) was established to take major responsibility for verification of technology on stations and farmers' fields. RIARS was established under the leadership of Dr. Edgardo C. Quisumbing of the Agricultural Research Office of MAF.

PCARRD watches with interest the development of this system which could complement the work of the regional centers. PCARRD believes, however, that MAF should be encouraged to build the system on its own, even while evaluating its activities as part of the national research program.

Strengthening Linkages and the Feedback Process

In April 1984, PCARRD was involved in the development of the research component of the Highland Agriculture Development Project (HADP). PCARRD used this opportunity to address a nagging question: Is the problem of low technology acceptance caused by poor research communication and extension strategies or is it a problem of relevance?

For several years now, observers from national research systems and international agricultural research centers have been promoting the idea that at the root of the problem of low technology acceptance is the research system's approach to problem identification.

Former Deputy Minister of Agriculture and Food Manuel Q. Lim, Jr. (1983) noted that for too long research problems were identified based on national goals rather than on farmers' needs. Lafflin (1982), on the other hand, stressed that farmers are information seekers and that information is subject to the same market forces as any commodity. Therefore, low technology acceptance must not be attributed to traditional peasant obduracy or an inefficient extension force. Other reasons, such as inadequate information, must be examined.

International agricultural research centers have come to accept that farmers have very rational bases for choosing the technology components they wish to adopt. IRRI, for instance, found that farmers invariably adopt the components that give the highest economic return. Farmers find it difficult to adopt whole packages: only the most important constraints must be addressed at any one time. Both farmers' rationality and adoption of components rather than whole packages point out the need to understand existing farmers' practices.

The farming systems approach to research offers an option that assures generation of relevant technology. It considers existing systems, actively seeks farmer opinion on problems and evaluates the development of a technology vis-a-vis the whole system. However, to be truly useful, the approach must be integrated into the planning system and be directly linked with extension.

The research and extension component of the HADP, when implemented, will provide an opportunity to test this concept. This approach has the following features:

- The project will address the needs of a wide spectrum of farmers living in resource-poor communities. Commodity and area teams composed of researchers and extension workers will consider farmers' capacity to take risks and adopt new technology, socio-cultural factors, availability of labor and other inputs as criteria for developing the research program and for identifying technologies for pilot testing and dissemination.
- The research and extension program will be prepared jointly by commodity and area teams to ensure that research and extension institutions move in tandem and that their activities are complementary. A coordinating group will provide the link between research and extension. This ensures that the system can survive after project completion.

It is hoped that the established linkages will be strong enough and the benefits from cooperation overwhelming enough for the linkages to endure even after the project is completed. Because the project addresses farmer needs and because of the close research-extension coordination, it is envisioned that technology diffusion will be rapid and spontaneous.

RESEARCH UTILIZATION PROGRAM

PCARRD's current outreach program is aimed at varied audiences: farmers, policymakers, development workers, government planners, researchers, and educators. This section will trace how the various components of the program evolved from 1972 to 1985.

Linkage Conferences

The distance and poor communication that existed between researchers and media on one hand, and researchers and extension workers, policymakers and planners on the other was a major stumbling block in the efforts to make research a full partner in development. Cognizant of this, one of the first outreach activities of PCARRD was a linkage conference between research and media. This was to be followed in succeeding years by linkage conferences with extension workers and media.

The First PCAR Linkage Conference with Extension in 1974 sought more effective, fast and accurate means of bringing the results of agricultural research to information users in order to hasten the development of the economy.

The proceedings of the first linkage conference with media gives the most vivid testimony of how well the research system has succeeded in its outreach program. The frequency with which articles on agriculture are found nowadays in magazines and dailies, publications for schoolchildren and on radio and TV is a far cry from the situation in late 1972 to mid-1973 when very few, mainly press relations, articles on agriculture could be found.

The advent of development communication as a discipline, the emergence of a new group of technically

trained media men, and PCARRD's outreach program contributed to this change.

Succeeding conferences focused on the communication component of successful programs launched by government. The purpose was to provide a forum for resolving the problems between researchers and end users and for feedback from other sectors.

The linkages and conferences with media and extension were held yearly between 1973 and 1976. This practice was revived in 1982 with the holding of a workshop at the National Press Club.

Print Media Outreach Program

Formerly a project under Media Services, this program consists of the various publications produced by PCARRD for different audiences. The program aims to:

- keep the reading public informed of the latest results and happenings in agriculture and resources research; and
- interpret or translate research results into clear, accurate and credible information packages for the different end-users.

These publications are as much a part of PCARRD's research utilization strategy as they are a means of keeping researchers within the system informed of the latest developments in agriculture and resources research.

Subject Matter Specialists

The corps of subject matter specialists was initially a separate program. With the reorganization of TSD into ACD in 1979, the program was subsumed under the Print Media Outreach Program.

The subject matter specialists are part of the research departments. They are responsible for reporting significant information from their respective sectors and spearhead the preparation of PCARRD publications like the



Philippines Recommends, Technology, Research Highlights, State of the Art and State of the Art Abstract Bibliography.

Agriculture Secretary Tanco launched the first *Philippines Recommends* volume on coconut in March 1975.

Public Information Program

The second project under Media Services became a separate program in 1979. It is based on the philosophy that anything worthy of public recognition regarding the national research system, such as accomplishments and major events,

BAEx Director Francisco Saguiguit addresses the PCAF Linkage Conference with Extension.

should be disseminated through different mass media channels like the national dailies, magazines, radio and television.

Outreach Developmental Projects

Under the leadership of Dr. Thelma S. Cruz, ACD has branched out into the planning, design and implementation of projects and activities that will enable PCARRD to continue to refine technology dissemination within the research-extension-utilization continuum.

The Outreach Developmental Projects Division (ODP) aims to:

- initiate and coordinate strategies to achieve a more rapid and effective delivery of appropriate technologies packaged by the national research system;
- develop technology packaging and dissemination programs that will complement special R and D programs spearheaded by PCARRD;
- develop and produce instructional materials and other multi-media software as tools for efficient and effective research utilization;
- provide educational and training opportunities to various groups of technology delivery channels or end-users; and
- continue to strengthen and orchestrate interagency linkages, mainly through the network of Regional Applied Communication Offices (RACOs).

Regional applied communication program. Initiated by Cuyno in 1979 as the applied communication program, the regional applied communication program was subsumed under ODP in 1984. The program is premised on the intent of the research sector to make a positive impact on the lives of the ultimate users of agricultural and natural resources technology. It recognizes that the transfer of information is not without

cost, therefore, the poorer sectors can have easier access to information if the source is closer. It also recognizes that technology is location-specific.

By 1983, ten RACOs had been set up and are now working components of the national and regional research centers. The RACOs have the following tasks:

- to provide communication support to the research activities of the regional research centers/consortia;
- to pool the scant communication resources of consortium members and cooperating agencies;
- to foster interagency cooperation by providing the venue for cooperative communication work; and
- to develop and upgrade regional communication capability and eventually make the regions self-reliant in meeting their communication needs.

Each RACO consists of a nucleus staff that serves as the secretariat for the larger information sub-network composed of communication specialists from consortium member-agencies. In some cases, it includes representatives from other agencies operating in the area which agree to participate in applied communication activities.

ACD provides leadership and organizational, administrative and training support to the different RACOs.

Instructional Resources Production Program. Formerly named Communication Prototype Development and Testing, this outreach service of PCARRD produces prototypes of instructional materials on packages of technology for the use of extension workers and target end-users. The prototypes are kept as simple as possible. PCARRD provides expertise in the production of prototypes, while responsibility for mass production is assumed by the requesting agency.

The subject of a prototype is based on a

problem identified by farmers and relayed to PCARRD through interagency linkage. For instance, the production of prototypes for rat control in corn fields is a result of PCARRD's involvement in the national corn production program's (MAISAGANA) subcommittee on technology.

Technology Packaging for Countryside Development

During his term, Dylon identified technology packaging as a major thrust. In response, then IPD Director Batugal developed the Technology Packaging for Countryside Development Project (TECHNOPACK) which was launched in 1980. TECHNOPACK provides location-specific technology recommendations for priority commodities of the IADPs. It is being implemented by PCARRD in close coordination with the NACIAD, MAF, MNR, provincial governments, local agricultural colleges and universities, farmer groups and other concerned institutions in the provinces.

The output of the project are provincial technoguides which are semi-technical bulletins containing the best current technology recommendations for major commodities in each IADP. Such recommendations are based on published and unpublished research data of local line agencies, farmers' experiences and results of field trials being conducted throughout the country.

The project harnesses local resources and expertise, including the RACOs situated in the research centers, in the formulation, preparation and verification of the technology packages in farmers' fields. To date, the project covers 20 provinces.

Comparative Research-Pilot Extension Projects

In 1977, KABSAKA was officially launched as a project by the IRRI, PCARRD, BAEx of MAF and twelve other provincial and national agencies.

The pilot project, which is an offshoot of the IRRI-PCAR Cooperative Applied Research Project, was implemented through farmer cooperators. These farmers were trained and provided with seeds, fertilizer and extension assistance. From this pilot extension phase, the project became a province-wide endeavor boosted by a \$12 million loan from the World Bank.

The KABSAKA strategy has the following features: interagency cooperation, research-extension linkage and technology-credit-local government-market-extension interfacing in the subsequent extension phase.

Encouraged by the success of KABSAKA and emboldened by its development mandate, PCARRD is implementing a number of pilot projects following this pattern:

- *Wheat Production Program.* The idea for a nationwide wheat production program was born during the National Wheat Research Consultative Meeting held at PCARRD headquarters in November 1981. In 1982, the Coordinated Wheat Pilot Project was launched.

The parties involved in the program have well-defined roles. The farmer provides labor; PCARRD provides material and technical inputs. The MAF, through BPI technicians, helps locate prospective farmer cooperators and extends to them the necessary technical assistance. The ACAP schools simultaneously coordinate verification trials on stations and farmers' fields. The NFA has instituted price support and organized buying and seed storage schemes. It has also launched a wheat



Where the technology is risky and new, the research system is slowly taking on the burden of trying out the technology for the farmer.

planting program in four provinces covering 46 hectares.

- *Soybean Pilot Production Project.* The soybean pilot production project aims to boost commercial growing of soybean. Its goal is to fine-tune an improved package of technology for the production of soybean as a second crop after rice.

The project was launched in December 1983 and initially implemented in three provinces (Nueva Ecija, Tarlac, Cagayan) with an aggregate area of 65 hectares. The implementors are PCARRD, UPLB, MAF, NFA, Land Bank of the Philippines, CLSU, CSU and farmers. The scheme provides required inputs to farmers, to be paid back after harvest. The project also assures farmers of credit, training, technical assistance and a ready market.

The pilot project is being undertaken in more areas and is attracting greater farmer participation.

- *Root Crop-based Pilot Feed Mill.* The idea of operating a root crop based feed mill at ViSCA was conceived as early as 1976 in response to the difficulty of processing animal feed during the rainy season when shipments to the island were delayed by adverse weather conditions. The original plan was to formulate corn-based rations similar to those produced by commercial mills in Cebu and Manila. However, it was decided to produce root crop-based feed because:

- use of corn would mean competing for a preferred staple in the region;
- the Philippine Root Crops Research and Training Center (PRCRTC) is actively promoting improved root crop technology; and
- importation of corn is being limited by the national government (Bernardo and Bernardo, 1985).

The project was launched in November 1983 with the installation of the mill. In February 1984, operations began with ViSCA and PCARRD providing the initial operating funds. Implementation is a shared responsibility of ViSCA, PRCRTC, MAF Region VIII and the Center for Social Research.

The project provides an interesting case study in technology adoption. It uses production and processing technology developed by a center within the network. The social and economic factors are a crucial determinant of the project's success. Hence, the implementors have had to include

publication of technical information, organization of associations, exploration of different supply and marketing arrangements as integral components of the project. A less visible but crucial component of the project is, of course, research to produce new implements, varieties and processes to answer problems met either in the production, postharvest handling or processing end.

By 1985, other action programs — on citrus, white bean, mungbean, cowpea, the carabao, rural energy development, and rice hull charcoal for curing tobacco — will have been launched. As in those discussed, these programs will be launched in areas where they answer a felt need, but where the technology is new and, as such, too risky from the point of view of the farmer, the research system has opted to take the risk for the farmer (Valmavor, 1983).

PART IV

Linking the Past and the Future



Mandala, sentinels of the field.
Where harvest has been bountiful,
farmers pile up the palay to dry
while waiting for threshing
operations to begin.
Time-honored practices such as this
convey the farmer's innate
practicality and sense of order,
qualities that have stood him in
good stead through centuries. The
national research system must learn
from the farmer even as it seeks to
answer his needs.

Thirteen Years' Harvest

The establishment of a viable national research system is expected of PCARRD. It is the essence of PCARRD's creation. For this alone, PCARRD can stand judgment. But PCARRD's concern does not end with the consolidation of such a system. It is committed to building and sustaining an efficient and effective national agriculture and resources research system — one that is able to undertake quality research and develop technologies for the betterment and progress of the nation.

This chapter describes a few of the component technologies and technology packages for dissemination in which members of the national research system have taken part — either in the process of generating, developing, refining, verifying or disseminating the technology. These technologies are concrete outputs of the research system that PCARRD has helped build and shape. PCARRD considers it a responsibility to document these as confirmation of the system's relevance and effectiveness.

Technologies for dissemination contained in this chapter were selected using the following criteria:

- technical feasibility,
- economic viability,
- social acceptability, and
- environmental soundness.

CROP TECHNOLOGIES

Chemical Induction of Flowering in Mango

The highly erratic flowering and biennial fruit-bearing habits of mango are some of the major problems in commercial growing of this crop. A mango tree may flower profusely this year and sparsely the next year. The traditional practice of "smudging" — generating dense smoke and making it pass through the tree's canopy — to induce off-season flowering and fruiting is tedious and hazardous, with unpredictable chances of success.

Smudging did not completely answer the problem of irregular and seasonal fruiting. This challenged young researchers at the UPLB Department of Horticulture to resume studies on mango flowering in 1969, using modern growth regulators.

The first breakthrough came in 1971 when ethephon at 125 to 250 parts per million (ppm), sprayed weekly or bi-weekly for one month, induced flowering of mature mango trees. However, the range of effectivity of ethephon is narrow since an overdose may defoliate the trees and an insufficient dose may not induce flowering. Thus, the chemical was never commercially accepted locally and abroad.

the national research system must furnish an accounting through PCARRD of the returns on national and foreign investments in the national research system over the years. The products of research should be a major criteria for judging the effectiveness and impact of the system."

IADS REVIEW TEAM, 1980



Foliar spraying with chemical flower inducers breaks the mango's biennial fruiting habit and extends the fruiting season for several months, so that consumers can buy fresh mangoes off-season.

Another breakthrough revolutionized mango production technology in the Philippines. Potassium nitrate (KNO_3) was found to be effective in inducing off-season flowering of mango. Today, it is the active ingredient of most commercially available mango flower inducers. The technology was first used commercially in 1973.

Chemical induction of flowering is now commonly practised in commercial mango orchards and backyard plantings all over the Philippines. The technology consists of spraying physiologically mature trees once with dilute solutions of flower inducers. The concentration of the spray solution depends on the brand of the chemical and age of the shoots, but 1.0 percent KNO_3 solution is very effective.

Spraying, however, should be done discriminately. Present data indicate that commercial flower induction is effective only on 'Carabao', 'Pico' and 'Pahutan' varieties of bearing age.

Researchers generally agree that trees with poor stand or those which fruited the previous season but have not flushed should not be induced to flower. Trees already sprayed within the season which flowered and set fruits but failed to mature are the least candidates for induction.

Foliar spraying with flower inducers breaks the mango's biennial fruiting habit, makes possible the production of mango fruits every year, extends the fruiting season for several months and makes available to consumers fresh mangoes off-season. This is definitely a boon to growers since off-season mangoes sell at a premium price.

To commercial growers, the technology offers a conservative net income of ₱ 36,307 per hectare with 50 full-grown trees as compared with only ₱ 2,976 per hectare from trees allowed to flower naturally (Bondad, 1980).

Corn and Ipil-ipil Farming System for Hilly Areas

Corn depletes soil nutrients faster than many crops. Planting corn for several successive cropping seasons in a given area without fertilization generally results in poor crop stand and low grain yield. Unfortunately, many farmers have to grow the crop in marginal hilly areas. This results in much lower yields.

Corn experts, wary of the high cost of oil-based fertilizers and the difficulty of transporting these over distant hilly areas, scored yet another breakthrough with the use of ipil-ipil leaves to fertilize the calcareous hillsides of Cebu in Central Philippines.

With the development of the corn and ipil-ipil farming system, using ipil-ipil as a source of nitrogen, farmers can attain a grain yield of 1.5 metric tons per hectare and a modest income as well, in spite of increases in fertilizer cost.

All that the technology involves is the planting of ipil-ipil along contour lines. These are cut every 45 to 60 days so that leaves and shoots laid on the ground will provide nutrients to the growing corn plants. Every ton of dry ipil-ipil herbage has a fertilizer value of 27.9 kilograms nitrogen, 3.9 kilograms phosphorus, and 7.8 kilograms calcium. Moreover, in the hilly regions, leguminous ipil-ipil helps check soil erosion.

This simple practice, launched by the UPLB Department of Agronomy and the National Food and Agriculture Council of the MAF, can result in yield increases of 300 to 400 kilograms of corn per hectare. While this increase in harvest may appear small, it is attained at minimum expense to the farmers. Once the ipil-ipil hedgerows are established, they provide an almost continuous source of nutrients to corn plants grown under adverse conditions (Magboo, 1980).

Multiple Cropping in Coconut

A big problem among coconut farmers is the current low price of copra. This situation, coupled with low production, severely pulls down income derived from coconut farms.

At the farm level, multiple cropping is the answer. Mixed cropping benefits both the coconut palm and the farmer. Weeds are controlled, soil fertility is conserved and nut production is increased. For the farmer, the practice provides additional employment for the family, increases and stabilizes income, and efficiently utilizes the land and other resources.

During nine years of experimentation at the Bureau of Plant Industry's Taong Experiment Station in Quezon province, no adverse effects were observed on the yield of intercropped coconuts. Once the intercrop, such as cacao, pineapple and banana, had attained their full bearing capacity, the gross income derived from these crops was even greater than from coconut.

The ongoing multiple cropping trials under bearing palms conducted by the Philippine Coconut Authority (PCA) showed that planting black pepper, cacao, and pineapple intercrops in the same area, with fertilization, considerably increased coconut production. Nut production increased by 25 percent and copra production, by 30 percent.

Added returns from coconut intercropping depend on the intercrop. A well-managed farm in Silang, Cavite, with a ready market at Metro Manila, earned from the intercrop an average net income per year that ranged from ₱655 with banana to ₱5,634 with papaya. Returns per peso invested ranged from ₱1.29 with banana to ₱3.34 with pineapple.

With a net income of about ₱4,500 from coconut and ₱9,113 from

intercrops, a farmer with an intercropped two-hectare coconut farm can expect an income of ₱13,613 per year (Rubio, 1981).

Outstanding Philippine Sugarcane Varieties

The breeding program initiated by PHILSUCOM in 1965 produced a number of high-yielding and disease-resistant sugarcane varieties (Phil 56226, Phil 6607, Phil 6553 and Phil 6723) that gained wide acceptance among sugarcane growers in the Philippines. The extent of acceptance of HYV's may be gauged by the fact that PHILSUCOM HYV's completely dominate the country's sugarlands. For instance, in crop year 1979 to 1980, 95 percent of sugarcane lands were already planted to improved varieties designated as the Phil series.

The economic benefit which the sugar industry derives from the use of PHILSUCOM HYV's is enormous. Records show that the use of PHILSUCOM varieties over the years increased sugar yield by an average of 10 piculs sugar per hectare (PS/ha).

Mixed cropping benefits both coconut palm and farmer. Soil fertility is conserved and nut production increases. Consequently, family income increases.



Based on the sugarcane hectareage of 430,000 for crop year 1982 to 1983, the increment in yield for this crop is estimated at 4,300,000 piculs sugar. This amount is valued at ₱709,500,000 at the liquidation price of ₱165 per picul (Dosado, 1981).

This one year increment in the value of sugar production derived from research will pay, not only for the total sugarcane research budget, but also for the total agriculture and resources research budget for three years.

Underground Storage of Cassava

Storing cassava underground is an indigenous technology studied and refined by the PRCRTC at ViSCA. It shows that scientists can help farmers by working closely with them and learning from them.

The earliest scientific report on cassava storage in the country was made in 1922 by Baybay who tested different materials (bamboo, wood, palm thatch) and structures (cellars, pits, trenches) to store cassava. However, he did not make definite recommendations.

The establishment of the PRCRTC in Baybay, Leyte in 1973 enabled researchers to focus on problems of root crop growers. Surveys conducted by Quevedo and Diamante and observations made by other PRCRTC researchers during their field studies show that farmers' storage practices are inadequate. Storage time often lasts about seven days at most. Some of the farmers' practices include placing roots under the shade, piling them on floors, immersing them in water, burying them in pits and trenches (underground storage) and leaving them in the field.

With funding support from the IDRC and PCARRD, researchers identified the soil types in which cassava roots stay fresh for a longer period. They also determined dry matter, sugar, starch,

cyanide and fiber contents of the stored roots at different periods.

The studies led to more definite recommendations on cassava storage with minimal cost and a number of advantages.

Storing harvested cassava by burying them in trenches and covering them with sea sand, river sand or clay loam soil enables the farmer to plant his farm to other crops, thereby giving him additional sources of income and food for his family. At the same time, farmers can take quality cassava tubers from the trench for food or for sale even after two to six months, depending on the variety. This gives the farmer flexibility in selling his produce and allows him to take advantage of a higher market price (Data and Lopez, 1984).

Tissue Culture of Orchids

The Philippines is blessed with one of the richest orchid flora in the tropics. Its 130 genera and about 1,000 species are a rich and varied source of genetic material. The Philippines, however, has not fully tapped this resource which could give birth to a million-dollar cut-flower industry.

One major constraint in exploiting the potential of Philippine orchid species and hybrids is the difficulty of propagating desirable plants speedily.

With the advent of the tissue culture technique, hundreds and even thousands of identical plants can be produced in a relatively short time from a small tissue.

The tissue culture technique dates back to the 1960s, but it has been refined to suit orchid species and hybrids that grow well under Philippine conditions and are potential cut-flower types. The Ornamental Horticulture Division of the UPLB Department of Horticulture, under the leadership of Dr. Helen L. Valmavor, has been working on the refinement of the tissue-culture

technique for the past ten years, with strong support from PCARRD and the NRCP. Researchers at UPLB have identified the proper media and optimum conditions for the growth and development of some important hybrids and species.

Essentially, the process consists of culturing an active growing part, such as a bud or shoot tip, in an artificial environment so that numerous plants are produced from a single mother tissue.

Tissue culture makes possible the early introduction of new and promising species and varieties. It dramatically reduces the usual long and expensive years of selection involved in the production of new cultivars.

Plants produced can be easily placed in flasks, making their transport much easier. Callus tissues (formative plant tissue) also occupy limited space, valuable ones can be maintained in gene banks and withdrawn when needed (Reyna, 1983).

KABSAKA: A Program to Increase Income of Rainfed Rice Farmers.

The Philippines' Western Visayas Region is predominantly rainfed. Almost 234,000 hectares of riceland in the region depend solely on rain for water, a condition that allows the growing of only one rice crop during the wet season. Yields from these areas average 1.5 to 3.0 tons per hectare.

A double-rice cropping technology, which was tested in Sta. Barbara, Iloilo under the project called KABSAKA (an acronym for an Ilongo phrase meaning "Kabusagan sa Kaumahan" or abundance in the farm), radically changed the picture. Two rice crops are now grown where one crop was grown before. The technology also dramatically raised rice yields in these areas to 8 tons per hectare in one year, almost eight times the average national yields of 1 to

1.2 tons per hectare in rainfed areas, obtained through the traditional cropping system.

The technology package used in KABSAKA was developed by IRRI scientists working in collaboration with Filipino researchers. In 1972, based on applied research in farmers' fields in Bulacan, scientists found that it was possible to grow two rice crops in a single wet season in rainfed areas through the use of early maturing rice varieties and direct seeding at the start of the monsoon. Appropriate tillage techniques were developed and effective herbicides were identified.

In 1974, the IRRI-PCAR Cooperative Applied Research Project started verifying the technology in farmers' fields in Iloilo. In 1977, KABSAKA was officially launched as a project by the IRRI, PCARRD, BAEx of MAF and twelve other provincial and national agencies.

The Cooperative Applied Research Project has grown steadily since its initial phase in 1974, when two farmers in two barangays in Sta. Barbara, Iloilo tried the technology on 2,700 square meters. In 1975, the area increased to 25 hectares and in 1978, to 1,039 hectares. This indicates strong acceptance of the technology by farmers in the pilot areas (PCARR, 1979). The success of KABSAKA continues with the launching of the five-year Iloilo Rainfed Agricultural Development Project, a World Bank-financed project covering an estimated 60,000 hectares of rainfed lowland areas in the province.

Off-Season Production and Marketing of Tomato

The development of improved tomato varieties and the favorable climate of the region led to the establishment of a lucrative tomato industry in Northern Mindanao. Developed at the Claveria

Horticultural Experiment Station of MAF, these tomato varieties — BPI Tm 1 (Improved Pope) and BPI Tm 2 (Apple-Shaped) — account for 95 percent of the crop grown commercially in Northern Mindanao.

The growing of these varieties enabled Northern Mindanao to supply Metro Manila markets in 1973 with fresh tomatoes from July to December, when very few farmers in Luzon grow tomatoes because of heavy rainfall, typhoons and high night temperatures.

Encouraged by the substantial returns they netted in 1973, farmers expanded operations in 1974 and still made good profits. Believing that the trend would continue to improve, farmers expanded production further. This led to overproduction and the eventual collapse of the industry in 1975.

The technology for off-season tomato production worked very well but it was not properly applied. Production had to be programmed. The Regional Development Council of Northern Mindanao came to the rescue by embarking on a Coordinated Tomato Production and Marketing Project to rationalize production and marketing of off-season tomatoes.

Planning, coordination and implementation of the project was handled by the Inter-agency Action Committee on Tomato Industry (IACTI) composed of representatives from the Bureau of Plant Industry, Trade Assistance Center, NEDA, Philippine Ports Authority, Farmers Federation of Misamis Oriental, Trader's Group, Development Bank of the Philippines, Philippine National Bank, Philippine Bureau of Product Standards, and BAEx of MAF. The project's basic aims were to stabilize farm gate price through programmed production and to assure producers of fair returns on a long-term basis.

Individual farmers were organized into groups for purposes of marketing their produce. Each group adopted a single farm plan throughout the season. Marketing was facilitated by the accredited trading partner. A marketing scheme regulated the shipment of fresh tomatoes from Cagayan de Oro City to deficit areas, particularly Metro Manila, during the lean months from July to December.

Because of improved technology and a rational production and marketing scheme, tomato production in Northern Mindanao is now stable and farmers receive greater farm value for their produce (Yabes, 1981).

Soybean Production After Rice

For the period 1978 to 1983, the Philippines imported about 1.34 million tons of soybean valued at \$267 million. To ease the situation, the MAF and the NSTA-PCARRD launched two programs to increase local soybean production. The MAF concentrates its commercial soybean production program in Mindanao where much of the soybean areas are located. Complementing the MAF efforts, the NSTA-PCARRD directs its pilot production program in Central and Northern Luzon where irrigation water is not enough to support a second crop of rice. In these areas, soybean can be an alternative crop after rice since it does not require as much water as rice.

The package of technology for soybean production after rice is based mainly on component technologies generated by UPLB, CLSU, BPI and other research agencies involved in varietal improvement and testing of soybean, rhizobium inoculation trials and studies on cultural management aspects of soybean production.

The technology consists of sowing about 40 kilograms of SJ-2 seeds per hectare at a drilling rate of 15 to 18 seeds per linear meter for lowland rice-based areas. Depending on the rainfall pattern of the area, sowing can be done from late October to early January.

Before planting, seeds are inoculated with *Rhizobium japonicum* at the rate of 100 grams inoculant per 10 kilograms of seeds. Three bags of 14-14-14 NPK per hectare are applied as side dressing. Specific weed control, irrigation, insect pest and disease control, harvesting and drying practices are recommended to obtain the potential yield of 1.5 to 2.0 tons grain per hectare.

Using this package of technology, the soybean pilot production project generated 16.1 tons soybean from 27 hectares in Lupao, Nueva Ecija and Sto. Niño, Cagayan during the dry season of 1984 to 1985. The average gross income among 35 farmer cooperators amounted to ₱7,738 per hectare. Cost of production was ₱5,333 per hectare. The average net income was ₱2,406 with an average return on investment of 45 percent.

Root-crop Based Feed Mill Operation

Most feed mills in the Philippines produce swine and poultry rations using yellow corn as the base ingredient. Recent findings show that root crops such as cassava and sweet potato in the form of dried chips can completely replace corn in growing and finishing pig rations. These dried chips can also substitute for 50 percent of the corn content in unpelleted rations for broilers and layers. Complementing these results are the high-yielding varieties of cassava and sweet potato developed by ViSCA-PRCRTC. These varieties are widely accepted by root crop farmers.

Using these research findings, ViSCA piloted the operation of a root crop-based feed mill at Baybay, Leyte in 1984 with funding from PCARRD. Cassava and sweet potato roots are converted into chips, dried, pulverized into powder form and mixed with other ingredients in the formulation of feeds. The ViSCA pilot feed mill buys cassava and sweet potato chips from farmer cooperators around the area.

The substitution of corn with root crops is expected to benefit root crop growers and livestock raisers, particularly in areas where root crops are extensively grown but have a limited market. With the feed mill as a sure market outlet, root crop farmers will be motivated to increase yield and maintain a steady supply. On the other hand, livestock growers will be assured of a constant supply of quality and cheaper feeds.

Operating a root-crop based feed mill is also profitable. The ViSCA feed mill earned a net income of ₱85,625 after 11 months of operation (February to December 1984). Return on investment was 81.5 percent.

FARM RESOURCES AND SYSTEMS TECHNOLOGIES

Phosphorus Fertilization In Volcanic Ash Soils

About 120,000 hectares of volcanic ash soils are grown to corn annually. Average corn yield in these areas is approximately 1.2 tons per hectare. The main reason for this low yield is deficiency in phosphorus, a nutrient element necessary for optimum corn production.

Intensive soil management studies on volcanic ash soils were conducted under the Benchmark Soils Project, jointly sponsored by PCARRD and the University of Hawaii in cooperation with the Bureau of Soils of the MAF. Earlier

findings show that phosphorus is the major production constraint in volcanic ash soils. Not only is the soil's total phosphorus content low, but the phosphorus is in forms which plants cannot use.

Results obtained from the Benchmark Soils Project revealed a significant increase in yields of corn, soybean and rice with phosphorus fertilization. The study also showed that the effects of large initial applications of phosphorus fertilizer are carried over to subsequent croppings. These experiments serve as basis for the development of phosphorus fertilizer recommendations to increase corn yield in volcanic ash soils.

Fertilizing phosphorus-deficient areas with phosphate (P_2O_5) at the rate of 110 kilograms per hectare increases average yield to 3.1 tons per hectare. This is 1.9 tons higher than the average yield of fields not fertilized with phosphate. Phosphorus fertilization therefore increases net income per crop from ₱525 to about ₱1,860 per hectare, using 1980 prices.

In 1979, about 200,000 hectares of irrigated rice lands were treated with zinc sulfate. This boosted national palay production by 3 million cavans.



Furthermore, applying a large dose of phosphate (480 kilograms per hectare) may supply the phosphorus requirement of corn for several croppings. Consequently, the net cost of fertilizer applied per crop is reduced. This in turn further increases net profit per crop. Accumulated net profit from four croppings adds up to about ₱10,460 per hectare.

If phosphorus fertilization is adopted by farmers in phosphorus-deficient areas, total corn production will increase to 372,000 tons per cropping season, valued at ₱0.47 million based on the 1980 corn price of ₱1.20 per kilogram. The practice will increase farmers' income and maximize corn production in volcanic ash soils (Ilaos, 1980).

Zinc Fertilization for Lowland Rice

About 2.0 million hectares of flooded rice lands in the Philippines are zinc-deficient, a major cause of reduced palay yields in these areas. The malady is steadily increasing nationwide with the intensification of irrigated rice production and the use of concentrated chemical fertilizers.

Irrigation waters in the Philippines contain considerable calcium (lime). This lime remains as residue after transpiration and evaporation of irrigation water. Consequently, the pH or alkalinity of lowland rice soils increases. High alkalinity fixes the zinc in the soil in forms not available to the rice plant.

Deficiency occurs in high-pH alkaline or calcareous soils, very poorly drained mineral soils and organic soils. Symptoms of zinc-deficiency in the rice plant are reddish brown foliage, stunting and delayed maturity.

The practice of zinc fertilization for lowland rice was developed and verified by IRRI and the Bureau of Soils, in a series of studies that began in 1968.

The technology is simple: zinc is applied to rice seedling roots or added to the soil. The *Masagana*⁹⁹ program recommends that farmers broadcast 5 kilograms per hectare of zinc sulfate with the use of varieties tolerant to zinc deficiency. As an alternative, farmers may use 2 to 4 percent zinc oxide as root dip. Results indicate that yields of moderately tolerant varieties, such as IR 42, can be increased by one ton (23 cavans) per hectare with the application of 10 kilograms of zinc sulfate per hectare.

In 1979, around 200,000 hectares or 11 percent of the 1.8 million hectares of irrigated rice lands in the country were treated with zinc sulfate which cost about ₱6 million. Data from the *Masagana*⁹⁹ program indicate that the use of zinc increased rice yield by an average of 15 cavans per hectare. This practice bolstered the 1979 national palay production by 3.0 million cavans (130,000 metric tons), worth approximately ₱170 million (Somoray-Sahni, 1980).

FISHERIES TECHNOLOGIES

Cage Culture of Tilapia

Fish culture in cages is a technology adapted from other countries which practice this method in both fresh and marine waters.

The Laguna Lake Development Authority (LLDA) first experimented on the culture of Nile tilapia in floating cages in 1974. This initial attempt showed promise both for the newly introduced species and the culture technique.

A few years later, a private fish-farmer devised a 50 x 25 x 5 m floating cage for raising *Tilapia mossambica* in Lake Bunot, San Pablo City, Laguna. Many such cages are now used in commercial tilapia production in the lake.

In 1977 to 1978, Dr. Rafael D. Guerrero III of the CLSU tried raising Nile tilapia in 1.0 cubic meter floating cages, with rice bran and fish meal as artificial feeds. The use of small cages minimizes capital requirements and simplifies management.

Because the floating cages are small, harvesting can be done easily by two persons. The cages are brought to the bank and the fish are collected with a scoop net.

Fresh Nile tilapia commands a high retail price. In 1980, fresh tilapia sold for ₱7 to ₱10 per kilogram which was about the same price for milkfish then.

A fisherman or farmer raising tilapia in cages on a part-time basis can substantially increase his income. A farm family can easily manage 10 to 20 units of the CLSU-designed floating cage.

In 1980, a 10-unit cage farm earned about ₱4,857 per year. If the farmer produces his own fingerlings and tends the cage himself, his net profit will be even greater (Pelayo, 1980).

Management of Fishponds with Acid Sulfate Soils

Soil scientists suspect that low fish yield in brackishwater ponds may partly be attributed to the inhibitory influence of acid sulfate soils.

Acid sulfate soils are found extensively in mangrove areas where the abundance of sulfates and organic matter favors their formation. The extent of the acid-sulfate soil problem in the Philippines has not been fully established. Soil surveys reveal that at least 15,000 to 18,000 hectares of brackishwater fishponds are affected in the island of Panay alone.

In 1979, the Brackishwater Aquaculture Center of the University of the Philippines in the Visayas initiated intensive studies on the identification and management of acid sulfate soils.

Research efforts were done in collaboration with the NSTA and the USAID.

The technology developed for reclamation of these soils involves a repeated sequence of intensive draining, drying, and flooding before residual acids are neutralized by liming. Reclamation work takes about three months and is begun in the early part of the dry season in the locality.

Total reclamation costs amount to ₱914 per hectare, of which 94 percent goes to labor requirements. Based on an increase in milkfish yield of 322 kilograms per hectare per cropping through reclamation, the return per peso invested is ₱1.35 (Singh and Darwin, 1983).

Mussel Farming

Mussels (*Perna viridis*) or "tahong" abound in the country's numerous coves, estuaries and channels that have the right brackish-marine water level and planktonic food necessary for mussel production.

Mussel technology is relatively simple and entails minimal cost. Since it is generally not labor-intensive, the farmer can work at it and still engage in his regular fishing activities.

Initially considered a nuisance in oyster plots, the mussel has, since its recognition as a primary crop by the Bureau of Fisheries in 1950, threatened to supplant oyster as the major shellfish in Bacoor Bay, Cavite. Between mussels and oysters, mussels win the race in terms of net returns. A family farm of 1,000 square meters in Bacoor Bay, using the stake method, nets an average annual income of ₱12,415 or a return of ₱1.61 per peso invested.

These pear-shaped bivalves spawn throughout the year. They are harvested during their peak period, called *spatfall*. Two selective cropping periods a year are

estimated; only mussels of marketable size are harvested and the rest left for the next harvest.

The prospective mussel farmer can choose from among three farming methods: stake or "tulog" farming, rope-web farming and raft farming. The simplest, cheapest and most commonly followed is the stake method. Rope-web farming requires high initial investment. The raft method is also generally expensive.

The best indication of a good site is the presence of a natural population of mussels. Mussel organisms can be transplanted, however, in areas with the right environmental conditions.

To refine the present technology, SEAFDEC is conducting research on the biological aspects of the mussel while BFAR is undertaking applied research on the various methods of mussel cultivation, seed culture, and propagation (Torres and Lorico, 1982).

Semi-Intensive Prawn Culture

Prawns have been traditionally cultured as a secondary crop in milkfish ponds. Incoming tidal waters bring in wild prawn fry. Fry supply, however, is inadequate for deliberate stocking.

Two major research breakthroughs spurred interest in prawn production. In 1973, the Mindanao State University (MSU) successfully produced prawn fry in its hatchery facilities at Naawan, Misamis Oriental. The Aquaculture Department of SEAFDEC boosted this effort when it induced the ovarian maturation and rematuration of captive broodstock through a technique called *eyestalk ablation*.

A small industry base of 15,000 hectares is now established in the Panay provinces of Capiz and Aklan and in the Central Luzon provinces of Pampanga, Bulacan and Bataan. This area may be expanded as technology verification

projects identify more areas suitable for prawn farming. Prawn hatcheries have increased the availability of prawn fry and juveniles.

SEAFDEC is conducting technology verification projects in collaboration with the BFAR to identify more areas suitable for prawn farming. Semi-intensive culture is being tried at Pagbilao, Quezon and the Southern Philippines Development Authority farms in Zamboanga del Sur. A trial run using SEAFDEC-formulated feeds was initiated at the Panay State Polytechnic College in Pontevedra, Capiz.

The San Miguel Corporation Aquaculture Center in Calatrava, Negros Occidental has developed a technology package for intensive prawn culture through a technology transfer agreement with President Enterprises Corporation of Taiwan. The Center is also involved in a cooperators' program.

Three culture systems have been developed for prawn farming based on varying input levels and water management: extensive, semi-intensive and intensive. Each culture system requires a different pond design and development cost.

The semi-intensive system of prawn culture is recommended since supplemental feeding, greater water management and a modified pond design allow higher prawn stocking densities than is traditionally practiced.

Semi-intensive prawn culture also requires less capital input than intensive prawn culture. Prawn stocks are fed with commercial feed pellets or unprocessed wet feeds to supplement pond-grown food. Milkfish ponds used for extensive culture are modified by providing peripheral or diagonal canals, reinforcing dikes and installing drain gates to allow better water exchange and protection of prawn stocks.

Annual prawn production under semi-

intensive culture is 500 to 1,500 kilograms per hectare. Economic analysis shows that, with this system, a farmer can net ₱39,010 per hectare per year.

This amount represents returns of ₱0.43 per peso invested. In 1983, 4,321 tons of giant tiger prawn (locally called "sugpo") were exported. This volume was valued at ₱369.7 million (Darvin, 1984).

FORESTRY TECHNOLOGIES

The Many Uses of Coco Timber

The coconut, known for its innumerable uses, offers yet another product: the coco timber.

Formerly, the unappreciated coconut trunks were often left in the fields to rot, the farmer unaware that these could become breeding places for pests.

With foresight, PCA and the Forest Products Research and Development Institute (FPRDI, then called Forest Products Research and Industry Development Commission or FORPRIDECOM) developed a technology for converting the coconut trunk into products of great commercial potential. Through the use of appropriate equipment, improvements on sawing techniques and the development of suitable preservation methods, coco wood is successfully fashioned to equal and perhaps better the qualities of conventional wood.

Coconut trunk utilization studies were initiated by FPRDI in 1958 when it conducted research on the fiber characteristics of coconut trunks. Both PCA and FPRDI worked on various aspects of coco timber research.

Research shows that coco timber is good material for low-cost housing, charcoal and particle board. Besides being a cheaper source of housing materials, coco wood is readily available whereas supply of other timber is projected to decline in the Philippines.

Moreover, a house made of treated coco timber has an equal or longer service life than a house made of hardwood.

Coco timber used as electric power and telecommunication poles and posts, treated with copper-chrome-arsenate (CCA) by pressure method, are still in good condition after seven years (Guiang, 1980).

When the coconut rehabilitation program goes into full gear and old and senile coconut plantations are felled to give way to the more productive hybrids, there will be a strong and ready market for coco timber.

Use of Alternate Woods for Railroad Ties

The supply of traditional tree species used for railroad ties is running out.

Molave (*Vitex parviflora* Juss.), foremost of these species, is now scarce.

Aware of the problems of scarcity, FPRDI initiated studies on railway ties as early as 1958. It started with a survey on the causes of failure of railway ties in service. A search for possible alternate species followed. Researchers conducted studies on physical and mechanical properties; durability and treatability; and working properties of potential alternate species.

The FPRDI developed a system for screening potential alternate species based on the most important properties required for railway ties. So far, species which meet the criteria are apitong (*Dipterocarpus grandiflorus* Blanco), bolon [*Alphonsea arborea* (Blanco) Merr.], bitaog (*Calophyllum inophyllum* L.), malakawayan (*Podocarpus philippinensis* Foxw.), dungon (*Heritiera littoralis* Dryard), ake [*Serialbizia aele* (Blanco) Kosterm.], lomarau (*Swintonia foxworthy*), binggas [*Terminalia citrina* (Gaertn.) Roxb.], malabayabas (*Tristania decorticata* Merr.), and narig (*Vatica mangachopoi* Blanco).

Since supply of alternate woods is adequate, procurement is easier. Also, the use of alternate woods for railway ties diversifies the uses of these species. This development will redound to the conservation of woods traditionally used for ties (Foronda, 1981).

LIVESTOCK TECHNOLOGIES

Backyard Fattening of Cattle

In 1979, about 78 percent of cattle production in the Philippines was in backyard farms. At that time, research efforts were geared towards developing technology for feedlot cattle fattening to augment the income of backyard cattle raisers with one or two animal holdings.

Properly fattened cattle commands a premium price in the market because of its high dressing percentage and better beef quality. This is exemplified by the much-sought after "Batangas beef" or "Philippine prime beef" produced by small farmers in Batangas province in Southern Luzon.

A two- to three-year old feeder stock of about 200 to 250 kilograms may be fattened for about six to 12 months through forced feeding ("supak" system). In addition, a liberal supply of roughage, such as, farm crop residue, roadside weeds or forage crops is also given. When the fattened animal is sold, the expected net income is about ₱843 per head, an amount that can supplement the income derived by the farmer from his crop.

Indigenous technology on feedlot cattle fattening is bolstered by research on feeding and animal nutrition conducted by the Bureau of Animal Industry, Livestock Development Council, the private sector, and other state colleges and universities. These agencies have investigated varied aspects of feedlot fattening and have achieved appreciable results on the utilization of crop residues such as corn stover, rice straw, rice hull,

sugarcane tops, peanut hay and pineapple pulp; vegetable and banana rejects; concentrate supplements, molasses and/or urea; and ipil-ipil and other forage crops. The effects of hormones which enhance growth have also been studied (Villar, 1980).

Cassava Meal as Substitute for Yellow Corn In Poultry Rations

Cassava meal can partially or completely substitute for corn as base ingredient in poultry rations.

Researchers at UPLB and research agencies abroad have shown that cassava roots and leaves are good as ingredients of animal feed. The leaves are as good as ipil-ipil (*L. leucocephala*) in maintaining egg yolk quality, pigmentation of the shanks and tissues of the body.

Normally, 50 percent of the ingredients of commercial poultry feed consists of corn. Animal nutritionists claim that up to half of the corn content of feed may be replaced by cassava meal without affecting the palatability of the feed. At this substitution level, 25 percent of the total feed ration will consist of cassava meal.

If 50 percent of yellow corn in the poultry ration is replaced by cassava meal, an annual demand of about 32,000 metric tons of cassava chips is created. This will require about 80,000 metric tons of fresh tubers at an assumed conversion rate of 40 percent from fresh tubers to dried chips. At an average cassava yield of 20 metric tons per hectare, a total of 4,000 hectares must be planted to cassava to meet the country's poultry feed requirement.

This substantial demand for cassava meal will lead to the development of a new agribusiness industry which involves cassava production and processing into feed rations (Villar,

Ipil-ipil Leaf Meal Production and Utilization

Ipil-ipil leaf meal production has become a cottage industry for many families in Central and Eastern Visayas and Northern Luzon. Farmers cut and gather ipil-ipil branches. The leaves are dried under the sun in front yards and along roadsides. After the leaves are dried, these are threshed and sold for processing into livestock feeds.

Some of the feed mills in the Philippines have set up buying stations for dried ipil-ipil leaves in the barrios. The buying price depends on the color, dryness and purity of the leaves.

Researches have been conducted by UPLB, Bureau of Animal Industry and FORI to fully tap the economic potentials of ipil-ipil.



Research efforts have been geared towards developing technology for feedlot cattle fattening to augment the income of backyard cattle raisers.

Varieties such as Hawaiian giants (K-8, K-22, K-28 and K-67) and the Peru variety can be used for this purpose. Giant ipil-ipil produces 95 metric tons fresh weight of leaves per year compared to 38 metric tons of the local strain.

High-yielding varieties of ipil-ipil can increase the leaf biomass that can go into the feed mill industry.

At present, ipil-ipil leaf meal producers supply only a small portion of the potential needs of the feed mill industry (Villar, 1980).

Upgrading the Native Carabao Through Artificially Induced Breeding

The Philippine carabao needs genetic upgrading to increase its size and weight, characteristics which determine the carabao's capacity to supply farmers with draft power and meat.

In the past, an average of 2.5 inseminations were needed to attain a 10 to 12 percent conception rate in large ruminants such as cattle and carabao. This method is quite inefficient. The main problem is that the estrus period is difficult to determine because caracows do not show estrus signs.

The technology developed by UPLB and CLSU under a UNDP/FAO-funded project, *Strengthening of the Philippine Carabao Research and Development Centre*, circumvents this problem. Breedable caracows are injected with prostaglandin (synthetic luteolysin hormone) to induce estrus. Caracows

showing estrus within 72 to 96 hours are inseminated with frozen semen of Nilli-Ravi or Murrah breeds. Those that do not exhibit heat after the first dose are injected with a second dose of prostaglandin after 11 days. The process is repeated for caracows that do not respond to a second dose of prostaglandin.

So far, the new technology has resulted in a 33 percent conception rate in caracows on the first service alone. At a 33 percent conception rate per service, caracows bred for the second and third time, including caracows pregnant from the first service, achieve an aggregate 70 percent calf drop.

The technology facilitates genetic upgrading of the native carabao and helps solve the problem of carabao availability among smallholder farmers (PCARRD, 1985).

TECHNOLOGY FROM THE MINES SECTOR

Geothermal Energy for Salt-Making

High purity or industrial grade salt (97 to 99 percent sodium chloride or NaCl) is an essential raw material in such industries as caustic soda-chlorine manufacturing; food processing; soap, textile, chemical and pulp manufacturing; and baking. Unfortunately, the country does not produce enough industrial grade salt. In 1980, shortage was estimated at 200,000 tons.

A salt-making technology using

Technologies

1. The double-rice cropping technology dramatically raised rice yields in rainfed areas through the use of early maturing varieties and direct seeding at the start of the monsoon.

2. The national research system has developed a package of technology that enables farmers to plant soybean as an alternative crop where irrigation water is not enough to support a second crop of rice.

3. The VISCA pilot feed mill production of root crop based animal feeds provides root crop farmers with a ready market for their harvest and offers livestock growers cheaper quality feeds.

4. With funding from IDRC and PCARRD, researchers identified soil types in which cassava roots stay fresh longer. Underground storage of cassava enables the farmer to take advantage of a better market price.



11402

Technologies

5a.b. Tissue culture of orchids allows the production of hundreds, even thousands, of identical plants in a relatively short time from a small tissue.



5a

6. Through improved technology and a rational off-season production and marketing scheme, tomato growers of Northern Mindanao receive greater farm value for their produce.



6

7. Ipil-ipil leaf meal production has become a growing cottage industry among many rural families. Feed mills have set up buying stations for dried ipil-ipil leaves in the barrios.



7



5b

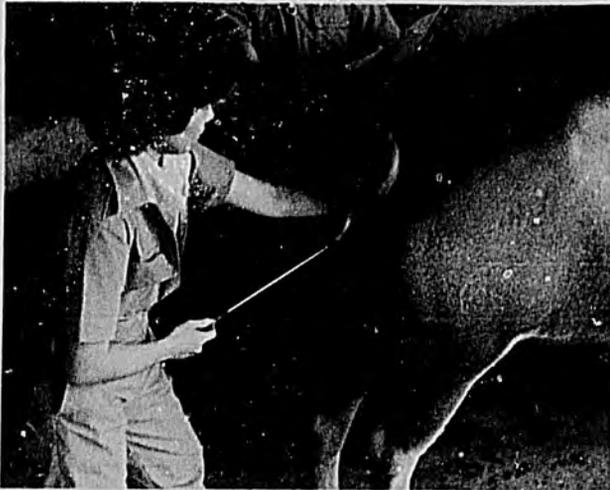
Technologies

8. Cassava meal can substitute for corn as base ingredient for poultry rations. This can lead to a new agribusiness industry involving cassava production and processing into feed rations.



8

9. Injections of prostaglandin can induce estrus among caracows. Caracows showing estrus are inseminated with frozen semen of Nilli-Ravi or Murrah breeds.



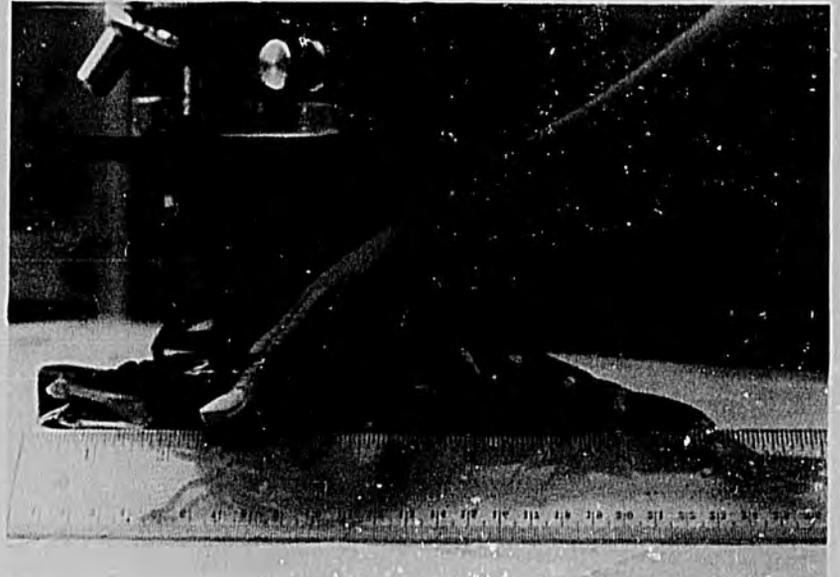
9

10. Cage culture of tilapia allows fish farmers to control production rates and meet the increasing demand for fish.



10

11. Semi-intensive prawn culture requires less capital input and allows higher stocking densities than is traditionally practiced.



11

140C

Technologies

12. Coco timber can equal and, perhaps, even better the qualities of conventional wood, especially as a source of low cost housing materials.

13. Alternate woods are the answer to the growing scarcity of tree species traditionally used for



13



12



14. The use of geothermal energy allows salt-making at night and even during the rainy season, thus, increasing and stabilizing salt production in the country.

14

geothermal energy is being tapped to solve the problem of salt shortage. The technology was developed by a group of Filipino scientists and engineers led by Commodore Alfredo Protacio. It was first demonstrated in 1972 and is being tested for subsequent large-scale operations at the Tiwi Geothermal Power Pilot Plant in Albay. The pilot plant is a joint undertaking of the Philippine Navy, Project Sta. Barbara and the NSTA.

The experiment simply duplicated solar salt pond technology. However, instead of the usual ponds, four open-type stainless trapezoidal pans were used to evaporate and concentrate sea water and crystallize the brine to produce NaCl. Geothermal steam provided the heat for evaporation as it passed through steam jackets forming an integral part of the bottom of the pans. For higher heat transfer, a triple effect evaporator-open pan settler-crystallization system was designed. This system provided greater productivity and higher product purity and facilitated by-product recovery.

The technology can improve the country's capability to produce high purity salt not only for industries but also for human consumption. Furthermore,

the technology facilitates iodination of table salt which will boost the country's goiter prevention program. Crude or low purity salt contains impurities which endanger health.

On a long-term basis, the new technology will generate income through recovery of valuable by-products such as magnesium carbonate, calcium sulfate, calcium carbonate, potassium chloride and magnesium chloride. These by-products simply go to waste under the traditional solar evaporation method.

Geothermal steam is an indigenous energy resource, relatively abundant, renewable and non-polluting. Its main advantage over solar energy is that it provides for weather-independent production. Salt-making can be done at night and even during the rainy season, thus, ensuring increased and stabilized production (Protacio, 1981).

All these technologies point to the tangible benefits of having a coordinated research system. They demonstrate the need for a research steward to guarantee that the "momentum that produces research is carried all the way to the production process in the farms and factories."



Those who till the soil begin at a tender age. It is for them that PCARRD and the national research system must achieve the wisdom of the ages and sustain the fervor and flexibility of youth.

Challenge and Opportunity: Looking Ahead

CARRD cannot afford to grow old — if growing old means inflexibility, the lack of creativity and reluctance to try new ideas. Given the mandate to introduce a new order of things, to provide vision in the midst of uncertainty, PCARRD must continually respond to the changing environment, both national and international, and must be sensitive to the needs of a maturing research system. Only then will the system be able to fulfill its role as a development catalyst. It is the only way PCARRD can nurture the growth of the national research system. Yet its path must be guided by a consistent set of directions, its continuing growth is to occur. For PCARRD must play the difficult role of leader even as it gives other parts of the system the opportunity to grow and become leaders themselves. PCARRD has gone a long way in implementing its mandate, as attested to by the following quote from the team that evaluated the ARDP II in 1984:

“The researchers repeatedly recalled the period before PCARRD was created when similar research was done by numerous different researchers who published few results. The present system, responding to national development objectives and providing financial and professional incentives for excellence, is viewed as a significant, positive change by almost all researchers. It is also evident that there has been a spillover

strengthening effect on the academic (instruction and extension) programs of the participating colleges and universities.”

However, it is still essential to develop the national research system to a level where it can help sustain an acceptable plane of national development. PCARRD developed systems of coordination and control which served the research system well in its early years. But as members of the network approach maturity, PCARRD must accord them a role in the system and in the national development effort consistent with their new level of capability.

KEEPING RESEARCHERS IN THE SYSTEM

Capable researchers, as it has been said repeatedly, are the single most important component of the national research system. To inspire their productivity and retain them in the system, they need to be provided an environment conducive to creativity and dedicated work.

In the last thirteen years, PCARRD has attempted to provide the required working environment through:

- provision of well-equipped laboratories and staff housing;
- creation of a critical mass of scientists in various disciplines;
- provision of reference materials;
- contact with researchers from both national and international research communities;
- streamlining of administrative procedures for research;

“When organizations are young, they are flexible, fluid, not yet paralyzed by rigid specialization and willing to try anything new. As the organization or society ages, vitality diminishes, flexibility gives way to rigidity, creativity flounders, and there is a lack of capacity to meet challenges from unexpected directions.”

JOHN W. GARDNER

- support to publications, both for the scientific community and for the general public, as a vehicle for publicizing research results; and
- efforts to raise researchers' income through honoraria.

PCARRD will continue to provide the desired working environment through a capability development program and the scientific career system. There are specific initiatives, however, that we hope can be accomplished in the next few years.

- The Scientific Career System presently applies only to agencies under the NSTA. PCARRD hopes to extend the benefits of this System to all network members in the next few years.

- Special emphasis will be given to the training of research managers. Hitherto, senior staff in the various research centers were sent abroad to attend short-term training on research management. PCARRD, in cooperation with SEARCA, also initiated workshops on research management. More recently, PCARRD helped create the Research Management Center at UPLB.

However, more and more, the system feels the need for formally trained research managers with technical training in agriculture and natural resources. The most logical answer appears to be to give prospective research managers degree training on management.

- PCARRD hopes to set aside a portion of the grants-in-aid as a discretionary fund which can be used to support research projects of scientists returning from graduate studies. Presently, funds made immediately available to a returnee are drawn from special project funds. In the long run, it will be useful to have such a provision for the grants-in-aid. This fund should allow application for and receipt of grant within one year of return to the mother institution.

Implementation of this scheme will depend on PCARRD's success in obtaining a bigger grants-in-aid fund from OBM.

CAPABILITY DEVELOPMENT

The capability development program is the most concrete accomplishment of PCARRD. However, while several centers have reached a level where they can sustain their own further development, others still need assistance in varying degrees. The projected capability development plan for which we hope funding can be generated will have these features:

- Any further development will give priority to consolidating gains achieved in the more promising centers so as to enable them to attain the critical mass of facilities and manpower required for a self-sustaining center. Beyond that, the choice of other centers for development will depend on a set of criteria that will include the existence of capable leadership.

- PCARRD will consult with the ACAP and the Ministry of Education, Culture and Sports in the choice of additional centers to be supported. Since most of the centers are based in educational institutions, this linkage is important so as to orchestrate the development initiatives of PCARRD with those of the Ministry.

- Planning will be done in close consultation with the concerned centers. Joint decisions will be made on the center's critical mass requirement, proper balance of manpower specialization to suit priority research and development needs, and proper phasing of facilities and manpower development.

- For regional centers, for which the requirements for full development cannot be projected in the immediate

future, a portion of the manpower development fund will be allocated for their needs.

- While Secretariat staff do not produce technology for national development, they are responsible for helping develop programs, policies and procedures that ensure the continued viability of the research system. PCARRD has attracted some of the more gifted scholars from different universities. It is hoped they can be retained within the system.

Corollary to the capability development program, PCARRD hopes to initiate an exchange program with centers which will enable Secretariat staff to gain first-hand experience in research. This will be beneficial to both PCARRD and the centers in several ways.

A great proportion of PCARRD technical staff are motivated workers. This characteristic, coupled with the training they have received, can be a great asset to any center. Secretariat staff also have experience in research management which can be used to advantage by the system.

PCARRD can also greatly benefit from having in exchange some of the more senior members of the research community. This scheme will allow center and PCARRD staff to gain better appreciation of each other's responsibilities and needs. Hopefully, this can lead to better coordination of research and development efforts.

- Some network members have suggested an exchange program between stronger members and weaker ones. As in the previous suggestion, this will be considered in greater detail as the existing level of capability among stronger members may not permit such an exchange program at present.

- It is envisioned that the exchange program will be linked with the granting of sabbatical leave for researchers.

PRIVATE SECTOR PARTICIPATION IN RESEARCH AND DEVELOPMENT

PCARRD has always considered linkage with the private sector as an important component of the research and development plan. This is why private sector representatives sit in as members of the Governing Council, the TAC, and national commodity research teams. Our working linkages with the private sector — such as those with the ANSA Cattle and Crop Farms, the Twin Rivers Research Center, San Miguel Corporation, Victorias Milling Company, and the more recent working agreement with Agricultural Investors, Incorporated — prove the importance of private sector participation in research and development activities.

PCARRD is proud of these initiatives but there is room for greater cooperation. New venues for encouraging private sector participation will be explored:

- In the planning process, private sector representatives, farmers, and processors will be invited as partners in the research and development effort.

- PCARRD will continue to support involvement of clientele groups in technology verification and encourage involvement of farmers in the preparation and testing of printed materials for distribution to other farmers.

IMPROVEMENT OF THE PROGRAM PLANNING AND BUDGET PROCESS

The present program planning and budget process starts with the preparation of proposals by researchers on priority areas identified by the various commodity research teams. Proposals are screened and consolidated at the station, agency and national levels, in that order. The process allows for selection of only the best and highest priority

projects, and ensures that recommendations are submitted to the OBM on time. The process ensures that PCARRD and the research system are properly heard at the OBM before agency appropriations are made; that agencies' allocations are released on time; and that only priority and technically acceptable projects are funded.

The improvement envisioned will have these features:

- Planning at the regional level will be strengthened and will consider both regional and national needs. Where a center only has a regional responsibility, the bulk of its program should not only reflect regional responsibilities, but must also harmonize with the national research effort. Where a center also has a national responsibility, the program needs to reflect both its regional and national responsibilities. The regional program must then reflect the center's responsibility for undertaking research which will be useful to centers in the other regions.

- The regional research and development program must be jointly decided upon by all agencies concerned in the region. The regionalization of NEDA and MAF makes this approach feasible.

The program is envisioned to address specific constraints to development in the region and, where required, in the nation. The program must be planned so that the various components reinforce and complement each other to attain the expected output in the shortest time possible.

- PCARRD's responsibility is to harmonize research in the regions and ensure that national needs are also addressed. It must review the various programs in depth and in their totality to ensure that the needs of one region are fed to the most relevant national center for inclusion in its program.

TECHNOLOGY DISSEMINATION

The present research utilization effort at PCARRD encompasses the following:

- It recognizes that access to information entails cost for the farmer. To minimize this cost, PCARRD produces publications addressed to development workers who can bring information to farmers. It publishes low-cost reading materials for farmers and rural broadcasters nationwide.

- PCARRD has embarked on action programs and technology verification trials involving farmers to enable the latter to judge for themselves the acceptability of new technology and lessen the risk and uncertainty inherent in the adoption of any new technology.

- PCARRD is aware that any development effort needs political will and provision of the necessary support services — credit, market, transport and technical assistance — to succeed. In view of this, publications addressed to policymakers and government planners are made available.

- The present approach reflects the belief that farmers are selective in adopting technology. Farmers only adopt technology which meets their most important farming constraints, to solve which they may be willing to take greater risks than they usually do. Any technology developed, therefore, must address perceived farmer problems if these are to be accepted.

Specific initiatives that we hope to strengthen or revive include:

- implementation of an old concept — assignment of subject matter specialists to the centers, to provide the link between research centers and their clientele. The suggestion to tap extension workers, train them and assign them in the centers while retaining their

positions in the extension agency, is a sound one, but one which needs to be discussed with the relevant agencies;

- strengthening the regional applied communication offices to serve the technology dissemination needs of the regional centers and in the process, complement the work of the research group;
- production of farmer-oriented, simple, low-cost reading materials; and
- implementation of action programs.

COMPLETING THE REGIONALIZATION PROCESS

PCARRD was among the first agencies to advocate regionalization. Thus, PCARRD conceived of regional centers and consortia as early as 1973. It co-sponsored with NEDA a series of regional conferences in an attempt to more accurately assess the research and agricultural information needs of the regions.

In 1981, the annual coordinated review of ongoing and completed projects was initiated, with regional centers playing a pivotal role. More recently, regional consultations were undertaken in relation to the implementation of the World Bank-funded ASSP and the USAID-financed RRDP.

PCARRD believes that the time is right to grant the research centers greater responsibilities in managing research and development efforts. PCARRD, however, will continue to provide assistance and to be involved in the decision-making process to ensure that national development needs are met and required linkages with other centers are provided. We are considering several ways of pushing the regionalization process further:

- Strengthening planning and evaluation at the regional level. The

annual coordinated review of ongoing and completed projects which evaluates existing research activities and identifies technologies ready for verification or dissemination is undertaken in the regions. It is envisioned that the same venue can be used for planning the regional research and development programs.

This is a logical move as the evaluation will pinpoint areas where gains need to be consolidated and identify gaps in the research and development effort. Specific constraints to development in the region must be identified and the center's responsibilities in the overall research and development effort must be delineated.

- As previously mentioned, the program from the region must be integrated, with the activities of the different agencies involved complementing each other so as to ensure a truly regional program.

It is envisioned that the program will clearly define the specific constraints to be addressed; the specific research and development activities to be undertaken; the responsibilities of the various agencies involved; and centers from other regions to be tapped for specific research topics.

- The regional centers will be encouraged to form committees which will involve participation of all concerned agencies in the region. These committees will be used as a venue for planning the implementation of the research and development program and the strengthening of research capability in the region.

- The regional centers/consortia will be encouraged to give full support to the regional applied communication offices, as a complementary activity to their research effort and as a necessary link with their clientele.

- It must be stressed that while planning is regional, participation of research centers with national responsibilities will continue to be a feature of the regional planning and evaluation process.

MEETING THE DEVELOPMENT MANDATE

National development realities dictate a need to focus on PCARRD's development mandate. In response to this, pilot testing activities will be intensified. Thus, the system will continue to shift risk-taking from the farmer to the national research system.

Corollary to this, a Department for Development, under the Deputy Executive Director for Research and Development is planned.

THE SECRETARIAT

In the future, PCARRD will concentrate on its integrative role and leave more of the details of research system management to the centers.

- It will be the Secretariat's responsibility to consolidate the results of the evaluation and planning conferences for use by policymakers, government planners, research administrators and researchers. The results of the review can be classified into top priority research topics that remain unattended or unfunded; technology for further development in the research centers; technology ready for testing in farmers' fields; technology for pilot testing in development programs; and information that can be the basis for national, regional or local policies.

It is important that results falling under the last two categories be prepared in a form useful to the agencies concerned, notably MAF, MNR, NEDA, NSTA and OBM. The first three types of results must reach research administrators and,

in the case of the first, OBM. The fourth category covers information which should be available to the general public and which the private sector can try out if they are willing to take the risk. This information is also useful to extension and research agencies as basis for on-farm trials.

- Corollary to the previous function, the Secretariat will strengthen its capability to serve as an information base. This will involve ensuring that the public can come to PCARRD at any time and be assured that the required information will be made available, either immediately or after inquiries from the concerned centers.

PCARRD must also ensure that the research system is kept informed of the latest developments in other national research systems and international research centers.

Lastly, PCARRD must provide policymakers and government planners with information they can use as basis in policy formulation.

This function necessitates that the MIS of PCARRD be strengthened. The MIS should be able to produce qualitative and quantitative analyses which will be useful to policymakers, the general public, planners, researchers and development workers.

- An important function which the Secretariat hopes to emphasize in the future is generation of funds for the system. Both internal and external sources of funds will be tapped.

To tap external sources, PCARRD will continue its practice of developing projects in cooperation with members of the national research system and linking these with potential donors, either directly or through MAF and MNR.

Internally, the source can be either the private sector or the government. Identified private research groups will be encouraged to cooperate in testing

technology of specific interest to them, the result of which they should be willing to share with the public.

PCARRD proposes to document the impact on the nation of technology generated and disseminated by the national research system. These impact studies will provide information to OBM and the *Batasang Pambansa*, government planners and policymakers that will hopefully result in greater support for the system from sectors that are able to influence budget appropriations.

WINDING UP

PCARRD has done a creditable job of strengthening the research system and catalyzing development of technology. More than anyone else, however, PCARRD's leadership is aware of imperfections in the research system and the enormity of the job that lies ahead. The preceding pages have articulated some of our thoughts for the future. In no way are these complete or final.

The task ahead is more challenging, less straightforward than that of earlier years. It is a task the thirteen-year old PCARRD hopes to face with courage and an open mind. For the years have taught us that in the path we have chosen to tread, our most important weapons are flexibility, a capacity to meet challenges from unexpected directions, and the patience to take one step at a time.

The research system is very young and is in the midst of a veritable revolution — in values, in perceptions, in capabilities, in philosophy — both national and international. PCARRD must continue to respond to these influences with caution and always with a farseeing eye.

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A

ACAP	Association of Colleges of Agriculture of the Philippines
ACD	Applied Communication Department
ACIAR	Australian Centre for International Agricultural Research
AGRIS	International Information System for the Agricultural Sciences and Technology
AII	Agricultural Investors, Incorporated
AMS	Activity Monitoring System
ANU	Australian National University
ARC	Agricultural Research Center
ARDP	Agricultural Research and Development Project
ARO	Agricultural Research Office
ASSP	Agricultural Support Services Project
ASTINFO	Regional Network for the Exchange of Information and Experience in Science and Technology in Asia and the Pacific
AVRDC	Asian Vegetable Research and Development Center

B

BAC	Brackishwater Aquaculture Center
BAES	Bureau of Agricultural Extension
BAI	Bureau of Animal Industry
BARC	Bangladesh Agricultural Research Council
BARRC	Bicol Agriculture and Resources Research Consortium
BFAR	Bureau of Fisheries and Aquatic Resources
BPI	Bureau of Plant Industry
BS	Bureau of Soils

C

CARIS	Current Agricultural Research Information System
CCA	Copper-Chrome-Arsenate
CCRD	Consultative Committee on Research and Development
CGIAR	Consultative Group for International Agricultural Research
CIAT	Centro Internacional de Agricultura Tropical (International Centre for Tropical Agriculture)
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo (International Wheat and Maize Improvement Center)
CIP	Centro Internacional de la Papa (International Potato Center)
CLARC	Central Luzon Agricultural Research Center
CLSU	Central Luzon State University
CMU	Central Mindanao University
COA	Commission on Audit
CRDI	Cotton Research and Development Institute
CSAC	Camarines Sur Agricultural College
CSIRO	Commonwealth Scientific and Industrial Research Organization
CSR	Center for Social Research
CSSAC	Camarines Sur State Agricultural College
CSU	Cagayan State University
CVIARS	Cagayan Valley Integrated Agricultural Research System

D

DA	Department of Agriculture
DANR	Department of Agriculture and Natural Resources
DMMMSU	Don Mariano Marcos Memorial State University
DNR	Department of Natural Resources

E

EDP	Electronic Data Processing
EIMS	Equipment Infrastructure Management System

F

FAO	Food and Agriculture Organization
FFTC-ASPAC	Food and Fertilizer Technology Center for Asia and the Pacific
FMS	Financial Management System
FORI	Forest Research Institute
FORPRIDECOM	Forest Products Research and Industries Development Commission
FPRDI	Forest Products Research and Development Institute
FRSP	Fisheries Research Society of the Philippines

G

GIA	Grants-in-Aid
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Acronyms

H

HARC Highland Agricultural Research Center
HADP Highland Agricultural Development Project

I

IACTI Inter-agency Action Committee on Tomato Industry
IADP Integrated Area Development Project
IADS International Agricultural Development Service
IARC international Agricultural Research Center
IAS institute of Animal Science
IBRD International Bank for Reconstruction and Development
ICAR Indian Council for Agricultural Research
ICRISAT International Crops Research Institute for the Semi-Arid Tropics
IDRC International Development Research Centre
IITA International Institute of Tropical Agriculture
ILARC Ilocos Agricultural Research Center
INFOTERRA International Referral System for Sources of Environmental Information
INTSORMIL The Sorghum-Millet Coordinated Research Support Program
INTSOY International Soybean Program
IPB Institute of Plant Breeding
IRRI International Rice Research Institute
ISU Isabela State University

J

JCUNQ James Cook University of Northern Queensland

K

KABSAKA Kabusugan sa Kaumahan ("abundance in the farm")
KBIs Key Budgetary Inclusions

L

LBCF Los Baños College of Fisheries
LBSC-LEP Los Baños Science Community-Library Exchange Program
LDC Livestock Development Council
LGARC La Granja Agricultural Research Center
LLDA Laguna Lake Development Authority

M

MAF Ministry of Agriculture and Food
MARDI Malaysian Agricultural Research and Development Institute
MICS Management Information and Control Services
MIS Management Information Services
MMS Manpower Management System
MMSU Mariano Marcos State University
MNR Ministry of Natural Resources
MSAC Mountain State Agricultural College

N

NACIAD National Council on Integrated Area Development
NAPHIRE National Post-Harvest Institute for Research and Extension
NARS National Agricultural Research System
NCC National Computer Center
NEDA National Economic and Development Authority
NFAC National Food and Agriculture Council
NIA National Irrigation Administration
NiFTAL Nitrogen Fixation by Tropical Agricultural Legumes
NOCEMCARRP Northern and Central Mindanao Coordinated Agriculture and Resources Research Program
NRCP National Research Council of the Philippines
NSDB National Science Development Board
NSTA National Science and Technology Authority

O

OBM Office of Budget Management

P

PAC Pampanga Agricultural College
PARC Palawan Agricultural Research Center
PCA Philippine Coconut Authority

PCAR	Philippine Council for Agricultural Research
PCARR	Philippine Council for Agriculture and Resources Research
PCARRD	Philippine Council for Agriculture and Resources Research and Development
PCHRD	Philippine Council for Health Research and Development
PCIERD	Philippine Council for Industry and Energy Research and Development
P-CRSP	Peanut-Collaborative Research Support Program
PDD	Planning and Development Department
PHILSUCOM	Philippine Sugar Commission
PHTRC	Postharvest Training and Research Center
PIS	Personnel Information System
PMS	Publication Mailing System
PNAC	Palawan National Agricultural College
PRCRTC	Philippine Root Crop Research and Training Center

Q

QDPI	Queensland Department of Primary Industries
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R

R & D	Research and Development
RACOs	Regional Applied Communication Offices
RCCC	Research Consortium Coordinating Committee
RCM	Ricegrowers Cooperative Mills Ltd
RETRES	Research Information Storage and Retrieval System
RIARS	Regional Integrated Agricultural Research System
RMIS	Research Management Information System
RRDP	Rainfed Resources Development Project
RRIM	Rubber Research Institute of Malaysia

S

SDI	Selective Dissemination of Information
SEAFDEC	Southeast Asian Fisheries Development Center
SEARCA	Southeast Asian Regional Center for Graduate Study and Research in Agriculture
SLS	Scientific Literature Service
SMARC	Southern Mindanao Agricultural Research Center
SPDA	Southern Philippines Development Authority
SU	Silliman University

T

TAC	Technical Advisory Committee
TECHNOPACK	Technology Packaging for Countryside Development
TRRC	Twin Rivers Research Center
TSD	Technical Services Division

U

UCPB	United Coconut Planters Bank
UH	University of Hawaii
UIUC	University of Illinois at Urbana-Champaign
UM	University of Melbourne
UNDP	United Nations Development Program
UNSW	University of New South Wales
UPLB	University of the Philippines at Los Baños
UPMSI	University of the Philippines Marine Science Institute
USAID	United States Agency for International Development
USM	University of Southern Mindanao

V

VICARP	Visayas Coordinated Agricultural Research Program
ViSCA	Visayas State College of Agriculture

W

WB	World Bank
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X

XU	Xavier University
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Z

ZDSDP	Zamboanga del Sur Development Project
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Appendix 1

MALACAÑANG
Manila

PRESIDENTIAL DECREE NO. 48

ESTABLISHING THE PHILIPPINE COUNCIL FOR AGRICULTURAL RESEARCH

Appendices

WHEREAS, agricultural growth, which embodies the development of our farm, forest, and fishery resources, is a matter of national concern;

WHEREAS, in order to attain the national goals in agricultural growth and development, research is necessary to determine the alternative means of achieving these goals or to identify the best means among the alternatives;

WHEREAS, agricultural research, which includes forestry and fisheries, is a systematic method of joining and applying knowledge efficiently not only to the biological, physical, and economic phases of producing, processing, and distributing farm, forest, and fishery products, but also in improving consumer health and nutrition, as well as the social and economic aspects of rural living;

WHEREAS, the application of better agricultural technology arising out of research would directly benefit not only the rural population which comprises two-thirds of the total Philippine population, but also a major segment of the urban sector;

WHEREAS, the national agricultural research program must not only be sensitive to the current needs of an advancing and developing agriculture but should also be forward-looking if it is to make most effective use of available money and manpower;

WHEREAS, to effectively implement the national agricultural research program it is necessary to develop a research capability in terms of manpower, facilities, funding and programs;

WHEREAS, in integrated fashion, the Philippine Government has initiated and implemented two closely-related studies for the purpose of reviewing the existing national agricultural research operations and developing a responsive and effective national system for agricultural research;

WHEREAS, there is an urgent need for a coordinating agency that will oversee, unify, and integrate the planning, administration, and implementation of the government's agricultural research program;

NOW, THEREFORE, I, FERDINAND E. MARCOS, as Commander-in-Chief of all the Armed Forces of the Philippines, and pursuant to Proclamation No. 1081, dated September 21, 1972, and General Order No. 1 dated September 22, 1972, as amended, in order to effect the desired changes and reforms in the social, economic, and political structure of the country, do hereby create the Philippine Council for Agricultural Research (PCAR) with the following major functions and powers:

- a) Define goals, purposes, and scope of research necessary to support progressive development of agriculture, forestry, and fisheries for the nation on a continuing basis;
- b) Using the basic guidelines of relevance, excellence, and cooperation, develop the national agricultural research program based on a multidisciplinary inter-agency and systems approach for the various component commodities;
- c) Establish a system of priorities for agriculture, forestry, and fisheries research and provide meaningful mechanisms for updating these priorities;
- d) Develop and implement a fund-generating strategy for supporting agricultural research;
- e) Program the allocation of all government revenue earmarked for agricultural research to implement a dynamic national agricultural research program;
- f) Provide the mechanism for assessment of progress and updating the national agricultural research program;
- g) Establish and provide support for a national network of centers of excellence for the various commodity research programs by drawing from the facilities of cooperating universities and colleges and other research agencies and linking these closely with selected PCAR research centers and stations;
- h) Develop a mechanism for full communication among workers in research, extension, education, and national development;
- i) Establish a repository for research information in agriculture, forestry, and fisheries;
- j) Provide for a systematic program of agricultural research manpower development and improvement;
- k) Provide for appropriate incentives to encourage topnotch research workers to remain working in their respective areas of agricultural research; and
- l) It shall 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.

For administrative purposes, the Philippine Council for Agricultural Research is attached to the Department of Agriculture and Natural Resources.

The Council shall be composed of the following officials:

1. The Chairman, National Science Development Board . . . Chairman
2. The Secretary of Agriculture and Natural Resources . . . Vice Chairman
3. The Budget Commissioner
4. A Representative of the National Economic and Development Authority
5. The President, Association of Colleges of Agriculture of the Philippines
6. The Chancellor, University of the Philippines at Los Baños
7. One outstanding leader in agricultural business to be appointed by the President upon recommendation of the PCAR Governing Council.

The policies and guidelines formulated by the Council shall be implemented by a Secretariat headed by Director General who shall be assisted by two Deputy Directors General, technical research directors, and commodity research program leaders who shall be designated by the Council and composed of personnel assigned and/or detailed to FCAR from the different departments, bureaus, state universities, or colleges, commodity institutes, offices, agencies, and other instrumentalities of the government.

The basic planning and coordination of the national agricultural research program shall rest on the various Commodity Research Planning and Implementation Teams. The Composition of these Teams shall be determined on an interdisciplinary basis with the guiding principle that the best possible expertise in the country should be drafted into these Teams irrespective of what agency they came from.

For the purpose of ensuring maximum quality, competence, and effectiveness of the technical commodity research programs of PCAR, a Technical Program Planning and Review Board composed of top quality technical men, is authorized to be constituted to assist the PCAR Director General. The members of the PCAR Technical Program Planning and Review Board shall be appointed by the Governing Council.

The Philippine Council for Agricultural Research is authorized to pay honoraria and to make research grants.

Selected field stations, personnel, facilities, and funds of the Department of Agriculture and Natural Resources, as may be later identified by the Council with the concurrence of the Secretary of Agriculture and Natural Resources, are hereby transferred to the operational control of the Council.

Research personnel, facilities, and other research resources which belong to universities, colleges, and commodity institutes shall be harnessed on a contract basis in support of the PCAR agricultural research program. Where needed, such research resources would likewise be available for development assistance as determined by the PCAR Governing Council.

The Council is hereby directed to develop appropriate rules and regulations governing technical personnel, accounting and auditing procedures for research funds, and research program budgeting. When approved by the Council, such rules and regulations mentioned above shall carry the force of law.

The Council shall formulate the national long term and annual programs in agricultural research. All government revenue earmarked for agricultural research (including research in forestry and fisheries), whether coming from regular budget appropriations or tax levies on specific commodities, or from the National Science Development Board, should be programmed by the Philippine Council for Agricultural Research. Beginning July 1, 1973, no funds earmarked from agricultural research shall be released by the Budget Commission or other funding agencies for research activities in PCAR research centers and stations, universities, colleges, and other research agencies, unless these were integrated as a part of the national agricultural research program. However, a small reserve should be set aside to provide for contingency allocations to finance research covering immediate problems of an emergency nature that might arise during a given year.

The Council is hereby authorized to draw from and negotiate for funds, not otherwise specifically allocated, of the National Economic Council, National Food and Agriculture Council, National Science Development Board, Department of Agriculture and Natural Resources, agricultural institutions, and all other possible fund sources, for the establishment, operational and program expenses of the Philippine Council for Agricultural Research.

All income and revenue that shall accrue from operations of the PCAR research program shall be considered as automatic appropriations for subsequent PCAR activities.

The Council shall submit to the President periodic reports of its activities.

All acts, parts of acts, executive orders, ordinances, rules and regulations which are inconsistent with the provisions of this Presidential Decree are hereby repealed, amended, or modified accordingly.

Done in the City of Manila, this 10th day of November in the year of our Lord, nineteen hundred and seventy-two

(SGD.) FERDINAND E. MARCOS
President of the Philippines

By the President:

(SGD.) ALEJANDRO MELCHOR
Executive Secretary

Appendix :

MALACAÑANG
Manila

PRESIDENTIAL DECREE NO. 864

AMENDING P.D. 48 TO EXPAND THE FUNCTIONS OF THE PHILIPPINE COUNCIL FOR AGRICULTURAL RESEARCH TO INCLUDE MINES RESEARCH, AND CHANGE ITS NAME TO PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES RESEARCH.

WHEREAS, the development and growth of our farm, forest and fishery, and certain mineral resources is a matter of national concern;

WHEREAS, research is necessary to determine the alternative means of achieving national goals in the development of our agricultural and natural resources or to identify the best means among the alternatives;

WHEREAS, mines are a natural resource which is one of the top foreign exchange earners of the country;

WHEREAS, there is a need to wisely utilize this exhaustible resource;

WHEREAS, mines research is best done in relation to agricultural, forestry, and fisheries resources in order to consider their combined effects in maintaining a favorable ecological balance;

WHEREAS, there is a need to strengthen the system and capability for mines research in the country; and

WHEREAS, this can best be done through the existing body which now monitors, coordinates, and manages all research in agriculture, forestry, and fisheries in the country;

NOW, THEREFORE, I FERDINAND E. MARCOS, President of the Republic of the Philippines, by virtue of the powers vested in me by the Constitution, do hereby decree and order the following:

SECTION 1. The name of the Philippine Council for Agricultural Research, established under P.D. 48, is hereby changed to the PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES RESEARCH, hereinafter referred to as PCARR, with the following functions in addition to those stipulated in P.D. 48:

- a) Have authority and responsibility, as part of the scope of its operations, over all government-supported and funded research on mineral resources except petroleum and other mineral oils.
- b) Establish, support and manage the operation of a national network of centers of excellence for the various research programs in crops; livestock; forestry; fisheries; soils; waters; and mineral resources; and socioeconomics research related to agriculture and natural resources; and
- c) Enter into agreements or relationships with other similar institutions or organizations, both national and international, in furtherance of the above purposes.

SECTION 2. The PCARR Governing Council shall be composed of the following officials:

1. The Chairman, National Science Development Board, Chairman;
2. The Secretary of Agriculture, Vice-Chairman;
3. The Secretary of Natural Resources, Vice-Chairman;
4. The Budget Commissioner;
5. A Representative of the National Economic and Development Authority;
6. The President, Association of Colleges of Agriculture of the Philippines;
7. The Chancellor, University of the Philippines at Los Baños;
8. The PCARR Director General;
9. Two outstanding leaders in the producers' and business sector of agriculture and natural resources to be appointed by the President of the Philippines upon recommendation of the PCARR Governing Council.

SECTION 3. The PCARR employees shall be exempt from the scope and coverage of the Wage and Position Classification Office (WAPCO).

SECTION 4. The PCARR Governing Council is hereby authorized to establish an Agriculture and Resources Research Service which will formulate rules and regulations covering qualifications, recruitment, compensation, performance evaluation, and separation from the service, of all government technical personnel engaged in research-oriented operations in agriculture and natural resources.

SECTION 5. The PCARR Governing Council is authorized to reorganize its Secretariat and Research Network by creating, consolidating or integrating as many divisions and research stations as may be necessary to accomplish its functions and objectives.

SECTION 6. All acts, parts of acts, executive orders, decrees, ordinances, rules and regulations, which are inconsistent with this Presidential Decree are hereby repealed, amended, or modified accordingly.

SECTION 7. This Decree shall take effect upon its promulgation.

Done in the City of Manila, this 29th day of December, in the Year of Our Lord, Nineteen Hundred and Seventy-Five.

(SGD.) FERDINAND E. MARCOS
President of the Philippines

BY THE PRESIDENT:

(SGD.) JACOBO C. CLAVE
Presidential Executive Assistant

Appendix 3. PCARRD Governing Council, 1972-1985

Name of Incumbent	Tenure	
	From	To
Chairman		
National Science and Technology Authority (NSTA)		
Chairman Florencio A. Medina	17 November 1972	— 30 March 1976
Chairman Melecio S. Magno	27 April 1976	— 28 June 1981
Dir. Gen. Emil Q. Javier	28 July 1981	— Present
Vice-Chairman		
• Ministry of Agriculture and Food (MAF)		
Sec. Arturo R. Tanco, Jr.	17 November 1972	— 27 January 1982
Dep. Min. Manuel Q. Lim, Jr.	24 February 1982	— 25 January 1983
Dep. Min. Orlando J. Sacay	23 February 1983	— Present
• Ministry of Natural Resources (MNR)		
Sec. Jose F. Leido, Jr.	28 May 1974	— 23 June 1981
Min. Teodoro M. Peña	28 July 1981	— 27 January 1982
Dr. Celso Roque	24 February 1982	— 8 July 1982
Dep. Min. Arnold B. Caob	2 September 1982	— Present
Ex-officio Secretary		
Philippine Council for Agriculture and Resources Research and Development (PCARRD)		
Dir. Gen. Joseph C. Madamba	29 December 1975	— 3 May 1978
Dir. Gen. Jose D. Drilon, Jr.	6 May 1978	— 31 March 1981
Exec. Dir. Ramon V. Valmayor	1 April 1981	— Present
Members		
• Association of Colleges of Agriculture of the Philippines (ACAP)		
Pres. Bruno M. Santos, MSAC	17 November 1972	— 29 December 1972
Pres. Faustino T. Orillo, UPLB	26 January 1973	— 17 May 1973
Pres. Fernando A. Bernardo, UPLB	21 June 1973	— 5 December 1973
Pres. Amado C. Campos, CLSU	22 January 1974	— 14 March 1975
Pres. Martin S. Celino, AUF	7 April 1975	— 26 January 1976
Pres. Alvaro R. Rabina, CSSAC	4 March 1976	— 16 February 1977
Pres. Francisco S. Zamora, CVAC	16 March 1977	— 9 February 1978
Pres. Miguel P. Palao, PNAC	17 May 1978	— 24 April 1979
Dean Macaureg Derongongan, MSU	7 June 1979	— 19 September 1979
Dr. Fernando A. Bernardo, VISCA	28 November 1979	— 28 April 1981
Dr. Isabelo T. Alcorido, CMU	26 May 1981	— 16 December 1981
Pres. Vicente T. Pinazo, DSAC	27 January 1982	— 28 July 1982

continued next page

- National Economic and Development Authority (NEDA)

Dr. Teodoro M. Ña	17 November 1972 -- 26 October 1973
Asst. Dir. Gen. Ruben B. Ancheta	5 December 1973 -- 28 January 1975
Asst. Dir. Gen. Eduardo G. Corpuz	14 March 1975 -- 28 July 1982
- National Food Authority (NFA)

Dr. Dante B. de Padua	2 September 1982 -- 27 February 1985
Dep. Adm. Pablo V. Pablo, Jr.	29 May 1985 -- Present
- Office of Budget and Management (OBM)

Com. Faustino C. Sychangco	17 November 1972 -- 23 September 1975
Com. Jaime C. Laya	28 October 1975 -- 19 December 1980
Min. Manuel S. Alba	27 January 1981 -- 28 July 1982
- University of the Philippines at Los Baños (UPLB)

Dr. Domingo M. Lantican	17 November 1972 -- 21 March 1973
Chancellor Abelardo G. Samonte	3 May 1973 -- 11 December 1978
Chancellor Emil Q. Javier	13 March 1979 -- 16 February 1985
- Private Sector

Manuel Q. Lim, Jr.	19 February 1974 -- 31 January 1982
Dr. Francisco Y. Panol	23 December 1977 -- 31 January 1983
Dr. Jaman S. Imlan	23 February 1983 -- Present
Luis F. Lorenzo	23 February 1983 -- Present
Ernesto F. Sanvictores	23 February 1983 -- Present

Appendix 4. PCARRD Technical Advisory Committee, 1972-1985

Chairman

Name of Incumbent	Tenure	
	From	To

Chairman

Philippine Council for Agriculture and Resources Research and Development (PCARRD)

Dr. Joseph C. Madamba	27 December 1972 -- 3 May 1978
Dr. Jose D. Drilon, Jr.	6 May 1978 -- 31 March 1981
Dr. Ramon V. Valmayor	1 April 1981 -- Present

Vice-Chairman

- Ministry of Agriculture and Food (MAF)

Exec. Director Domingo F. Panganiban	28 September 1973 -- 22 December 1978
Dr. Edgardo C. Quisumbing	31 January 1979 -- Present
- Ministry of Natural Resources (MNR)

Dr. Celse Roque	6 June 1980 -- 5 August 1983
Jesus D. Valerio	10 November 1983 -- 31 December 1984
Asst. Secretary Jose Nograles	1 January 1985 -- Present

Members

- Association of Colleges of Agriculture of the Philippines (ACAP)

Dr. Ricardo M. Lantican, UPLB	28 September 1973 -- 22 April 1975
	4 February 1984 -- Present
- Dr. Jaman S. Imlan, USM

Dean Domingo R. Villaluz, MSU	28 September 1973 -- 17 December 1976
Dr. Jose A. Eusebio, UPLB	28 September 1973 -- 12 November 1974
Dean Rogelio O. Juliano, UPCF	23 April 1975 -- 7 January 1977
Dr. Cesar C. Jesena, ViSCA	23 April 1975 -- 10 December 1980
Dr. Arturo A. Gomez, UPLB	7 January 1977 -- 7 March 1980
Dr. Edilberto D. Reyes, UPLB	4 February 1977 -- 22 December 1977
Dr. Meliton U. Ordillos, UPS	13 January 1978 -- 3 February 1984
Dr. Filomena F. Campos, CLSU	6 June 1980 -- Present
	6 February 1981 -- Present

- **Board of Investment (BOI)**

Dr. Rodolfo M. Ela	28 September 1973 — 30 May 1975
Ramona P. Miguel	5 September 1975 — 22 December 1978
- **Ministry of Agriculture and Food (MAF)**

Rodolfo P. Madrid	26 April 1979 — 19 December 1980
Dr. Dalmacio M. Trinidad	3 July 1981 — 17 January 1982
- **Ministry of Agrarian Reform (MAR)**

Rodolfo Bonoan	7 December 1973 — 15 February 1974
Jose C. Patañhug	23 April 1975 — 22 December 1978
- **Ministry of Natural Resources (MNR)**

Elizabeth D. Sanson	23 April 1975 — 22 December 1978
Jesus D. Valero	31 January 1979 — 2 July 1982
Gloria S. Arce	6 August 1982 — Present
- **National Food and Agriculture Council (NFAC)**

Exec. Dir. Domingo F. Panganiban	28 September 1973 — Present
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- **National Economic and Development Authority (NEDA)**

Teodoro M. Ela	28 September 1973 — 7 October 1973
	11 April 1980 — 4 December 1981
Dr. Eduardo G. Corpuz	7 December 1973 — 12 November 1974
Er. P. Barangantang	30 March 1975 — 17 June 1977
Guillermo M. Trinidad	22 July 1977 — 8 June 1978
Dr. Cayetano S. Sarmago	17 November 1978 — 7 March 1980
Dr. Manetta S. Adriano	7 January 1982 — Present
- **National Pollution Control Commission (NPCC)**

Comm. Reynaldo M. Lesca	2 April 1976 — 10 November 1976
Er. B. Bienvenido N. Garcia	17 December 1976 — 22 December 1978
- **National Research Council of the Philippines (NRC-P)**

Dr. Francisco M. Fronda	28 September 1973 — 12 March 1978
Prof. Demetrio E. Rosell	28 December 1978 — 25 June 1979
Dean Godofredo B. Perez, Jr.	9 July 1979 — 1 March 1985
Dean Gerson E. Lantican	12 April 1985 — Present
- **National Science and Technology Authority (NSTA)**

Prof. Pedro M. Laudencia	28 September 1973 — 15 February 1974
Ricardo P. Verdurina	27 August 1974 — 12 November 1974
Dr. Elara O. Tan	3 July 1975 — 17 November 1978
Lydia G. Laransan	31 May 1979 — Present
- **Nutrition Center of the Philippines (NCP)**

Dr. Florentino S. Solon	23 April 1975 — 22 December 1978
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- **Office of Budget Management (OBM)**

Asst. Dir. Jesus C. Benmuela	28 September 1973 — 2 December 1983
Raymundo A. Tomas	11 January 1985 — Present
- **Private Sector**

Leonardo D. Angles	28 September 1973 — 22 December 1977
Dr. George G. Davide	28 September 1973 — 7 January 1982
Dr. Francisco Y. Pared	28 September 1973 — 22 December 1977
Venancio M. Galano	6 August 1976 — 7 December 1984
David D. Gomez	13 January 1978 — Present
Domimador M. Faustino, Jr.	13 January 1978 — 7 March 1980
Dr. Ireneo L. Domingo	1 August 1980 — 5 October 1984
Prof. Victor E. Paner, Jr.	7 May 1982 — Present
Dr. Feliciano B. Calera	1 March 1985 — Present
Eulopeo Lagudan	1 March 1985 — Present

- **Ex-Officio Secretary**

Philippine Council for Agriculture and Resources
Research and Development (PCARRD)

Deputy Dir. Gen. Ramon V. Valmayor	1 August 1973	-- 31 March 1981
Deputy Exec. Dir. Alfonso N. Eusebio	1 April 1981	-- 31 August 1985

Appendix 5. PCARRD Directorate, 1972-1985

Name of Incumbent	Tenure	
	From	To
Directors General		
Dr. Joseph C. Madamba	17 November 1972	-- 3 May 1978
Dr. Jose D. Drilon, Jr.	6 May 1978	-- 31 March 1981
Dr. Ramon V. Valmayor	1 April 1981	-- Present
Deputy Directors		
• Research (formerly Programs and Operations)		
Dr. Fernando A. Bernardo	1 December 1972	-- 30 June 1973
Dr. Ramon V. Valmayor	1 August 1973	-- 31 March 1981
Dr. Alfonso N. Eusebio	1 April 1981	-- 3 August 1985
• Development and Financial Management (formerly Station Development and Operations)		
Francisco B. Tetangco	2 February 1973	-- 31 December 1978
Dr. Senen M. Miranda	1 January 1979	-- 12 May 1980
Dr. Eduvigis B. Pantastico	16 May 1980	-- 14 February 1982
Dr. Filiberto S. Pollisco	15 February 1982	-- 15 January 1984
Dr. Elvira O. Tan	16 January 1984	-- Present
• Directors		
Applied Communication Department (formerly Technical Services Division)		
Dr. Thomas G. Flores	1 July 1973	-- 15 June 1978
Dr. Rogelio V. Cuyno	13 March 1979	-- 15 January 1984
Dr. Thelma S. Cruz	16 January 1984	-- Present
• Crops Research Department		
Dr. Romeo A. Obordo	1 December 1972	-- 30 June 1974
Dr. Eduvigis B. Pantastico	1 February 1976	-- 24 August 1981
Dr. Dely P. Gapsin	25 August 1981	-- Present
• Farm Resources and Systems Research Department (formerly Soil and Water Resources Research Division)		
Dr. Andres P. Aglibut	1 December 1972	-- 14 August 1974
Dr. Eduvigis B. Pantastico	1 April 1975	-- 31 January 1976
Dr. Senen M. Miranda	1 June 1976	-- 31 October 1980
Dr. Amado R. Maglinao	1 November 1980	-- Present
• Finance and Administrative Department (formerly Accounting Services Division)		
Genaro D. Revilleza	1 December 1972	-- 31 March 1979
Lillian A. Brion	1 June 1979	-- 31 August 1983
Carol M. Yorobe	1 September 1983	-- Present
• Fisheries Research Department		
Prof. Inocencio A. Ronquillo	1 December 1972	-- 30 June 1974
Dr. Elvira O. Tan	16 September 1974	-- Present

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- Forestry Research Department
Dr. Filiberto S. Pollisco 1 December 1972 — Present
- Livestock Research Department
Dr. Alfonso N. Eusebio 1 December 1972 — 31 March 1981
Dr. Moises R. de Guzman 22 June 1981 — 6 August 1985
Dr. Patricio S. Faylon 7 August 1985 — Present
- Mines Research Department
Dr. Raymundo Punongbayan 1 October 1977 — 31 August 1982
Dr. Guillermo R. Balce 1 September 1982 — Present
- Planning and Development Department
(formerly International Projects Division)
Dr. Ponciano A. Batugal 1 January 1981 — 1 March 1984
Dr. Beatriz P. del Rosario 1 April 1985 — Present
- Socio-Economics Research Department
Dr. Thomas G. Flores 1 December 1972 — 30 June 1973
Dr. Arda R. Libro 1 August 1973 — Present

Assistant Directors

- Crops Research Department
Dr. Ponciano A. Batugal 20 May 1977 — 31 December 1980
Dr. Crisanto R. Escano 1 January 1981 — Present
- Farm Resources and Systems Research Department
Dr. Beatriz P. del Rosario 1 January 1983 — 31 March 1985
- Forestry Research Department
Dr. Virgilio A. Fernandez 6 September 1982 — Present
- Livestock Research Department
Dr. Patricio S. Faylon 1 July 1982 — 6 August 1985
- Planning and Development Department
Dr. Patricio S. Faylon 1 March 1984 — August 5, 1984



Joseph C. Madamba
Director General
1972-1978



The PCAR Directorate. (Seated, left to right: Francisco Telangco, Deputy Director General for Station Development; Madamba; Ramon Valmayor, Deputy Director General for Programs and Operations. Standing, left to right: Filiberto Pollisco, Forestry Research Director; Elvira Tan, Fisheries Research

Director; Alfonso Eusebio, Livestock Research Director; Senen Miranda, Soil and Water Resources Research Director; Eduvigis Pantastico, Crops Research Director; Manuel Frias, Chief Accountant; Aida Librero, Socio-economics Research Director; Thomas Flores, Technical Services Director.



Jose D. Drlon, Jr.
Director General
1978-1981



The PCARR Directorate. First row, left to right: Leticia Sarino, Resident Auditor; Carol Yorobe, Chief Accountant; Drlon; Elvira Tan, Fisheries Research Director; Aida Librero, Socio-economics Research Director. Second row, left to right: Eduvigis Pantastico, Deputy Director General for Operations; Ramon Valmayor, Deputy Director General for Research; Florentino Tesoro, Forestry Research

Assistant Director. Third row, left to right: Enciano Batugal, International Projects Director; Rogelio Cuyno, Applied Communication Director; Raymundo Punongbayan, Mines Research Director; Alfonso Eusebio, Livestock Research Director.



Ramon V. Valmayor
Executive Director
1981 to date



The PCARRD Directorate. First row, left to right, Eizra Tan, Deputy Executive Director for Development and Financial Management and Fisheries Research Director; Alfonso Eusebio, Deputy Executive Director for Research (retired). Second row, left to right: Dely Gapasin, Crops Research Director; Amado Maginao, Farm Resources and Systems Research Director; Filiberto Pollisco, Forestry

Research Director. Third row, left to right: Patricia Faylen, Livestock Research Director; Guillermo Balce, Mines Research Director; Aida Librero, Socio-economics Research Director. Fourth row, left to right: Beatriz del Rosario, Planning and Development Director; Carol Yorobe, Finance and Administration Director; Thelma Cruz, Applied Communication Director.

Appendix 6. Tanglaw Awardees

- 1974** University of the Philippines at Los Baños (UPLB) National Economic and Development Authority (NEDA) National Food and Agriculture Council (NFAC), Ford Foundation, United States Agency for International Development (USAID)
- 1975** The Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA)
Budget Commission (now the Office of Budget and Management, OBM)
Commission on Audit (COA)
- 1976** Philippine Sugar Institute (now the Philippine Sugar Commission, PHILSUCOM)
Forest Products Research and Industries Development Commission (now the Forest Products Research and Development Institute, FPRDI)
- 1977** Visayas State College of Agriculture (VISCA)
- 1978** Victorias Milling Company, Incorporated (VICMICO)
- 1979** Freshwater Aquaculture Center of the Central Luzon State University
- 1980** Philippine Root Crop Research and Training Center (PRCRTC)
- 1981** Institute of Plant Breeding of the University of the Philippines at Los Baños
- 1982** Marine Sciences Center of the University of the Philippines System (now Marine Science Institute, UPMSI)
- 1983** San Miguel Corporation (SMC)
- 1984** Philippine Tobacco Research and Training Center (PTRTC)
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Appendix 7. Pantas Awardees

- 1976** Honorable Florencio A. Medina
Honorable Arturo R. Tanco, Jr.
Honorable Jaime C. Laya
Director Domingo F. Panganiban
- 1977** Dr. Jose D. Driilon, Jr.
Dr. Francisco M. Fronda
Dr. Dioscoro L. Umali
- 1978** Dr. Joseph C. Madamba
- 1979** Dean Domiciano R. Villaluz
- 1980** Dr. Ernesto B. Pantastico
- 1981** Dr. Leopoldo S. Castillo
- 1982** Dr. Fernando A. Bernardo
Dr. Adolfo V. Revilla
Dr. Gela T. Castillo
- 1983** Dr. Ruben L. Villareal
Dr. Perla L. Lopez
- 1984** Dr. Vicente B. Valdepeñas, Jr.
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