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Review and Evaluation
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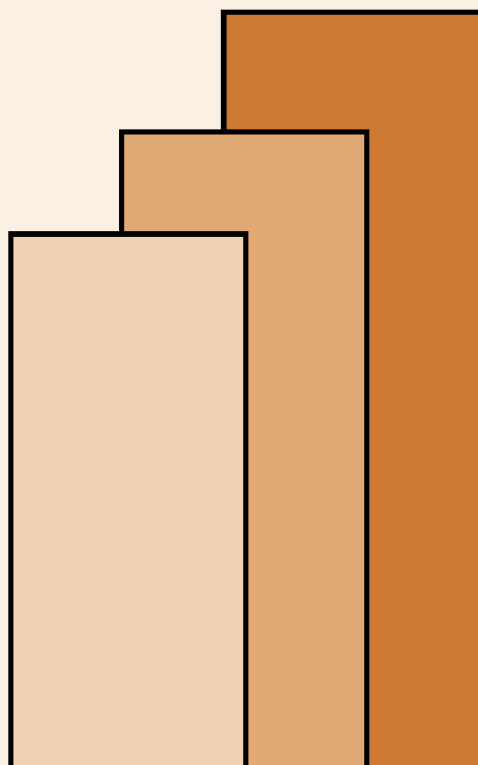
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REVIEW AND EVALUATION OF PUBLICLY FUNDED RESEARCH AND DEVELOPMENT IN AGRO PROCESSING

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Part I

REVIEW AND EVALUATION OF PUBLICLY FUNDED RESEARCH AND DEVELOPMENT.

Going over the research titles of the agro processing work financial plans of 1996 to 1998 it appears that the information does not lend itself to an organized management information system that is essential for sound decision making based on agreed upon policies. Three classification of research proposals will help, in making it easier for decision makers to evaluate and decide if the researches are attuned to the policies and needs of the clientele.

1. The first classification should differentiate between those which are more technical than scientific. For example: If there is agreement that scientist and technical manpower are scarce resources, then the researches should be identified in terms of researches that are procedurally technical in nature and those that are truly scientific requiring the inputs of science based knowledge.

There is much to be gained by recognizing the expertise and qualifications of technicians who over the years have by experience learned detailed skills in carrying out a process. They may not have the educational qualifications of the scientist but they know exactly the critical details of what has to be done on the ground to truly enable them to transfer technology that can be replicated by the ultimate users (farmers). A technician may therefore be able to demonstrate and with the help of an educationally trained person document properly how to plant and grow vegetables better than a Professor who has not spent as much time planting vegetables.

Researches that are technical and procedural in nature may turn out to be more effective researches if prepared by or with the participation of the experienced technicians. For example 'utilization of culled chicken'. Researches of this nature are better performed by experienced technicians whose expertise are procedural methodologies associated with the process. Practice and experience in the process activities are the more essential elements rather than scientific inputs.

On the other hand, there are researches that are dependent upon the specialized scientific knowledge or the combination of scientific knowledge to bear upon the defined problem. Application of laboratory experiments and/ or scientifically accepted experimental procedures and methodology is the core of the research work to be undertaken. These types of research requires the more educationally trained researchers.

The differentiation of research activities into these two categories will improve the decision process of determining the qualifications required of the researchers. The proper deployment of expertise can be influenced by the funding made available for research activities. It will also provide an opportunity for experienced technicians to gain access to the research funds. By documenting technical processes and procedures, they provide end users of the research, such as farmers, with practical best practice or applicable new technology presented in ways that the users can immediately apply. In like manner, their research output can also be used by the scientist doing the more theoretical scientific research activities.

When the scientific inputs are clearly stated in the research proposal there can be the possibility of challenging the intellectual pride of the scientist and improving the quality of scientific research proposals submitted for funding.

To illustrate further, for instance in the case of fruits, corn and rice dryers, we have to distinguish between a research design for dryers that are science based and those that are simply designed to operate like dryers. Corn dryers that simply provide heat to dry without any controls for temperature and air movement velocity and without the elements that specify the temperature and the drying time to get various desired results for the dried product do not have the proper scientific input.

The fast dryers for wet palay designed by the government is a very good example of a dryer that has practically no utility value. The design of the dryer is so bulky that the equipment cannot reach out where there is a need for fast drying of palay. The high temperature curb of the dryer causes the grain to become brittle and crack giving the palay a very poor rice milling quality. The design of the kerosene heating component of the dryer causes the odor of kerosene to permeate the palay making the rice milled from palay dried with the equipment unacceptable to consumers.

If the scientific inputs were clearly incorporated in the research proposal then the mechanical design plan could have avoided some of the technical pitfalls of the output.

- 2 The second form of classification should be made to aggregate related researches by commodities. This will make it possible to determine the various researches being undertaken by different institutions for the same product groups. It can minimize unnecessary duplication. Research or development gaps can easily be identified to insure that the output of the various research when linked together will be useful.

Budgetary allocation by commodity will also surface very clearly so we can better determine if we are over investing in a commodity that may have very little economic value. The preponderance of research for silkworm is noted in the list of researches undertaken exceeding the budgetary research allocation for legumes and nuts, sugar, rootcrops, marine products, tobacco, and cotton. This was covered in the paper of Dr. C. David which related research fund allocation to commodity value contribution to domestic production.

(see ANNEX 1)

The various research proposals made by the Regional Director of Region VIII may be used as an example of what may at first glance be considered an integrated research proposals for jackfruit.

It covers the issue of plant varietal selection that will match the product use, the issue of plant disease, utilization of by- products to increase the value of the fruits, the processing and the product application. It is difficult to assess if these are duplications of other research completed or are being undertaken by other research institution in the country.

There is however no indication that planters or tree cultivators of jackfruits and the users of the fruits have been consulted to incorporate their input in the research design. For example, is it the juice that is of value to the ones who buy jackfruits or is it the bite and taste qualities of the fruit that is more important to the consumer.

Actually, research management should first provide direction for the research activities. It must first determine if the processing of jackfruit for juice is the relevant value for jackfruit. Was there a more basic economic study to determine if the amount of juice that can be derived from the highest juice producing jackfruit variety will cover the cost of processing for juice? What will be the cost of juice given the volume of juice that can be derived from the fruit. What if the greater economic value for the jackfruit is towards fruit preserves making the solid characteristics of the fruit more relevant than the juice. The research output for juice may even mislead farmers to planting the varieties that the market will place little value when harvest time comes.

But even before research direction can be made, there has to be a study to provide information on the economics of planting jackfruit. How many kilos of fruit does one tree yield ? How much revenue can be generated for every kilo of jackfruit as a fresh fruit? If processed, what yields will it have? Will the cost of processing and the volume of finished product produced after processing provide a return to the farmer planting the trees.

While the decision to plant may be in the hands of the farmers, we have to recognize that small farmers do not always have the capacity to make this kind of economic evaluation. They are therefore swayed by research output like those that show a variety of jackfruit providing a high yield of juice. By implication of the positive results of the research, decision makers of government agency can even be misled into developing programs encouraging the planting of this jackfruit variety only to find out six years later that there is no market for the fruits.

Very often, what farmers present as marketing problems are not real marketing problems but rather problems derived from producing products that have no consumer demand either because of limited utility value, quality or price or both quality and price.

- 3 The third classification of research proposals should try to attempt to classify by differentiating
 - a) researches that are 'more related' to the agricultural activities of producing the agro products;
 - b) general research that provides inputs to other researchers doing specific application research;
 - c) research on processing; and
 - d) researches on product development.

Different commodities have different research priority requirements. (we assume here that there are separate budgets for the purely agricultural activities of say producing rice and corn). Some require adjustments of the raw materials in order to be more economically compatible with the processing requirements in which case the research project should deal more with providing the farmers with research information of the characteristic requirements of processing. For example, in the

processing of mangoes, research to determine the most desirable solid and moisture content in the fruits will help farmers select varieties to plant when large scale plantations are planned to supply processing requirements. In other cases, the real problem has to do with the production and supply of the agricultural raw materials.

Some food processing activities are dependent upon raw materials that seem to have sprouted from the wilds rather than cultivated. The banana chip, the banana catsup processors for example are dependent upon availability of Saba variety of bananas indigenous to the Philippines. Banana chips have no substitute while banana catsup manufacturers reformulate to use less bananas in the manufacture of banana catsup. The versatile characteristics of this variety of banana has been recognized by other countries and attempts are being made to cultivate this variety in other countries. I am informed that there is very little being done to systematically propagate and cultivate Saba banana.

Kaong is another raw material of food processors that is dependent upon the harvesting from existing plants. On the agricultural research side, we do not see much interest in Kaong research.

In some commodities, processing is the bottleneck. Very often available technologies are built into machines and equipment. If these machines are too big or too expensive they do not become applicable to agro processing under Philippine conditions. It is therefore important to understand the technologies involved in order to manufacture alternative process equipment or to be able to mimic the process that takes place in the machines with the built in technology. Process research usually requires the collaboration of the food scientist and the engineers to be effective in having useful outputs. We note the absence of joint projects by food scientist and food engineers working on process research.

Product development research are priority for commodities that are already available in quantities at farm and processed stage. The objective will be to gain value added for the agricultural product so product development research has to be attuned to the market. Information on market demand and acceptable pricing levels are essential parameters of product development research.

Based on the attempt to classify the Researches listed in the 1996-1998 work plan into the above categories, it appears that only one percent of the research budget relates to the agricultural production. A slightly larger 7.63 % may be considered as general research i.e. researches whose value will depend on its usefulness to other scientist doing research work; 42.13 % involves processing and 49.22 % are for product development.

(see ANNEX I)

The distribution of research funds to each of the research agencies may be a dominant factor that influenced the type of research undertaken.

(see ANNEX II)

OTHER RESEARCH MATERIALS AVAILABLE

Among the research materials available for review are listing of researches undertaken and thesis output of Ph.D. and Masteral graduate students.

1. These materials can be put to greater use if they are properly indexed by subject so other researches can access the information with greater facility.

2. It is also noted that substantial budgetary allotments are given to the same researcher who undertakes several research activities. For those making decisions in funding the various researches of the same researcher it might be useful to determine the inter relationships of each of the research activities among each other or with the researches of others. Otherwise, there can be the possibility that researcher will be undertaking several unrelated research activities without any end result direction towards specific wealth creation. There is a danger that the research activities becomes the end in itself or a means to capture available research funds.

Part II

MANAGEMENT OF RESEARCH INSTITUTIONS – CLARIFY PUBLIC AND PRIVATE SECTOR ROLE.

The suggested general policy approach to agricultural research is to link researches as much as possible to the productive systems in the economy. (Dr. George Tzotzos of UNIDO). This will mean relating research backward to agricultural production activities and forward to the processing and value added chain of agricultural products. There is a huge gap between the research activities and the productive systems. This leads to what is often referred to by scientist as the lack of interest by investors in their research output and in what investors in the productive system laments as a dredge of viable research output that they can use or invest in.

Research when viewed to be linked to the existing, productive systems opens two new dimensions to the type of researches that will have to be undertaken.

First, the research output will have to somehow match the technical capabilities of the users. While research is often synonymous with being in the forefront of contemporary times, it is of little value to the productive systems that is so far behind. They are thus unable even if desirous of using the knowledge output of the research.

Secondly, research expenditures have to be treated as investments that will have economic value and make a quantifiable return on investments. Much like other forms of investments, research expenditures can be measured in terms of its rate of return on investment.

It will be helpful for those making budgetary decision to have cost information of the research and the potential quantifiable value of the outcome if successful. It will also help identify the unproductive research areas. Some problems are over researched over a span of time with no apparent outcome. In these cases an in depth analysis of the reasons may be in order before additional funds are given or that the research proposal should be exploring new avenues not previously explored.

It is also important to identify the productive researchers. This can be done if a summary of public funds entrusted to a scientist can be summed up over time to determine the viable or useful output the researcher has produced over the years. New research money should therefore moves towards institutions and researchers according to performance record measured in terms of economic returns.

Changes in Research Institutional Practices

Efficiency of management in research institutions then becomes the starting point in producing results that will make some if not good rates of return on research investments.

In the absence of a formal study on the management efficiencies of our research institutions, interviews were conducted among research scientist to draw from them generally known practices of publicly funded research institutions. Those interviewed

have done and published scientific researches and while they declined to be identified each one had about the same observation.

It was generally observed that most research undertaken by scientist in the Philippines do not have the benefit of inputs from 'experts' in specialized fields of discipline. e.g. chemistry or physics etc. each researcher therefore acts as an expert himself even when the research activities requires interdisciplinary expertise.

Among the most often mentioned as practices that causes unproductive research output are the practice of institutions charged with granting research funds to solicit research proposals and literally 'steal' the intellectual content of the proposals. When proposals are submitted, additional information are requested by the reviewers then the proposal are left in limbo for a long period of time. At a later date, the research proposal are recycled by other parties connected with the research granting institution. The scientist who ends up being funded may not necessarily be the most qualified to undertake the particular research.

There are also reports of research proposals being approved only after revisions are made by the proponent to include conditions such as the inclusion of other favored researchers with specified compensation regardless of whether such person are really relevant to the research undertaking.

Research granting institutions takes off 20% of the research budget proposal for administrative expenses. If the researcher is connected with a University, another 10% is splice off the research budget. The 30% non research overhead is therefore not budgeted with transparency in that there is no tracking of the real management cost for research activities. Research proponent either overstate their budget by 30% or undertake the research underbudgeted by 30%. Research proponents tend to overstate budgetary request while those administering research budgets prune what they think are overstatements in the proposal. The system does not lend itself to the proper determination of what is really required to do a good job.

To improve the management of research institutions, it was suggested that it starts with the basic of proper qualification of researchers who will be entrusted with deciding and /or receiving research grants.

1. It was recommended that the first priority for scientific research grants be given to those who have published research in an ISI (Institute of Science Information) approved science publication.
2. In order to provide more opportunities for Filipino scientist to qualify, the Philippine Journal of Science can be supported so that it can be accredited by ISI over a two year period.

For the Philippine Journal of Science to meet the international standard requirements for an ISI accreditation, the condition for public fund support should be that the initial Board of Editors be selected from among the Filipino scientists now working abroad who have already made a name in their field and have published research work in an ISI accredited publication. There are a number who will qualify now residing in the United States, Europe, Japan or Australia.

3. That in selecting the senior management of educational and research institutions – Presidents of State Universities and Colleges, Deans, Directors etc. publication of research in an ISI accredited publication be added as a requisite to the academic degree requirements.
4. Reviewers of research proposals must themselves have published credible work in the past.
5. Research granting agencies should not themselves be research grant receiving units otherwise, the granting agencies will tend to capture research funds instead of harnessing the expertise that is available in other institutions. In other words research management managers should not themselves be competing for research funds.
6. To insure that the research output do not fly over the heads of the intended users, a separate section may be considered in the publication to incorporate practical research output that may not have the sophistication of state of the art or trail blazing researches.

Rice and Corn Research

Summed up over a prolonged period of time, Rice and Corn represents the two commodities that must have used the lion share of research funds in the Philippines. The amount of budgetary expenditure and the long history of research activities in these two commodities provided the time for research and development to be institutionalized possibly providing the historical opportunities for research management to be the most effective among the publicly funded research activities in the country.

From an institutional point of view, Rice research has managed to have an organizational mechanism for coordinating research activities when Phil Rice was organized in 1985. To date there is still no institutional mechanism to coordinate the research activities for corn. There is an international corn research organization located in Mexico equivalent to the Philippine based IRRI for rice but there is very little evidence that a mechanism formally exist to systematically transfer internationally available corn technology to the Philippines.

Bias of Rice and Corn Research

A random scan of the various research output for rice and corn appears to indicate a very heavy bias towards varietal research. It is as if the research output of new varieties is the be all and end all to meet the value creation needs of the production system i.e. the rice and corn farmers. From 1955 to 1997 one hundred thirty five varieties of rice (135) were released by the seed board. All the rice varieties were released by publicly funded research institutions. During the same period 166 varieties of corn were released. Of these, eighty seven (87) , all hybrid corn almost all yellow varieties were research output of the private sector

The value of varietal research can not be under estimated, it is however important that the research be directed to respond to well studied anticipate future needs. For example, in addition to the objective of developing varieties that will increase yield, there may be need for new varieties to replace existing varieties if such succumb to some disease. There will also be a need for varieties tolerant to diseases, or not requiring too much water. Farmers should also have seed varieties with a longer harvest period and some with short harvest characteristics. The advent of biotechnology as a scientific tool facilitates moving towards more specific future need oriented objectives.

Ideally, we should have varieties and seeds on hand that will best produce under different weather conditions. A rice variety that grows well during periods of drought, a variety suitable when there is too much water and high probabilities for typhoons, an early harvest variety for the second and third cropping , varieties resistant to certain disease endemic to some geographic areas, etc.

Availability of adequate seed required for the season is the most limiting consideration for farmers to be able to use the right variety for the required weather conditions. Seed producers can not be expected to produce and have these varieties on hand on short notice when the weather conditions can be better predicted.

The government has an opportunity to provide a 'common good' service to the rice farmers if government will undertake to construct controlled atmosphere seed storage facilities that can be leased at a nominal rate to seed producers. These storage facilities will have greater value to the farmers than government owned rice or palay warehouses. Adequate loans should also be made available to seed producers for stocks of seeds that are kept in these strategic seed storage facilities. Better still it may be worthwhile for government intervention to be directed towards making the right seed varieties available. Instead of the buying and selling of rice, government can buy and own the strategic seed supply for release before planting season. The quantities and indirect subsidies involved will surely be less than the current NFA subsidy for palay and rice stocks and will even be more manageable.

From a management point of view, to optimize the value derived from the varietal research, there must be a system to enable the farmers to actually put to use in the field the research output. This is only possible if the seeds are available to them when needed and where needed.

The heavy research bias towards varietal research has made valuable contribution to the increase of rice production in the country. This experience may however have also resulted to the oversight of some very critical considerations that has caused damage to the industry because some critical research activities were undertaken only much later in response to the negative outcome of the hybrid varietal adoption. In some instances the issues that can make more substantial contribution to productivity are not yet adequately addressed.

To explain further, the introduction of several varieties of rice and its promotion among farmers has resulted to farmers within geographical areas to be planting different varieties instead of the varieties that are most suitable to the soil and the

weather condition during the season. Planting different varieties may have beneficial effects in controlling pest and disease but cycle rotation of varieties can also achieve the same results. Multi varietal production in small geographic areas results to the mixing of palay production in different shapes and forms causing rice milling inefficiencies i.e. reduced milling yield of good grain rice.

The introduction of hybrid rice varieties which required the heavy use of fertilizer was made before adequate researches were undertaken to determine the real soil condition in at least the major rice producing areas. Farmers were no wiser on the effects of misusing or over using some types of fertilizer. This has resulted to the increase in soil acidity and in further increasing the input cost of production in some areas. Cost that can not be compensated by the higher yield may be one reason for the slow adaptation rate of certified seeds now calculated at only 15 % among rice farmers.

Too much emphasis in macro fertilization has even to date left behind the application of micro soil nutrition which is less expensive and which even without change in the variety planted can increase yield from 3.0 to 8.3 MT per hectare in some soil conditions.

Lack of Institutional Coordination Among Public Research Organizations

Coordination among research institutions involved with rice research have not yet succeeded to coordinating their output. For example the recommended balanced fertilization technology of the DA Bureau of Soils, the Phil Rice and UPLB are different from each other.

Government itself has not been an effective user of research output. Various technologies like those that will help determine the nitrogen requirements by means of the color or the leaves have not been widely adopted by the Department of Agriculture as a tool in assisting farmers.

Specific Research Direction That Matches The Varying Conditions and Capabilities of the Corn Farmers.

If we are to remain faithful to the concept that research has to be linked to the productive systems, 'high tech solutions can only be effectively adopted by high tech farmers who has the capacity to use the technology. How many high tech corn farmers do we have? How much 'ideal ' farm land are used to plant corn . Corn land in Mindanao when irrigated are converted to rice land because of the higher commercial value derive from producing rice than corn. This is also influenced by the "NFA guaranteed price for palay and corn. Only when integrated to livestock production, can corn for silage production in some areas compete with rice for land use.

Good decisions are made when there are adequate and reliable information. Lack of good statistics are often substituted by the use of 'average figures' . Using average figures for decision making can mislead when the range of the highest and lowest figures are wide or when the relative weight of each data used are not accounted for.

Our approach to increase our corn production output by using 'average' production as a point of reference misled our past efforts. This is aggravated when we compare 'average' production with yield potentials of high yielding varieties that grow under specific conditions not necessarily existing in the farms where the 'average' figures were drawn from.

More than in the case of rice, the variables in the land, growing conditions and capabilities of corn farmers are much greater than that of rice farmers. We do not even know if surges in corn production output in some years are the result to land use conversion from rice to corn when the available moisture is not adequate for rice.

The lack of appreciation to understand this variability as a critical information to develop solutions to the problem of low corn productivity has also resulted to very little information gathered about the different conditions or classifications of corn growing areas and of corn farmers. The needs of say the upland corn farmers are very different from the low land corn farmers. The needs of corn farmers in northern Luzon are very different from that of Cotabato and that of the Bukidnon / Lanao area are still different.

Commercialization of Private Corn Research Output

The private sector involved in the business of hybrid corn has managed to identify the corn areas and the corn producers where hybrid yellow corn are most applicable. Their concentration in providing hybrid yellow corn varieties as economically viable solutions has resulted to an increase in the output of yellow corn over the past few years. It does appear that the private sector is providing itself with the 'high tech' research and solutions to corn farmers and farm land that can absorb the higher level technology.

But what then of the corn producing areas that are not covered by the hybrid corn producers? These production land areas can be much greater and in spite of the very low yield their output may be so significant as to drag down the national production average output of corn.

If this proves to be the case, then high technology corn varieties requiring more demanding inputs and more sophisticated cultivation practices may not be the solution to the problem of increasing corn production. We may have to search for other alternatives.

Mining The Intellectual Assets on Hand.

In business, private corporations have recognized the value of its intellectual assets. A process termed as 'mining the corporate intellectual assets' is regularly conducted to surface information and knowledge that is available but not fully utilized for wealth creation.

It may be a worthwhile investment to find out what is the status of the varieties of corn (specially the open pollinated white corn) already developed and approved for release in the past. Are they still applicable? In what growing areas will each of the

varieties improve yield over what is currently being used by the farmers. (see ANNEX III)

Among the marginal farmers, their basic crop is white corn. Do they represent a significant segment in the total corn output? If so what will it take to increase their output? After all they are part in the calculation of the 'average' corn production yield. Since most of these farmers are located in far away places, are farm to market road the solution for very small farms in the upland? Will it not be better for the farmer to convert the extra corn he produces into livestock which he can walk down to the market? Again, what are the requirements of the upland marginal corn farmer to raise livestock? The greatest deterrent to small scale livestock production is the seasonality of the availability of feeds. Small upland farmers can not afford or access commercial mix feeds required for small livestock. This is also true in some regions like the Ilocos provinces. They are unable to raise more ruminants because after the corn harvest they will have no feeds.

Need for Research on Feeding Grass

It is a surprise that when scanning all the researches being undertaken by the various research institution, I came across only one research on 'grass' for feeding livestock. A Ph.D. thesis entitled " Forage, yield and digestibility of promising grasses and legumes by Pacia, R.B. " Feeding grass was not among the popular research activities funded by government research institutions. If feeding grass were to replace the cogon grass in most farm areas, farm productivity can increase significantly. Australia for example has a feeding grass variety that crawls and can kill grass like cogon which has poor feeding characteristics and very little nutritional value to ruminants. It is research of this nature that directly impacts on the poor and gives meaning to many mission/ vision statements of public institutions committing themselves to help the poor farmers.

Need for DEVELOPMENT to Tie Up With Research Activities

We often use the term RESEARCH and DEVELOPMENT but in practice we do research with very little 'development' in mind. The absence of the development aspect that is concomitant to the research undertaking can be one of the major factor that adds to the distance between many research output and the productive sector that can make use of the research. Pursuing the development aspect of research can help bring down to earth 'ivory tower' research activities.

The possibilities of private sector collaboration with government funded research activities in the development aspect of research should be explored as one of the ways to bring research closer to the productive systems.

Private /Public Sector Role

We started by stating that research should be linked to the productive systems. The productive systems are private. But the private productive system can be classified into the more technically and financially able and those that are still very traditional.

It can be expected that private sector research will move first towards the more affluent and monetized sector of agriculture and wherever their research investment can be protected so that they can derive monetary benefits from their research, development and marketing investment.

The Public research institutions however has to fund the requirements of the people who can not be serviced by the private sector because they do not represent viable customers of private business and can not earn by means of selling the value derived from their research investment.

There are also researches that has to remain in the public domain. These are researches that are required in order to establish the environment for the common good of all. These includes researches to establish standards for all the players in the industry, provide information such as moisture and weather conditions, provide access to information that are made available on a government to government basis. Provide technology for common facilities that are required by everyone to do business.

The needs of the more traditional sector of Agriculture do not represent a real market for private research output and therefore has to be supported by public funds. Normally, after the research results are released, the private sector are the logical market for the intellectual output. Unfortunately in the case of Agriculture, the level of sophistication among majority of our farmers have not yet reach the level where left on their own they can make the best available alternative decision. For them to make decisions, there has to be specific intervention to either make the technology more friendly and to provide more detailed information on the application of the technology. For example, we can not expect the corn farmers to review the list of available seed varieties and make decisions on the varieties that will be most suitable to the land he cultivates. We can not even expect farmers to anticipate a major weather shift such as El Niño or El Niña and on their own decide on what variety of seeds to use. After developing the variety, government intervention is still required to match the application of the research output to the specific potential farmer user.

PART III

IDENTIFY PUBLIC RESEARCH PROGRAMS THAT WILL ASSIST THE PRIVATE SECTOR

To better ensure that the suggestions are relevant to specific commodities, this section will try to cover research areas in two of the five identified priority commodities to be given focused for national research support and one non priority commodity that may fall under the a regional program. It should be noted that public research output for agriculture to be of value to the private sector requires corollary inputs to organize self sustaining productive systems that links the farmers with traders and processes and even to the end user markets.

BANANA

In a conference on priority commodity research among the researchers working in the field and representatives of the private sector, there seem to be a consensus that there is adequate state of the art technology on Cavendish bananas now applied by the plantation growers and their contract producers.

The areas of opportunity for the further development of the banana industry is in the Lakatan and Saba varieties. Large planters in Mindanao are moving quickly towards applying more advanced technology to propagate the Lakatan variety. However, small farmers, particularly those in Luzon and the Visayas, are being left behind. They are not as updated in the knowledge and application of technology, both in the propagation and in the cultural management needed to manage disease and increase production yields.

Food processors/exporter are also concern with the long term availability of the Saba variety of bananas. Saba is said to be an indigenous variety that is not being systematically propagated. Saba variety of banana has cooking and processing characteristics that lend itself to the export in process form. Banana chip leads among Philippine export products but is faced with future competition from countries like Thailand and Malaysia possibly Indonesia who has acquired the seedling of Saba from the Philippines. Exporters expressed concern over the long term supply of Saba banana is also based on an increase domestic demand for banana-que , banana catsup etc.

The major technology available for both varieties are tissue culture and cultivation practices that can increase yield and reduce significantly the incidence of banana plant diseases.

To address the issue of research activities that will benefit the private sector, it appears that programs to increase the application of already known technology such as tissue culture can increase the planting of Lakatan and Saba varieties of bananas in the Luzon area. This will address the need of the private food processors and exporters.

Transfer of tissue culture technology and farm cultivation practices to reduce plant diseases and increase yield particularly in Luzon where the demand is highest should be given priority attention.

As a pilot, it is suggested that a private sector enterprise in Luzon be encouraged to invest on a 'tissue culture' laboratory. As an investor in an agri-business project, the entrepreneur will have good reason to drive the production and sale of Lakatan and Saba seedlings.

To encourage the entrepreneur to make a financial investment in the project, the investor can be provided with the following assistance from the public sector.

1. The tissue culture technology will be transferred to the private investor free of charge. UPLB is in a position to undertake the technology transfer. UPLB can also provide the investor with a rough project study to show the viability of the investment.
2. The DA should undertake a survey of the potential farm areas for expansion in Quirino and Nueva Vizcaya (These provinces in Luzon are now planting Lakatan and Saba bananas using traditional practices. The province of Mindoro was also identified as a Luzon based supplier of the processors and can be organized into another geographic agri business system for Saba and Lakatan bananas.)
3. The DA will undertake to gather the potential Lakatan and Saba Banana farmers in Quirino and Nueva Vizcaya so they can dialogue with the investor in the tissue culture laboratory.

Among the agenda will be

- a.) discussion of the estimate pricing of the seedling and a profit and loss presentation by DA or UPLB to the farmers planing to increase their Lakatan and Saba production output.
 - b.) technical presentation of the cultivation practice recommended.
 - c.) verification of the survey that DA has undertaken on the demand estimate for seedlings.
 - d.) identification of the other requirements of the farmers to be able to expand production. e.g. credit
 - e.) promote among the farmers the adoption of the tissue culture seedling and the adoption of better cultivation practices.
 - f.) assist the tissue culture laboratory investor estimate the number of seedlings that will be produced.
4. In the same one day meeting, DA will also invite the Food processor, exporters and the banana traders buying from the two provinces so they in turn can provide the farmers an idea of the additional volume they can absorb.

The concept involves putting together an agribusiness system within a manageable geographic territory. In the process, seedling production technology can be transferred to the private investment sector who can act as the sustainable driver of the system. Farmers cultivator will be introduced to better cultivation practices , encouraged to increase their planting and the raw materials supply of food processor –exporters .

This will be a proactive management approach to start an agri business system that has 12 months to 18 months gestation period for the seedling producer and another one to two years for the farmer cultivator. By taking a proactive approach, all those involve in the system are able to decide with more information and hopefully reduce their decision making risk.

MANGOES

Mangoes has been identified to lead among the potential fruits with an export demand. Mangoes have markets as fresh fruits and in various forms of processed products. In the medium and long term, there is an estimate shortage of fruit supply.

In the Mango congress held in Cebu from June 17th to 19th 1990, there was a general consensus that while mango production and processing has reached early maturity as an industry, mango farmers still require specific information that can be provided only after more research activities are undertaken.

The Agricultural Areas for Research

1. Planting distance between trees.
2. Water management
3. Fertilizer management
4. Better understanding of flower inducing process.
5. Better understanding of plant physiology transformation from the generative mode to the reproduction mode.
6. Causes and ways to reduce fruit drops after flowering.
7. Disease and pest management.
8. Selection and availability of planting materials
9. Development of alternative variety or strains to the Carabao variety.
10. There is a need to develop a way to prolong the harvest season during the year.
11. Current average yield output of 7 tons per hectare can be improved up to 1- to 12 tons per hectare.

Post Harvest

1. Disease that affects the fruit quality.
2. Latex damage to the fruits
3. Shelf life extension

The Processing

1. Standards of finish products are currently driven by the technology adopted by each processor. There is a culture of 'confidentiality' among each processor as each are using technology that are internally generated mostly by trial and error and some by means of ingenious invention or use of equipment.

The implication of this is that some product standard of processed mango products may be set on a brand basis rather than a set national standard for the country.

2. Processing is currently labor intensive. For production capacities to increase that will result to efficiencies of larger scale production, the mango processing industry will need to mechanize their process. Otherwise, increasing output by addition of labor can result to increasing production cost.

A processor has indicated that any research in the area of automating mango processing will greatly benefit the mango processors.

3. Most of the mango processing plants started as small manufacturing facilities that expanded over time. As a consequence, the production layout and the facilities are not conducive to the practice of good manufacturing practices and are in danger of failing to meet the international HACCP standards.
4. Power cost is significant for dried mangoes and most processed products are made less competitive because of the higher prices of sugar. Sugar supply under special arrangement to assist them do not take into account the seasonality of the fruit supply.

Research on lower power cost dryers and effective recycling use of sugar can improve the cost competitiveness of processors.

5. Short supply of mango fruits is currently a restraining factor to further development of markets. It was cited that there is a demand for dried mangoes in the United States and Europe but manufacturers can not supply due to shortage of fruits.
6. The production of fruits is very seasonal providing the processing plants raw materials for only four months during the year.

Research that will make it possible to produce mangoes year round will greatly improve the competitiveness of mangoes.

It was pointed out that only Cebu has the favorable weather condition that makes it possible to produce off season which is fully absorbed by the fresh fruit market demand.

Based on this observation, there is a real opportunity for DA to have a joint program with the Cebu Provincial government so as to systematically undertake a province wide program whereby every farmers in every municipality will plant mango trees. Cebu seem to be a favorable geographic location. The environment will improve with more trees reducing soil erosion and improving the water table in the island. The soil and proximity to the sea shores (areas within 10 km from the sea and rolling land) are said to be ideal for mango trees to grow and bear fruit. Off season fruits can be harvested. The physical and marketing infrastructure for mangoes are already in place.

An aggressive large scale mango tree planting in the province of Cebu specially where there are already roads going to the City of Cebu will surely have a high payoff to the farmers and the economy of the province.

Jackfruit (Langka)

The approach of selecting only some commodities to focus research activities leads people in geographic areas to try to force participation of their province in the selected major commodities for research. An example may be the case of Leyte and Samar. Scientist and institutions located in these provinces will naturally signify their desire to be a part of the mango commodity development program. It may however turn out that the weather conditions in some provinces such as the high incidence of typhoon the length of the wet and dry days during the year etc. may not be ideal for mangoes or citrus or bananas. It may also be that even if the area is suitable, the physical infrastructure and marketing structure will make it unprofitable for the farmers to compete with the better located provinces. Without an immediate alternative to offer, the political pressure may force the issue of dispersing resources and nullify the objective of focusing limited research resources towards commodities that has the greatest potential.

It is therefore suggested that the plans to have regional research and development programs be accelerated. This will enable those provinces currently unable to participate in the national commodity programs to know in what way they can participate in and benefit from the overall research and development objectives.

One way will be to identify fruit trees that are suitable in specific regions and develop an efficient propagation program that will be tied up with a corresponding processing and marketing programs that is suitable to the province.

For example , there is now a technology for vacuum frying of fruits and vegetable. The fruit and vegetable snacks produced with the use of this technology is now in the market and appears to be of a quality and acceptability that can be considered for the export market.

Sample of the vacuum dried langka is available. It appears to be a high value product when processed in this form. Available geothermal power in Leyte might be a plus factor for processing in the province.

A plant using the vacuum frying technology is estimated to require at least one ton of raw materials per day. The tendency of food processors will be to locate in the Metro Manila area where they expect raw materials coming from all the provinces to converge assuring them of raw materials supply to feed the plant.

If say Leyte is determined to be suitable to grow Langka trees and the economics of growing langka trees are determined to be viable for the farmers then a minimum number of trees will have to be planted within accessible areas to be able to support a plant or two.

Initial information about Langka indicates that it takes three years for the tree to bear fruit. That is a shorter gestation period than mangoes. It takes about three months for fruits to mature for harvest. It has a seasonal fruiting of March to April. Trees bear only four fruits per year and each fruit has only 6 to 7 kilos of edible portion.

The research challenge are therefore numerous to make Langka a more economically viable fruit tree.

Is there a way to propagate a variety so that there will be 8 or more fruits per year instead of four. Is there a way so the trees can be made to bear fruit on a staggered basis year round.

Given the technology, will government undertake the mobilization and provide the technical and financial services to enable the farmers to expand their production towards the products that has potential market demand.

If we are to encourage dispersal of food processing in the provinces say Leyte, what numbers of tree will have to be planted in the provincial areas with access to the plant? What other fruits can grow in the area that will be suitable for the processing equipment of a food processor so that the plant can operate year round? Leyte already has the advantage of growing sweet potatoes, squash and other root crop vegetables that lends itself to the mentioned processing technology.

Research to be effectively helpful to the private sector has to be integrated to also address all the considerations necessary for a viable agri business system to work. We have to identify products that have a market and the processing technology to process the product. We must also produce the agricultural raw materials suitable to the equipment/process in the volumes required by the processing machineries. The planting of the raw materials must have economically viable access to the plant, and produce adequate agricultural raw materials to feed the plant on a daily basis year round. We must ensure that the technology and cost from the farming to processing and marketing will be profitable to all the stakeholders in the system.

The private sector generally are not able to support the cost of researches that farmers need to be able to produce economically the raw materials needed by the food processors. These is specially true if the raw materials are produced by a very large number for farmers. Private sector also have limited resource and expertise in mobilizing farmers to produce the raw materials they need in the quality and quantity that they require. Food processors generally have to compete with other products that does not carry the cost burden of developing the production of the raw materials and educating the producers of raw materials. Investment decisions are therefore made where the economic imperatives of the business are already available.

By way of orientation, farmers seldom have the inclination and expertise in manufacturing and marketing of consumer products while manufacturers seldom have the orientation of the farmers. Somehow, the government must assume the role of bridging the gap. Government research institutions and activities can provide a good vehicle to bridge and form new agri-business systems that will increase farm production, increase the volume of value added products and even accelerate export of agri based products.

ANNEX I

BUDGET ALLOCATION FOR THE TOP 12 AGENCIES (1996-1998)

Name of Agency	Agriculture	%Budget	General Research	%Budget	Processing	%Budget	Product Development	%Budget	Total Budget	% of Total Budget
ITDI	0.00	0.00%	0.00	0.00%	4,683,099.00	41.97%	6,475,681.00	58.03%	11,158,780.00	18.31%
DA-FIDA	0.00	0.00%	1,785,000.00	28.46%	0.00	0.00%	4,487,000.00	71.54%	6,272,000.00	10.29%
PHILRICE	0.00	0.00%	0.00	0.00%	0.00	0.00%	4,934,000.00	100.00%	4,934,000.00	8.10%
BPI	0.00	0.00%	1,031,300.00	22.80%	2,121,287.00	46.90%	1,370,700.00	30.30%	4,523,287.00	7.42%
PTRI	0.00	0.00%	0.00	0.00%	2,272,421.00	65.22%	1,211,806.00	34.78%	3,484,227.00	5.72%
UPLB	112,032.00	3.31%	311,136.00	9.19%	2,446,100.00	72.27%	515,520.00	15.23%	3,384,788.00	5.55%
DMMMSU	0.00	0.00%	0.00	0.00%	2,651,099.00	78.68%	718,233.00	21.32%	3,369,332.00	5.53%
PCIERD	0.00	0.00%	800,000.00	24.24%	0.00	0.00%	2,500,000.00	75.76%	3,300,000.00	5.42%
DA-BAI	0.00	0.00%	0.00	0.00%	2,382,900.00	93.85%	156,123.00	6.15%	2,539,023.00	4.17%
DA-SRA	32,904.00	1.38%	0.00	0.00%	1,712,332.00	71.61%	645,877.00	27.01%	2,391,113.00	3.92%
CAVSU	198,721.00	10.67%	0.00	0.00%	1,663,239.00	89.33%	0.00	0.00%	1,861,960.00	3.06%
FNRI	0.00	0.00%	0.00	0.00%	932,351.00	50.96%	897,153.00	49.04%	1,829,504.00	3.00%
TOTAL	343,657.00		3,927,436.00		20,864,828.00		23,912,093.00		49,048,014.00	80.49%

ANNEX II

BUDGET ALLOCATION FOR EACH AGENCY (1996-1998)

Name of Agency	Total Budget of Research Grant	% of Total Budget
ITDI	11,158,780.00	18.31%
DA-FIDA	6,272,000.00	10.29%
PHILRICE	4,934,000.00	8.10%
BPI	4,523,287.00	7.42%
PTRI	3,484,227.00	5.72%
UPLB	3,384,788.00	5.55%
DMMMSU	3,369,332.00	5.53%
PCIERD	3,300,000.00	5.42%
DA-BAI	2,539,023.00	4.17%
DA-SRA	2,391,113.00	3.92%
CAVSU	1,861,960.00	3.06%
FNRI	1,829,504.00	3.00%
FPRDI	1,180,107.00	1.94%
DA-PCA	1,080,000.00	1.77%
DA-GPEP	922,000.00	1.51%
DMMMS-SRDI	847,500.00	1.39%
DA-PCC	789,500.00	1.30%
VISCA	650,000.00	1.07%
DA-NTA	632,187.00	1.04%
DA-R SERIES	622,403.00	1.02%
MMS	602,921.00	0.99%
FIDA	587,982.00	0.96%
DA-BAR	500,000.00	0.82%
NVSIT	464,000.00	0.76%
WLAC	428,465.00	0.70%
ISU	331,050.00	0.54%
PCCAR	311,025.00	0.51%
UPV	296,640.00	0.49%
CLSU	250,000.00	0.41%
PSU	250,000.00	0.41%
TC	232,500.00	0.38%
CSCS	217,000.00	0.36%
WVCS	150,000.00	0.25%
BU	143,600.00	0.24%
DA-BPI	135,000.00	0.22%
SPCP	81,150.00	0.13%
CNSC	50,000.00	0.08%
CRDI	48,000.00	0.08%
CLPC	44,755.00	0.07%
CSSAC	39,000.00	0.06%
TOTAL	60,934,799.00	100.00%

ANNEX III

Year	Name of variety	Type	Institute/Company
1955	Cebu White Flint	WHITE	
1955	Cebu Yellow Flint	YELLOW	
1955	Cuban Yellow Flint	YELLOW	
1955	Isabela White Flint	WHITE	
1955	Cagayan White Flint	WHITE	
1961	Phil. Hybrid No. 2 (L315 x L314)	WHITE HYBRID	
1961	Phil. Hybrid No. 2 (A200 x A204)	WHITE HYBRID	
1961	Phil. Hybrid No. 3b	YELLOW HYBRID	
1961	Phil. Hybrid No. 6	WHITE HYBRID	
1961	Phil. Hybrid No. 9	YELLOW HYBRID	
1961	Phil. Hybrid No. 11	YELLOW HYBRID	
1962	Phil. Hybrid 801	SWEET CORN HYBRID	
1966	Phil. Hybrid 1d	YELLOW HYBRID	
1967	Phil. Hybrid No. 4	WHITE HYBRID	
1966	Phil. Hybrid No. 6	WHITE HYBRID	
1966	Caribbean Yellow Flint	YELLOW	
1966	Intermediate white synthetic III	WHITE	
1967	UPCA Var 4 (late white synthetic)	WHITE OPEN POLLINATED	UPLB
1968	UPCA Var3 (Cuban x early Caribbean)	YELLOW OPEN POLLINATED	IUPLB
1969	BPI Var 1 (E.G Synthetic 107)	YELLOW OPEN POLLINATED	BPI
1969	BPI Var 2 (E.G Synthetic 104)	WHITE OPEN POLLINATED	BPI
1969	UPCA Glutinous 22	WHITE GLUTINOUS	UPLB
1970	UPCA Sweet 1	YELLOW OPEN POLLINATED	UPLB
1972	MIT Var 2	WHITE OPEN POLLINATED	USM
1972	Phil DMR 2	WHITE OPEN POLLINATED	
1973	Phil DMR 1	YELLOW OPEN POLLINATED	
1974	BPI Var 4	WHITE OPEN POLLINATED	BPI
1974	UPCA Var 5	YELLOW OPEN POLLINATED	UPLB
1975	Phil DMR Composite 1	YELLOW OPEN POLLINATED	
1975	Phil DMR Composite 2	WHITE OPEN POLLINATED	
1976	Glutinous Comp. 410	WHITE OPEN POLLINATED	
1976	Phil DMR Opaque Comp. 1	YELLOW OPEN POLLINATED	
1976	PIONEER X 306 A	WHITE	PIONEER OVERSEAS CORP (PHIL.)
1976	PIONEER X 65 A	YELLOW	PIONEER OVERSEAS CORP (PHIL.)
1977	Glutinous Composite 2	WHITE OPEN POLLINATED	
1977	Supersweet Comp. 1	YELLOW OPEN POLLINATED	
1978	BPI Var 2	WHITE OPEN POLLINATED	BPI
1978	MIT Var 9-10-11-12		USM
1978	Phil-DMR Comp. 1	YELLOW OPEN POLLINATED	
1978	UPCA Var 1	YELLOW OPEN POLLINATED	UPLB
1978	UPLB IBP 218	WHITE HYBRID	UPLB
1980	DMR 2	WHITE OPEN POLLINATED	
1980	Improved Tiniguib	WHITE OPEN POLLINATED	
1980	Phil-DMR Comp 2	WHITE OPEN POLLINATED	
1981	IPB Var 1	YELLOW OPEN POLLINATED	IPB, UPLB
1983	Cargill 100	YELLOW HYBRID	CARGILL SEEDS, INC.
1983	Cargill 200	YELLOW HYBRID	CARGILL SEEDS, INC.
1983	Hycorn 9	YELLOW HYBRID	Pacific Seeds Inc.
1983	Pioneer 6181	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1983	SMC 102	YELLOW HYBRID	San Miguel Corp. Hybrid Seed Research C
1984	Cargill CS 711 (CE-1)	YELLOW HYBRID	CARGILL SEEDS, INC.
1984	Cargill SX 747 (C6385)	YELLOW HYBRID	CARGILL SEEDS, INC.
1984	SMC Hi-yield 152 (SMC 152)	WHITE HYBRID	San Miguel Corp. Hybrid Seed Research C
1984	SMC Hi-yield 301 (SMC-301)	YELLOW HYBRID	San Miguel Corp. Hybrid Seed Research C
1984	SMC Hi-yield 301 (SMC-305)	YELLOW HYBRID	San Miguel Corp. Hybrid Seed Research C
1984	XCG-33 (PSI20736)	WHITE HYBRID	CARGILL SEEDS, INC.
1985	P-3228 (ZH 115)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1985	SMC Yield 309 (SMC-309)	YELLOW HYBRID	San Miguel Corp. Hybrid Seed Research C
1985	UPL Cn 2 (Tanco White, IPB Var 2)	WHITE OPEN POLLINATED	IPB, UPLB
1986	P3208 (3H208)	WHITE HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1986	P3224 (3H201)	WHITE HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1986	P-3274 (211-108)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1986	SMC-317 (S-E3)	YELLOW HYBRID	San Miguel Corp. Hybrid Seed Research C
1987	CX 757 (Super)	YELLOW HYBRID	CARGILL SEEDS, INC.
1987	SMARC 1283	WHITE OPEN POLLINATED	USM
1987	SMC 308 (S-E2)	WHITE HYBRID	San Miguel Corp. Hybrid Seed Research C

Corn varieties released by the Philippine Seed Board, 1955-1997.

Year	Name of variety	Type	Institute/Company
1988	CX767 (CPX-621)	YELLOW HYBRID	CARGILL SEEDS, INC.
1988	IES Cn 1 (IES Var7, Isabela Yellow)	YELLOW OPEN POLLINATED	DA Bagan Exp. Station, Bagan, Isabela
1988	SMC 319 (SMC E-9)	YELLOW HYBRID	San Miguel Corp. Hybrid Seed Research Center
1988	SMC 321 (SMC E-17)	YELLOW HYBRID	San Miguel Corp. Hybrid Seed Research Center
1988	SMC 323 (SMC E-19)	YELLOW HYBRID	San Miguel Corp. Hybrid Seed Research Center
1989	IESCn2 (IES Var2, Isabela White Corn 2)	WHITE OPEN POLLINATED	DA Bagan Exp. Station, Bagan, Isabela
1989	SMC 310 (SMC E-6)	WHITE HYBRID	San Miguel Corp. Hybrid Seed Research Center
1990	PSB Cn 90-1 (IPB Var 5)	YELLOW OPEN POLLINATED	IPB, UPLB
1990	PSB Cn 90-2 (P 3262)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1990	PSB Cn 90-3 (VISCA Maize Var2, VISCA 3550)	WHITE OPEN POLLINATED	VISCA
1990	PSB Cn 90-4 (X-767)	YELLOW HYBRID	CARGILL SEEDS, INC.
1990	PSB Cn 90-5 (P3278)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1990	PSB Cn 90-6 (E-25)	YELLOW HYBRID	PIONEER HYBRID AGRIL TECHNOLOGIES
1990	PSB Cn 90-7 (CPX 912)	YELLOW HYBRID	CARGILL SEEDS, INC.
1990	PSB Cn 90-8 (USM Var 6, USMARC 2088)	WHITE OPEN POLLINATED	USM
1990	PSB Cn 90-9 (P3234)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1990	PSB Cn 91-10 (AP 4)	YELLOW OPEN POLLINATED	IPB, UPLB
1991	PSB Cn 91-11 (CPX 921)	YELLOW HYBRID	CARGILL SEEDS, INC.
1991	PSB Cn 91-12 (IES Glutinous #1, Deko)	GLUTINOUS CORN OPEN POLLINATED	DA Bagan Exp. Station, Bagan, Isabela
1991	PSB Cn 91-13 (IPB Improved Macapuno)	WHITE OPEN POLLINATED	IPB, UPLB
1991	PSB Cn 91-14 (CPX 1011)	YELLOW HYBRID	CARGILL SEEDS, INC.
1991	PSB Cn 91-15 (CPX 1012)	YELLOW HYBRID	CARGILL SEEDS, INC.
1991	PSB Cn 91-16 (CPX 1014)	YELLOW HYBRID	CARGILL SEEDS, INC.
1991	PSB Cn 91-17 (OPG238)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1991	PSB Cn 91-18 (YOF 62)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1991	PSB Cn 91-19 (USMARC 1887)	WHITE OPEN POLLINATED	USM
1991	PSB Cn 91-20 (USMARC 1888)	WHITE OPEN POLLINATED	USM
1991	PSB Cn 91-21 (USMARC 1383)	YELLOW OPEN POLLINATED	USM
1992	PSB Cn 92-22 (19 PG 248, YIF 62)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1992	PSB Cn 92-23 (CPX 113)	YELLOW HYBRID	CARGILL SEEDS, INC.
1992	PSB Cn 92-24 (IPB x H913, IPB 113)	YELLOW HYBRID	IPB, UPLB
1992	PSB Cn 92-25 (YOF 61, Maistiza, P3400)	WHITE HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1993	PSB Cn 93-26 (IES EO2)	WHITE OPEN POLLINATED	DA Bagan Exp. Station, Bagan, Isabela
1993	PSB Cn 93-27 (USM Var 10, USMARC 1288)	WHITE OPEN POLLINATED	USM
1993	PSB Cn 93-28 (IES 8906, IES Cn 6)	WHITE OPEN POLLINATED	DA Bagan Exp. Station, Bagan, Isabela
1993	PSB Cn 93-29 (CMU VAR 2, POOL 2)	WHITE OPEN POLLINATED	CMU
1993	PSB Cn 93-30 (USM Var 3, USMARC 1188)	YELLOW OPEN POLLINATED	USM
1993	PSB Cn 93-31 (USM Var 5, USMARC 0190)	YELLOW OPEN POLLINATED	USM
1993	PSB Cn 93-32 (IES Cn 3, IES EO1)	YELLOW OPEN POLLINATED	DA Bagan Exp. Station, Bagan, Isabela
1993	PSB Cn 93-33 (P 3246)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1993	PSB Cn 93-34 (X1402 U)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1993	PSB Cn 93-35 (IPB Var 7, Dapmasa)	YELLOW HYBRID	IPB, UPLB
1993	PSB Cn 93-36 (IPB 919)	YELLOW HYBRID	IPB, UPLB
1993	PSB Cn 93-37 (IPB 921)	YELLOW HYBRID	IPB, UPLB
1993	PSB Cn 93-38 (IPB 929)	YELLOW HYBRID	IPB, UPLB
1993	PSB Cn 93-39 (XCW11)	YELLOW HYBRID	CORN WORLD BREEDING
1993	PSB Cn 93-40 (XCW15)	YELLOW HYBRID	CORN WORLD BREEDING
1993	PSB Cn 93-41 (MX8336)	YELLOW HYBRID	ASIAN HYBRID CORP
1993	PSB Cn 93-42 (CPX 3122)	YELLOW HYBRID	CARGILL SEEDS, INC.
1993	PSB Cn 93-43 (MX 8190)	YELLOW HYBRID	ASIAN HYBRID CORP
1993	PSB Cn 93-44 (X 1352G)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1993	PSB Cn 93-45 (CTH 501)	YELLOW HYBRID	CARGILL SEEDS, INC.
1993	PSB Cn 93-46 (CW 16)	YELLOW HYBRID	CORN WORLD BREEDING
1993	PSB Cn 93-47 (CW 18)	YELLOW HYBRID	CORN WORLD BREEDING
1993	PSB Cn 93-48 (SC111)	YELLOW SWEET CORN HYBRID	IPB, UPLB
1993	PSB Cn 93-49 (DLU Pearl, White Sweet Glutinous)	WHITE SWEET CORN OPEN POLLINATED	IPB, UPLB
1994	PSB Cn 94-50 (BPI LG COMP 1, LG COMP 1-91)	YELLOW OPEN POLLINATED	LGNCRDC, BPI
1994	PSB Cn 94-51 (USM Var 7, USMARC 1194)	YELLOW OPEN POLLINATED	USM
1994	PSB Cn 94-52 (7 PASO 54)	GREEN CORN (SWEET CORN) HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1994	PSB Cn 94-53 (8 PASO 54)	GREEN CORN (SWEET CORN) HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1994	PSB Cn 94-54 (AH 193, FE 815)	YELLOW HYBRID	ASIAN HYBRID CORP/FAR EAST
1994	PSB Cn 94-55 (C-520A, CPX 520A)	YELLOW HYBRID	CARGILL SEEDS, INC.
1994	PSB Cn 94-56 (C-900 M)	YELLOW HYBRID	CARGILL SEEDS, INC.
1994	PSB Cn 94-57 (CPX 3205)	YELLOW HYBRID	CARGILL SEEDS, INC.
1994	PSB Cn 94-58 (PAC 1398)	YELLOW HYBRID	HARDINI AGRIL CHEMICALS
1994	PSB Cn 94-59 (CPX 3007)	YELLOW HYBRID	CARGILL SEEDS, INC.

Corn varieties released by the Philippine Seed Board, 1955-1997.

Year	Name of variety	Type	Institute/Company
1994	PSB Cn 94-60 (P-3008)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1995	PSB Cn 95-61 (IES Cn 4)	WHITE HYBRID	Iligan Exp. Station, BPI
1995	PSB Cn 95-62 (IPB 911)	YELLOW HYBRID	IPB, UPLB
1995	PSB Cn 95-63 (IPB 9204)	YELLOW HYBRID	IPB, UPLB
1995	PSB Cn 95-64 (BS 9754)	YELLOW HYBRID	BIOSEED RESEARCH PHIL.
1995	PSB Cn 95-65 (FE 817)	YELLOW HYBRID	FAR EAST HYBRID RES. INC
1995	PSB Cn 95-66 (FE 820)	YELLOW HYBRID	FAR EAST HYBRID RES. INC
1996	PSB Cn 96-67 (LG 3B, BPI LG)	YELLOW OPEN POLLINATED	LGNCRDC, BPI
1996	PSB Cn 96-68 (USM Var 12)	WHITE OPEN POLLINATED	USM
1996	PSB Cn 96-69 (AG 5355, Kristal)	WHITE HYBRID	AYALA GENETICS RES., INC.
1996	PSB Cn 96-70 (BS 988)	YELLOW HYBRID	BIOSEED RESEARCH PHIL.
1996	PSB Cn 96-71 (TCT 361)	YELLOW HYBRID	CORN WORLD BREEDING
1996	PSB Cn 96-72 (TCT 311)	YELLOW HYBRID	CORN WORLD BREEDING
1996	PSB Cn 96-73 (TCT 393)	YELLOW HYBRID	CORN WORLD BREEDING
1996	PSB Cn 96-74 (FE 326)	YELLOW HYBRID	FAR EAST HYBRID RES. INC
1997	PSB Cn 96-75 (C-818)	YELLOW HYBRID	CARGILL SEEDS, INC.
1997	PSB Cn 96-76 (C-838)	YELLOW HYBRID	CARGILL SEEDS, INC.
1997	PSB Cn 97-77 (C-909)	YELLOW HYBRID	CARGILL SEEDS, INC.
1997	PSB Cn 97-78 (Mariana I)	YELLOW HYBRID	AYALA GENETICS RES., INC.
1997	PSB Cn 97-79 (Mariana III)	YELLOW HYBRID	AYALA GENETICS RES., INC.
1997	PSB Cn 97-80 (Mariana)	YELLOW HYBRID	AYALA GENETICS RES., INC.
1997	PSB Cn 97-81 (C-939)	YELLOW HYBRID	CARGILL SEEDS, INC.
1997	PSB Cn 97-82 (FE 325)	YELLOW HYBRID	FAR EAST HYBRID RES. INC
1997	PSB Cn 97-83 (Mariana II)	YELLOW HYBRID	AYALA GENETICS RES., INC.
1997	PSB Cn 97-84 (BS-9889)	YELLOW HYBRID	BIOSEED RESEARCH PHIL.
1997	PSB Cn 97-85 (BS 9890)	YELLOW HYBRID	BIOSEED RESEARCH PHIL.
1997	PSB Cn 97-86 (C-848)	YELLOW HYBRID	CARGILL SEEDS, INC.
1997	PSB Cn 97-88 (P-3013)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1997	PSB Cn 97-89 (P-3023)	YELLOW HYBRID	PIONEER OVERSEAS CORP (PHIL.)
1997	PSB Cn 97-90 (CW-48)	YELLOW HYBRID	CORN WORLD BREEDING
1997	PSB Cn 97-91 (CW-108)	YELLOW HYBRID	CORN WORLD BREEDING
1997	PSB Cn 97-92 (LG-5)	YELLOW OPEN POLLINATED	La Granja NCRDC, BPI
1997	PSB Cn 97-93 (CMU-9422)	YELLOW OPEN POLLINATED	CMU
1997	PSB Cn 97-94 (CMU-9424)	YELLOW OPEN POLLINATED	CMU

Source: Bureau of Plant Industry. 1993. Philippine Seed Board Seed Catalogue.
 Bureau of Plant Industry. 1988. Philippine Seed Board Seed Catalogue.
 Bureau of Plant Industry. List of Varieties by Crop Released by the Seedboard, 1955-1994.
 Bureau of Plant Industry. National Seed Industry Council Approved Crop Varieties for Commercial Release (CY 1994-1997).