Republic of the Philippines
DEPARTMENT OF AGRICULTURE
Office of the Secretary
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SUBJECT: NATIONAL TECHNOLOGY COMMERCIALIZATION PROGRAM DOCUMENT AND OPERATING GUIDELINES

In the interest of the service and in support to the provisions of the Agriculture and Fisheries Modernization Act of 1997 (AFMA) specifically on research and development, the national technology commercialization program document and operating guidelines shall be immediately adopted and utilized to enhance and strengthen the country's implementation of agriculture and fisheries technology commercialization program:

INTRODUCTION

The agriculture and fisheries sectors have been identified as the prime movers of development in the country. Specifically, these sectors address the economic, social and ecological development through dynamic and interactive programs and activities of agricultural and fishery commodities.

Nowadays, new trends in these sectors, are emerging to support the pressing and increasing issues on technological needs, people empowerment, commodity improvement, institutional and support services requirement, and sustainability among others. Based on these issues, innovative programs are necessary to increase the productivity and profitability of farmers/fisherfolk, industries, and communities involved in agriculture and fisheries production as well as those in processing and marketing. One of the innovative programs identified by the Department of Agriculture is technology commercialization.

The Technology Commercialization (Tech Com) Program highlights research and development (R&D) breakthrough and mature technologies generated and developed by R&D institutions. It also serves as a vital tool for the development of enterprises and the improvement of agriculture and fisheries related industries anchored on appropriate activities emphasizing particularly, better technology transfer, promotion, adoption, utilization, and commercialization.

The Tech Com program of the Department of Agriculture (DA) being managed and coordinated by the Bureau of Agriculture Research (BAR) envisions making technologies work for agriculture, fisheries, industries, people and communities. The program will structure and deliver technologies where they are needed and where appropriate while gaining adequate market penetration to sustain commercialization for a variety of competitive reasons.

Additionally, the Tech Com program will insure the transformation of agriculture and fisheries from a resource-based to technology-based interventions. Attention will be given to strengthen the market-driven approach for a more holistic and integrated development. Based on this, it is recognized that the sectors will demand technologies that encourage total farm or community development with the support of government, non-government organization, private sectors and commodity specific industries.

This program document is prepared as guide and bases for the implementation of the National Technology Commercialization Program (NTCP) of the Department of Agriculture. The document is divided into three major parts, namely, the NTCP description, Tech Com Framework, and the criteria for the selection of technologies for commercialization and evaluation of proposals for accessing program funds.

A. THE PROGRAM

Working Philosophy

"Making Technology Work for Agriculture, Fisheries, Industry, People and Communities."

Objectives

General

- To accelerate the commercialization of mature technologies for increased productivity and profitability of stakeholders and key players through the transformation of the agriculture and fisheries from resource-based to technology-based (market driven).

Specific

- Consolidate the technology commercialization related activities of the different DA agencies, selected state universities and colleges (SUCs), the local government units (LGUs) and the private sector through the adoption of a common framework;
- Establish the economic and financial viabilities of mature technologies to ensure the effectiveness and efficiency of their adoption;
- Demonstrate the feasibility of location-specific mature technologies at the farmers and fisherfolk level;
- Facilitate the dissemination of research results to the public and private sectors and stimulate new business and economic development, enhance trade, preserve the environment and improve the quality of life in the rural sector;
- Accelerate the adoption of modern production and processing technologies and to help expand, maintain and develop markets for agriculture and fisheries products; and,
- Strengthen the link between research, development and extension

Expected Outputs

- Social acceptability and economic viabilities of mature technologies established;
- Technology demonstration farms (location-specific) of mature technologies identified and supported;
- Disseminated R&D results/technologies to the public and private sector and stimulated new business and economic development;
- Enhanced trade, preserved the environment and improved the quality of life in the rural sector;
- Accelerated the adoption of modern production and processing technologies resulting from scientific research;
- Helped expand, maintain and develop markets for agriculture and fisheries products;
- Encouraged knowledge and information sharing of mature technologies among farmers/fisherfolk, processors, traders, researchers and extension workers; and,
- Strengthened the link between research, development and extension

Target Beneficiaries

- Processors
- Industry
- Consumers
- Farmers and fisherfolk
- Communities

Support Staff/Services

- Policy Makers
- Scientists and Researchers
- Extension Workers
- Local Government Units
- Credit and Financial Institutions

PROGRAM COMPONENTS

- **Coordination and Management**

  The National Technology Commercialization Program (NTCP) is a Department wide program being managed and coordinated by the Bureau of Agricultural Research (BAR) in partnership with the Agribusiness and Market Assistance Service (AMAS), Agricultural Training Institute (ATI), the Regional Field Units (RFUs) through the Regional Integrated Agricultural Research Centers (RIARCs), collaboration with the local government units (LGUs), private sector, peoples organizations (POs), farmer/fisherfolk organizations and associations, and selected state universities colleges (SUCs).

- **Program Implementation**

  The NTCP will be implemented by the key players involved in the technology commercialization process. These are the DA-Staff Bureaus, Attached Agencies and Regional Field Units particularly the RIARCs and PFRDCs for RDE activities, Local Government Units for supports services, Private Sector for industry/enterprise development and support services, farmer or fisherfolk

groups/associations, community organizations for enterprise initiatives and management, and selected State Universities and Colleges (SUCs) for related RDE activities.

- **Program Monitoring and Evaluation**

  The NTCP will be closely monitored by the DA-BAR in coordination with DA-ATI and DA-AMAS. Henceforth, all activities in the technology commercialization process will be evaluated based on a set of criteria formulated for efficiency and effectiveness. The M&E activities will involve a multi-disciplinary team that would operate based on the principle of participatory monitoring and evaluation of activities of the national, regional, provincial and local levels.

- **Program Documentation**

  The NTCP will continuously conduct program documentation that encourages knowledge exchange and management. The component supports information sharing through information, education and communication activities in support to the different technology promotion activities such as technology for a, exhibits, product displays and fairs, etc.

ROLES AND RESPONSIBILITIES

Bureau of Agricultural Research (BAR)

- Provide the overall management and coordination of the National Technology Commercialization Program (NTCP) of the DA;
- Generate, integrate and package information to enhance stage specific development;
- Support and enhance enterprise development activities to pave the way toward agribusiness systems development;
- Provide relevant information and encourage knowledge exchange that will insure the complementation of the development stages for unity;
- Support innovative researches with focus on stage specific breakthroughs;
- Institutionalize agribusiness systems development that encourage linkage and networking activities among stakeholders and keyplayers;
- Move mature technology to strengthen the domestic and global competitiveness of agribusiness systems development; and
- Formulate and develop mechanism that will improve the dynamic and interactive relation between research and development and extension (RDE) activities to support and enhance technology commercialization.

Agricultural Training Institute (ATI)

- Provide the overall coordination of extension, communication and training activities of stakeholders and key players involved in the technology commercialization program;

- Assist in the formulation of information, education and communication activities for efficient and effective technology commercialization program;
- Coordinate with local government units in the implementation of training and extension related to technology commercialization activities;
- Develop and implement training programs on cooperatives, leadership and enterprise management and development; and
- Encourage and support the participation of other agencies that can enhance the implementation of technology commercialization program enterprise and agribusiness development.

Agribusiness and Marketing Assistance Service (AMAS)

- Coordinate with the private sector for the establishment and development of appropriate marketing scheme;
- Identify profitable market channels and support marketing of products locally, nationally and internationally; and
- Assist in the packaging and promotion of products in support to product quality and standards.

Bureau of Agriculture and Fisheries Product Standards (BAFPS)

- Provide the overall coordination of the agriculture and fisheries product standardization;
- Institute and set up agriculture and fisheries product standard mechanism for efficiency and effectiveness;
- Establish linkage and networks with other agriculture and fisheries entities for standardization and competitiveness; and
- In coordination with concerned agencies, provide regular update and feedback on latest product information, standardization of agriculture and fisheries products.

Technology Generators and Developers

National Research Units *(PCA, PCC, PhilRice, NFA, SRA, CODA, FIDA, BAI, BPI, BFAR, BSEM, BPRE, etc.)*

- Generate and develop appropriate technologies for commercialization to support the packaging, processing and marketing of commodities;
- Provide technical assistance on specific technologies identified for commercialization;
- Assist in the preparation of information, education and communication materials specifically designed to respond to technical issues and concerns; and
- Establish and maintain linkage and networks between and among stakeholders and key players of technology commercialization.

Regional Integrated Agricultural Research Centers (RIARCs) and the Regional Fisheries Research and Development Centers (RFRDCs) of the Regional Field Units (RFUs)

- In coordination with the local government units (LGUs), provide leadership in the technology commercialization at the regional level;
- Generate and develop appropriate technologies for commercialization to support the packaging, processing and marketing of commodities vital to the requirements of enterprise development;
- Assist in technology promotion activities including technology demonstration at the local level in support of enterprise development;
- Assist in the identification of market and processing activities supportive to technology commercialization to enhance enterprise development; and
- Establish and maintain linkage an networks between and among stakeholders and key players of technology commercialization at the regional level to set the state for agribusiness development.

State Universities and Colleges (SUCs)

- Generate and develop appropriate technologies for commercialization to support the packaging, processing and marketing of commodities for enterprise development;
- Provide technical assistance on specific technologies identified for commercialization;
- Assist in the preparation of information, education and communication materials specifically designed to respond to technical issues and concerns; and
- Establish and maintain linkage and networks between and among stakeholders and key players of technology commercialization to stimulate the complementation of enterprise and agribusiness development.

Local Government Units (LGUs)

- Coordinate with the RIARCs/RFRDCs in the implementation of the technology commercialization activities at the local and regional level to stimulate enterprise development;
- Provide assistance through co-sharing of resources;
- Coordinate with ATI in the extension and training activities of LGU staff involved in the technology commercialization; and
- Establish and maintain linkage and networks activities between and among stakeholders and key players of technology commercialization to stimulate enterprise and agribusiness development.

People Groups, Farmer and Fisherfolk Organizations

- Encourage community participation in technology commercialization activities that will support and enhance its empowerment;
- Provide and institute regular stakeholders' feedback on their technology needs particularly on production and processing activities;
- Initiate and institutionalize community organization for enterprise development;
- Coordinate with LGUs, ATI and RIARCs/RFRDCs on technology needs, information, education and communication activities;

- Maintain linkage and networking activities between and among stakeholders and key players of technology commercialization; and
- Enhance and institutionalize the complementation of enterprise and agribusiness development.

Private Sector and Other Industries

- Institute a mechanism for technology packaging, promotion, expansion and development activities supportive of enterprise and agribusiness development;
- Provide additional financial support to enterprises with commodities that have comparative advantage and market potential;
- Maintain linkage and networking activities between and among stakeholders and key players of technology commercialization to stimulate enterprise and agribusiness development; and
- Coordinate with DA-AMAS for technology commercialization activities specially on marketing and processing vital to enterprise and agribusiness development.

Credit and Financial Institutions (ACPC, Quedancor, LBP, etc)

- Through the existing program of the Department of Agriculture on the Agricultural Modernization Credit and Financing Program (AMCFP), the credit and financial institutions involved shall open a credit window or lending facility in support of the National Technology Commercialization Program;
- Provide funds for approved project proposals for technology commercialization towards agriculture and fishery development.

Organization and Management

The overall management of the National Technology Commercialization Program (NTCP) shall be provided by the Bureau of Agricultural Research (BAR) in coordination with concerned agencies. Technical and financial management will be coordinated by BAR through a pool of experts at the national level. Regional concerns and needs, however, shall be managed by the regional field units through RIARCs/RFRDCs and Selected SUCs in close coordination with partner local government units, people's organization, private sector and non-government agencies.

Structure

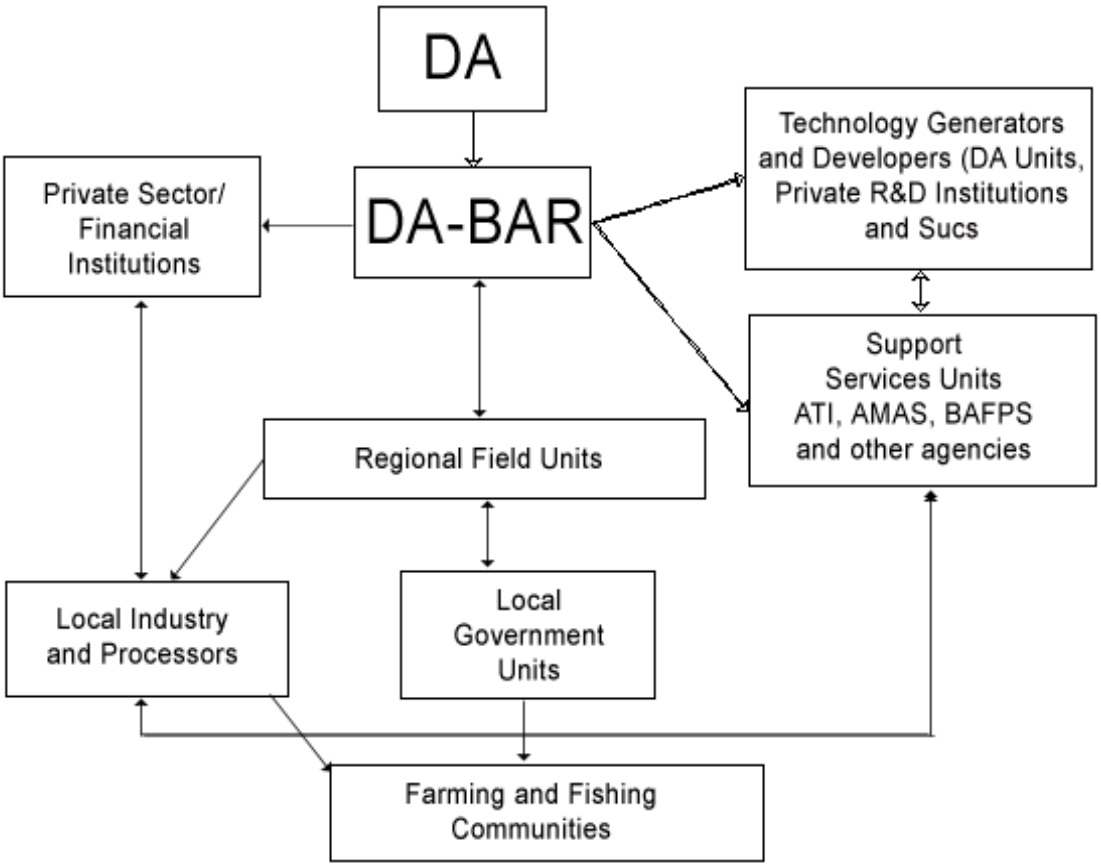

Figure 1. Operational structure for the implementation of the National Technology Commercialization Program

B. FRAMEWORK

Rationale

It seems that currently, there is some vagueness in the definition of technology commercialization. The substance and context of the term commercialization appear to confuse some people. Does it refer to the marketing of a process, service or product? Presently, the context of commercialization has not been fully delineated. It is for this reason why the precise location of this function in an organization has not been clearly specified.

In order to overcome this fuzzy situation, a framework is in order so as to more clearly delineate the elements of technology commercialization. Its implementation can readily be simplified on the basis of an agreed upon framework. BAR has enough lessons learned in its attempt to mobilize and institute inter-agency coordination. Its experience indicates that without such framework, coordination and work complementation could not be attained.

Concept of Technology Commercialization

If taken in its literal context, technology commercialization is a process of marketing/selling a technology. For instance, a researcher has developed an improved process of food preservation. If he is university based, the university can create a mechanism to circulate and promote his improved process to potential users who are likely to obtain better product and derive more profit from its use. In other words, the university will assist the researcher market his technology. In general, two mechanisms are used for this purpose, namely: Technology Incubator – is an environment and program that offers a full array of business assistance services tailored to the client companies; and Technology Park – a mechanism, designed to stimulate the development of entrepreneurial, knowledge-based micro to small and medium-size enterprises.

On a smaller scale, the University can setup regular techno forum for the researcher and the users to meet. Announcement through the media is likewise done by the University. This idea of selling/marketing a technology must be clarified and put in its most appropriate context.

Perspective of Technology Commercialization

- As a **process**, it makes use of mature technologies to work for the development of the agriculture and fisheries sectors.
- As an **approach**, it supports the development of agriculture and fisheries products that are of quality and of the required quantity for marketing and processing
- As a **strategy**, it enhances the social marketing aspect of commodities of agriculture and fisheries for increase market matching and development of enterprises. Incorporated here are the active roles and responsibilities of stakeholders and key players in organizational development for enterprise and agribusiness development.

Context of Production

In agriculture there are at least three types of farmers actively engaged in production and these are: small scale, medium and large scale including micro groups which when clustered will form a big part in the production system. Regardless of the scale of production, it must be clear that technologies occupy a very important place and always perform important role in shaping the direction of production. This is the reason why DA in the formulation of AFMA emphasizes that production is technology driven rather than resource driven. This, however, must be placed in its appropriate context.

Regardless of the level, production is an organized activity of farmers or fisherfolk. As the scale of production expands, its organizational structure becomes more formalized. This is best shown in the case of corporate farming. Thus, in the technology commercialization program of BAR, appropriate attention will be given to the organizational aspects of production. This will be more important in the case of small scale farmers. It becomes rather obvious that the scale of technology application determines the level of success in any scale of production. Thus, as the level of complexity of production increases, the demand for more and better technologies likewise goes up.

Yet, what is, at times, missed, are the interactive and complementary functions of technologies together with other resources needed for production. The complementation of these resources while internal to farmers organization is enhanced by external services extended by support agencies and non-government organizations. It is in this regard, that the organizational aspect of production becomes the focal entry in technology commercialization. This is based on the knowledge that the introduction of any given technology in the production system will always have effects either positive or negative on the organization and management of production.

It is here where extension will play critical role. The design of extension support system must always be based on the explicit delineation of the various effects of technology intervention. Close attention to the organization and management of production is in order. Enhance the capabilities of farmers in a major extension concern. In this connection, the mobilization of related institutional supports will enhances the activities of these organizations for better production activities. Unfortunately, this at times, is ignored in the design of production related activities resulting to fragmented program design.

It can be said that the current difficulties in transferring technologies to farmers is a result of the failure to situate the technology intervention in the overall context of production. The holistic or total farm and family approach to production is important. However, its multi-disciplinary basis must be clearly shown and spelled out so that the interaction and complementation of different disciplines will be fully delineated. In this way the impact of the technologies can readily be enhanced. This is important so that the different aspects of production can be woven together so as to increase their synergistic impact. This is what is meant by the whole is greater than the sum of its parts.

The impact of technology on production must be seen in two ways: 1) technology intervention is designed to enhance the overall structure of production. This means that the focal attention is geared on production improvement; and 2) it also has a revolutionary aspect which is focused on change. The two are related in the sense that as the production system improves, there will also be areas where innovation will have to be made. Their interaction and complementation reveals the real essence of change. The objective of technology promotion, therefore, is to enhance the overall structure and management of production in order to effectively respond to market demands and in the process develop new products for the new market.

The utilization and application of technologies will therefore, result to increase in the volume of production. As soon as this is attained, post production and processing activities with emphasis of quality management will be undertaken to complete the requirements of the whole production cycle.

Concept of Technology Intervention

There is another important point that is also missed in technology intervention. In general, the scales of production are never homogeneous. Farmers

in any community are involved in different scales of production. It seems then, that the notion of recommendation domain may be difficult to identify and isolate since the idea of homogenous farming systems does no exist.

Variations in production management are a function of the commodity used, types of technology applied, style of farm management, access to support services and market. If a commonality orientation is to be utilized in technology intervention, there could be no other than the main commodity, e.g., rice.

In this case, it is always important to develop a matrix of community-based production management systems based on its focal commodity, e.g., rice. In this way, it will not be difficult to establish lines of commonalities and variations in the overall structure of the production systems in a given community. Hence, on the basis of this matrix, it will not be difficult to document the variation in production output. This matrix could be used for assessing the technology and training needs of the farmers.

Through participatory research, appropriate information system can be developed. These processes will be complemented by sensitizing the farmers to develop market management skills and product marketing. Furthermore, the matrix will thus serve as a basis for designing other R&D activities so that a holistic approach to production will be instituted. In this way, the improved performance of production is attained.

In theory and experiments conducted on a commodity, e.g. rice, the activities are focused on problem solving which are addressed to bring about positive results in terms of increased yield. Once the stability indicators are identified, then the technology is transferred to the farmers. However, it must be pointed out that this methodological orientation has had limited impact on rice production especially in the case of small and medium scale farms.

Understanding the Production System

In order to insure that technology interventions will be efficient and effective, there is always a need to fully understand the overall production system and its total technology requirements. The major challenge, therefore, in technology transfer is to find the right fit or the technical complementation of the technologies needed in production. In other words, the technologies must be placed in the context of overall production system. Central to this is the need to understand the overall production management systems utilized by farmers.

Oftentimes, it is this management system that has been neglected in planning the transfer of technologies. To avoid the repeat of this error, production planning must be focused on planning for the total farm and that interventions must be responsive to such totality. In short, technology intervention must be strongly anchored on the needs of the farmers defined in terms of the dynamics of production. It must also be anchored on the technology user needs and will not just serve as prescriptive in nature. Plans, therefore, must be focused on the total technology requirements of the farm together with the other resources vital in insuring the expected impact of technology. Technology intervention cannot be

isolated from other production related interventions. To insure their overall impact, timely delivery of organized support services is needed.

Role of Indigenous Technologies

It must be fully-recognized that, regardless of the scale of production, farmers who are engaged in small and medium scales production are using traditional technologies or indigenously developed technologies and, at times, exogenous technologies brought in from the outside. But again, what generally happens is, in the process of intervention, the fit between the indigenous and an exogenous technology is ignored.

In fact, it seems that the methodology for technology transfer is oriented toward overcoming the use of indigenous technology. This orientation has resulted to a debate regarding the nature and dynamics of technology transfer. Today, there is much talk about incorporating the tacit knowledge of the farmers in the intervention. This is good! More importantly, however, is the need to be quite explicit in documenting the indigenous technical knowledge of the community and fitting it to the technical interventions in production. These interventions in production, therefore, must always begin from the tacit knowledge, especially technical knowledge of production of the members of the community.

Strategies

In response to the importance of situating technology intervention in the overall requirements of production, the current strategies of the Bureau of Agricultural Research (BAR) to technology commercialization will be divided into two complementary strategies, namely: **technology infusion and technology mediation.**

Technology Transfer as Technology Infusion

This conceptual orientation is being developed by BAR so that its research program can appropriately respond to the requirements of Medium Term Development Plan mandate on institutionalizing the agribusiness systems development (ASD). BAR fully subscribes to this mandate, However, it recognizes that there is an intervening stage that must be accounted for and supported by research. This is the process of enterprise development.

As shown earlier in this framework, the notion of scale of production is quite important to technology commercialization. It is true that the scale are linked together to form a unity for productivity and profit. It should be recognized that enterprise development, however micro, is a pre-condition to agribusiness development. In other words, the cyclic development of farm business venture must always be underscored. The different lines of interaction and influence most especially in strengthening the support system are a must. In addition, the ASD must consider the horizontal and vertical system of technology utilization and

adoption as well as the enhancement of the marketing aspect. The horizontal and vertical system must not limit its activities within the station which is normally done as a demonstration activity but should include linkage and networking activities among partners, e.g. local government units and the private sectors.

The institutionalization of this process is the precondition for agribusiness systems development. Research, Development and Extension (RDE) will be instrumental for the creation of an entrepreneurial culture and the organization of farm enterprises- the focal tool in this regard is technology transfer. This is based on the assumption that the technical base of production is limited. Hence, there is a need to **infuse** production management with better/improved technologies.

For the small and medium scale production systems, BAR will continue its focus on technology transfer through farming systems development focused on on-farm research. A holistic approach will be its focal orientation. BAR will continue designing technology intervention strategies focused mainly on **infusing** such production systems with the much-needed technologies.

This is designed mainly to raise the scale performance of the small and medium scale production systems thereby improving the overall management of production for productivity and profit. This is very much in line with the AFMA mandate that production must be technology driven rather than resource driven.

To facilitate the creation of an entrepreneurial culture for enterprise development, a new awareness will be instituted among the farmers through participatory action research and community mobilization and organizing. A new modality of training will be instituted focused on leadership, entrepreneurship, enterprise management, information and knowledge management, organizational development, resource management, information technology and communication systems, decision making, value orientation, decision support system, marketing including product value adding, networking and linkages, etc.

In view of the holistic orientation of technology infusion, the farming community will be organized. However, the organizing process will not start from a zero point, meaning the farmers are not organized. Community organizing will start from the assumption that the farmers are organized regardless of its level of formalization. This is the main reason why the strategy of organizational development will be adopted. Technology intervention and organizational development always go together. To ignore the latter will lead to the failure of technology transfer.

Cycle of Production

BAR will, therefore, give more attention to the total production cycle from the management of the land to the

marketing of the produce including processing. It is obvious that the application of technologies cuts across the overall cycle of production and will always be placed in the context of interaction and complementation.

The goals of enterprise development can be attained provided that technology transfer is based on the overriding principle of synergy. In view of this, technology applications will not be seen as separate interventions. It will always be situated in the overall context of production. Again, the intervention will be focused on complementation and synergy and a strong foundation of interlinks and relationships.

Technology Commercialization as Technology Mediation

BAR will take it that the stage of agribusiness systems development is situated in the production activities of large scale and commercial farming systems. BAR will focus its technical intervention through technology mediation. It is in this scale of production that the full force of technology commercialization will be made concrete. It must be fully recognized that this scale of production already involves the use of different production technologies and the production system is organized through a formal management systems. People, technologies and systems as well as support system, institutions, linkages, networks are included as part of the ASD.

DYNAMIC OF PRODUCTION SYSTEMS

Technology Mediation Processes	**Opportunities**	**Constraints**	**Potentials**
Improvement	**x**		
Innovation		**x**	
Change			**x**

This matrix will readily show the systems effects of technologies. They are designed to enhance the overall technical performance of the technologies as aid to production. To simply reiterate, at a higher level of development, agribusiness is a formalized activity with supporting technologies. The technology to be commercialized can therefore be involved, in all three processes, i.e., improvement, innovation and change. However, the complementation principle must be applied in the utilization of commercialized technologies. They must not unduly depart from the prevailing technical structure of production and its organizations. In short, the focus is continuity rather than discontinuity.

A corporate status is readily visible in farming operations. The technologies to be commercialized at this stage are intended to do two things" 1) enhance/improve the existing production performance; and 2) introduce complementary innovation to further enhance/improve the efficiency and effectiveness of production performance.

It is at this stage of production that the intervention to be undertaken by BAR are focused on intensifying and diversifying production for agribusiness systems development. In other words, the intervention strategies of BAR will be in consonance with the formal structure of production. Technology commercialization will set the pace of increasing the scale of production to meet the exigencies of global competitiveness.

Technology Synergy

Technical synergy is viewed as interlink of systems indicative of strong foundation of production relationship that are taking place. This means that technologies must complement each other as other systems are directed to complement the required services

The technologies to be commercialized at this scale of production are to be taken as more advanced in the sense that their main function is to create technical synergies among the technologies currently being used in production. Whenever necessary, innovative technologies will be introduced to enhance production performance efficiency and effectiveness. This is the reason why at this level, this technical intervention is addressed primarily at modernizing the overall performance of production.

It must be pointed out, however, that in all cases, the technologies to be commercialized at this stage have for their major function – improve the overall performance of production for productivity and profit. In the end, the ***aim of technology commercialization is improved products and product positioning in the overall agribusiness venture at the domestic and international markets.***

In this scale of production, organizational development strategies will be more focused, giving stronger attention to improving the corporate management structure so that management efficiency and effectiveness will be at par with the standards being use by the competitors. Product quality is the goal of technology mediation.

Underlying Principles

The ease by which technology commercialization can be successfully instituted is highly dependent on the adoption of a set of guiding principles. These are taken to constitute the foundation on which the overall design of commercialization program is based. The adoption of a set of guiding principles is motivated by the recognition that the transfer of technology and, more so, technology commercialization is not easy to implement.

There is no need to dispute the role of technology in development. In fact, it has been said many times, that it is the engine of development. So true This has been shown most especially in developed countries. The role of technology commercialization in these countries is well endowed with research funds coming from different sectors of society, most especially from the universities.

The research agenda is focused on technology improvement and innovation. A major focus is on technical breakthroughs. Oftentimes, technologies are developed with specific application but derivative applications are developed for practical application. This is, perhaps, the best illustration of technology commercialization. In fact, major innovations in the industrial world are initiated by researches classified as breakthroughs. The historical transformation of the industrial world is largely a function of technical innovations and breakthroughs.

The directions and patterns of technology commercialization in the Philippines and the neighboring regions follow the same processes, structure and trajectories. However, the much needed support systems for technology commercialization are wanting in the case of the Philippines. The harmonization of research, development and extension systems is not in place. Moving information quickly to users has not materialized. This situation has created fragmentation in the delivery of support services. In other words, there is always a need to be cognizant to the complexity of the production systems and the development of systems oriented technology interventions.

The formulation of a set of guiding principles is imperative in order to be cognizant of the inherent danger associated with technology transfer and commercialization. The denial of access to them is best demonstrated in the case of marginalized small farm holders and fisherfolk. While it is true that technology transfer, commercialization and diffusion of innovations are premised on equity, this, oftentimes, does not happen because of the multi-dimensional alliance of the commercial sector.

Thus, the technology commercialization of the Bureau of Agricultural Research (BAR) is designed to bring about equity and justice in transferring, commercializing and diffusing technologies that will revolutionize Philippine agriculture for productivity and profit. Its vision is focused on the creation of new sources of wealth through improved organization and management of production.

BAR is fully cognizant that the adoption of a set of guiding principles in its technology commercialization program is inherently biased. Its bias is supportive of ensuring free and open access to innovative agricultural technologies by all sectors especially farmers and fisherfolk, processors, traders and consumers. In short, the needs of commercial and non-commercial farmers and fisherfolk are being addressed by BAR.

Thus, technology commercialization is directed to specifically respond to the needs of specific group of farmers/fisherfolk, industry and other key players. Towards this end, the effective complementation of enterprise and agribusiness development will be readily institutionalized. The unity aspired for by the DA will be realized. With these guiding principles, the users and clientele of technology commercialization can play an active role in meeting the goals mandated in MTDP.

What are the guiding principles of BAR's technology commercialization program? The following are of central importance:

- **Community Mobilization, Organization and Development**
    - The Program takes it that production is an organized activity of farmers/fisherfolk and successful technology transfer and

commercialization can only be realized when its organizational underpinnings are fully delineated. In the true sense of taking technology as the engine of development, its organizational demands will be given appropriate attention so as to insure that the development impact of technology will be addressed.

The development perspective of BAR will be addressed and focused on the social, economic and ecological dimensions including the cultural and environmental aspects in the overall community development process for a more dynamic and interactive development of the people, community, and industry.

- This principle is most critical in the overall technology infusion of production. Oftentimes, the focus of intervention is on the output. However, without the right process management, the desired output will not materialize. In short, in any technical intervention, its structural impact must always be given appropriate attention.

- **Participation**
  - It will be focused on community participation. All key players must play an active role and be involved in its programs and activities to attain the overall goal on the development of the community as initiated by the technology commercialization process.
  - Participation will highlight the importance of the domestic process of decision-making. However, the deeper philosophical substance of participation will be instituted. It is the key to people empowerment. In part, participation is a political strategy since it is aimed as a tool for poverty alleviation.
  - Active people's participation in technology transfer and commercialization will be enjoined by BAR so that broad based technology awareness will be instituted. In this manner, new production management will be instituted together with the various requirements of the different stages of commercialization.

- **Resource Management**
  - Even if technology is taken as central figure in the development process, it cannot stand-alone. This is the Achilles Hill of technology transfer. It was oftentimes assumed that once the technology is adopted, all other processes would follow. There is enough historical evidence to the contrary. Hence, the inter-connection of resources linked to technology will be given proper attention. These are: Social, Technical, Economic, Environmental, and Political (STEEP).
  - While the interconnection of these resources is obvious, managing them is both an art and science. Their complementary nature must always be highlighted. In view of the importance of the decentralized functions of the LGUs, its institutional authority as a resource will be given appropriate attention, Institutional collaboration and sharing will be encouraged to address the meager resources available needed to promote, adopt and utilize the technology.

- **Knowledge Management**
    - There is an on-going debate on the context, meaning and functions of knowledge management. The trend seems to indicate that what is taken, as knowledge management is nothing but information management. However, the Program takes it that technology transfer and commercialization must begin from where the farmers are, what technology they have, the benefits they derived from it, what improvements and innovations must be instituted in order to enhance the technical requirements of production. Knowledge exchange and development will be encouraged and supported as these are dependent on the technology needs of the users especially these are not being met.
    - Hence, the existing structure of knowledge underlining the overall structure of production will be documented through participatory action research. This documented knowledge is known as tacit knowledge. The Project will promote technology transfer and commercialization using the base knowledge of the community, i.e., tacit knowledge as the critical point of entry of innovative technical interventions.
    - In other words, the fit between information and knowledge will only happen when the information has become knowledge and from part of the current knowledge (tacit knowledge) of the farming or fishing community. It is shared by the members of the farming or fishing community. In short, therefore, the Program will always ensure that fit between innovative technologies and extant knowledge of the farmers is instituted. Knowledge therefore is nothing but institutionalized information used in shaping the structure of everyday life.

- **Multi-Disciplinary Orientation**
    - The Program takes it that technology transfer and technology commercialization cannot stand alone. Their effectiveness and impact on the community are ensured when complementary resources as defined by STEEP are mobilized. Hence, technology transfer and commercialization activities will be underlined by interdisciplinary perspective. Following the principles embedded in STEEP, a holistic approach will be utilized in installing the process.

- **Complementation**
    - Evidently, the unity harmony of any activity is attained through complementation. The effort to be invested in technology transfer and commercialization will bring about higher rewards provided that the production activities are well orchestrated through complementation. Effective coordination of various production activities are enhanced through complementation. In like manner, technical synergy is insured.

- **Teamwork**
    - Obviously, orchestration and harmony is a result of team effort. Hence, the Program will ensure that the sectors to be mobilized in technology transfer and commercialization will be committed to a shared perspective based on the program framework. BAR is aware that through the years, many memoranda of agreements (MOAs) have been signed instituting

interagency commitment to teamwork. Unfortunately, quite often it's the commitment was only good on paper. BAR will reverse this trend by insuring that the performance of the team is always based on shared information. Hence, a team can only have functional unity based on share perspective instituted by an effective sharing of information.

- **Partnership**
  - The real essence of any development effort, hinges on partnership. This becomes all the more important when mobilizing the local communities in the process of technology transfer and commercialization. The roles of the following sectors are indeed invaluable – farmers and fisherfolk, processors, traders, consumers, local government units, researchers and scientists, policy makers, etc. The real essence of partnership is realized through complementation and teamwork.

- **System Oriented**
  - The successful management of production through technology transfer and commercialization will only succeed if and only if, agriculture is able to actively mobilize domestic and international technologies vital to improved production performance for global competition. Agricultural production, like that of industries must have a market that has no boundary. The interaction of the internal and external systems as these affect the state and direction of agricultural production will be delineated by the program.

Technology Commercialization Process

Conceptually, there is no definitive technology commercialization process for effective and efficient technology adoption, utilization and commercialization. Practitioners formulate their own process to suit their needs in the different aspects of technology transfer, adoption, utilization and commercialization. Based on this observation, the NTCP team devised a process to support program implementation that encompasses key stages in the total technology development and commercialization identified in the framework. The ideal technology commercialization processes are found within the stages of enterprise and agribusiness systems development that strengthen program implementation, monitoring and evaluation including process documentation.

Relation between Enterprise and Agribusiness Systems Development

In order to place the above principles in the context of enterprise and agribusiness systems development (ASD) as reflected in the Medium Term Development Plans (MTDP) of DA, it can be said that technology transfer as an **infusion process** will address mainly the needs of small to medium scale farms for enterprise creation and development. Technology commercialization as **mediation instrument** will address the needs of agribusiness sector to enhance and intensify production performance for profit and competitiveness. It must be pointed that infusion and mediation form part of the overall technology intervention cycle. The developmental nature of the cycle is duly recognized.

As stated before, enterprise development is a pre-condition to agribusiness development. In order to properly handle and align the graduated scale of complexities in agricultural production, its stages must be properly spelled out. This is needed so as to properly orchestrate and harmonized the structure and patterns of technical interventions to meet the technical requirements of production. All the principles identified in the foregoing will apply in relating enterprise development to agribusiness development

In order to properly address the precise interaction and complementation of technologies and other resources at any given scale of production, specifying the stages of production development must be done. The rationale and descriptions of the stages are indicated below.

Rationale for the stages

Five points must be given attention, namely:

1. It is quite importance to fully recognize that on the whole agriculture and fisheries production involves process and product. Although this is rather obvious, what, at times, is ignored, is the need to look at the totality of the process and the interactive and complementary dynamics of elements in the process. This has resulted to design fragmentation and limited impact on the product.
2. The synergistic nature of production elements must be established so as to attain cost-effective production management design.
3. Specific goal oriented activity such as agribusiness development must always be situated in a appropriate context. This means that it is important to consider whether there are processes before and after a specified activity. Presently, the framework is focused on the role of technology commercialization in agribusiness development. However, the process before this is enterprise development. While enterprise development and agribusiness development can be treated as separate activities, in the end, they go together as a continuing process.
4. Regardless of the scale of production, it is a fact that production is an organized activity of the community. Production related organization can be view from the most informal, i.e., traditional mode of production and micro enterprise system to the most formal, i.e., corporate farming and agribusiness development.
5. To value of adopting a process approach to technology commercialization is to highlight the changing nature of the research and extension activities. This is the most important challenge to these services. Perhaps, the need for convergence is fully illustrated in the framework.

Stages of Agricultural Production

There are four stages of agricultural production focused on growth performance for agribusiness systems development. It must be noted that the technology intervention strategies for stages I and II will be technology transfer/infusion. The intervention will specifically address the need of small to medium scale farming. The infusion process will be directed at improving the performance of the farm toward enterprise development.

This activity will require mobilizing and organizing the farmers/fisherfolk and their production systems toward a market oriented production system.

The utilization of technology commercialization as technology mediation will be applied to stages III and IV. The basic assumption is that the current production system is already supported with technologies. The commercialized technologies will strongly play the mediating role for intermediate and advance cycles of production to enhance agribusiness performance and competitiveness.

Stage I (Social Preparation for Enterprise Development – Community Mobilization, Organization and Development)

Goal – Initiate/revitalize farmer and fisherfolk organization in order to raise the consciousness farmers and fisherfolk on the importance of organizing production and livelihood activities.

It is at this stage where the interaction or research, extension and farmers will be enhanced. Attention will be given to the current status and predicament of production in the community. The tacit production knowledge will be placed in its most appropriate structure. This will be enhanced/ improved through participatory research and extension. The inherent organization of production will be developed through organizational development and value orientation . Through information, education and training, the farm and enterprise management skills of farmers and their community will be developed. They will be sensitized to the innovative mode of production activities leading to the management of micro enterprises. The role of women will be enhanced in livelihood related activities.

Activities

- Community Appraisal
- Community Mobilization and Organization
- Characterization and Profiling
- Technology and Training Needs Assessment

Outputs

- Farm resources management skills instituted.
- Designed Information, Communication and Training with focus on the importance of participatory management, leadership and decision making.
- Motivated and mobilized the community to participate in organized livelihood activities.
- Raised the consciousness of the community to the value of sustainable environment management.
- Enhanced the structure of production and livelihood activities through new value orientation, role and control system management.
- Initiated/revitalized primary cooperatives for livelihood development.

Stage II (Organizational Development – Organized Production Management Systems for Micro Enterprise Development)

Goal – Increase the efficiency of farmers' organization in managing production and micro enterprises for productivity and profit.

Activities

- Identification, selection and application of technologies
- Coordination with institution for support services
- Organization of cluster producers and technology users
- Strengthening of local linkage and networking
- Establishment and/or identification of other markets

Outputs

- New value orientation and production standards for managing production and micro enterprise instituted.
- New work orientation focused on responsibility, accountability and commitment instituted.
- A unified approach to livelihood institutionalized.
- An efficient and coordinated team work between research, extension and farmers enhanced.
- Organization differentiation are encouraged and supported.
- Multi purpose cooperatives instituted focused on micro enterprise development.
- Information management for effective decision making developed.
- Marketing skills developed through effective access to proximate or nearby markets.

Stage III (Intermediate Enterprise Development – Enhancing Agribusiness Initiatives)

Goal – This is a transcendence stage where the multi-purpose cooperative is transformed into a full fledge special purpose engaged in full commercial ventures.

Activities

- Tie-up with private sector or industry for a particular commodity
- Strengthening regional linkage and networking
- Establishment of partnership for fresh and processed products
- Establishment and/or identification of other markets.

Outputs

- Organized core requirements for enterprise development focus on domestic and international markets.
- Enhanced attention to the management of business activities.
- Conducted market analysis for more effective consumers orientation.
- Developed new product for new market.
- Strengthened production management system.
- Increased higher level management skills for competitiveness.
- Enhanced production planning and quality control.

- Instituted management control systems for accountability, responsibility and commitment.
- Instituted high performance skills training.
- Instituted new mode of product development.

Stage IV (Advance Agribusiness Systems Development (ASD) for Global Competitiveness)

Goal – This is the stage where the competitive status of the cooperative is fully instituted. Niches both at the domestic and export markets enhanced. Higher level professionalism in the organization instituted.

Activities

- Establish worldwide market
- Tie-up with international markets
- Coordination with international market support, linkage and network
- Expansion of other areas for commodity or product development

Outputs

- Creative Management is encouraged and supported
- Collaboration and coordination with research agencies and colleges and universities on technology commercialization and production innovation operational.
- Product development and innovation instituted.
- Production diversification supported and enhanced.
- Advanced training in product value adding and packaging enhanced.
- Management control system fully operational and responsive to the challenges of the market situation.
- Join venture schemes instituted.

Process Flow as shown in Figure 2.

Entry Point **Mature Technologies (Products and Process)**

Process I **TECHNOLOGY SOURCING**

- Technology Identification/Intelligence
- Technology Synthesis

Outputs Sectoral List of Mature Technologies

Process II **TECHNOLOGY PACKAGING**

Tools : Technology Assessment

- Pre-feasibility Studies
- Feasibility Studies
- Investment Analysis

Outputs : Package of Technology
Investment Package

Process III **TECHNOLOGY PROMOTION**

Tools : Technology Demonstration
Technology Forum
Technology Fairs/Exhibits
Information, Education and Communication Training

Outputs : Technology Knowledge Products and Services

Process IV **TECHNOLOGY UPSCALING**
(Enterprise Initiative and Management)

Tools : Enterprise Management
Cooperative Development Training

Outputs : Markets
Small-scale/medium-scale Enterprises
Large-scale Enterprises

Process V **ENTERPRISE EXPANSION & INTEGRATION**

Tools : Successive Technology Application
- Technology Mapping
- Spatio-temporal Information System Analysis

Outputs : Expanded Technology Demonstration Farms
Technology Users and Adopters Profiles
Village Site Profiles

End Result **WIDE-SCALE ADOPTION**
- Technology Acceptability
- Technology Application
- Technology Utilization

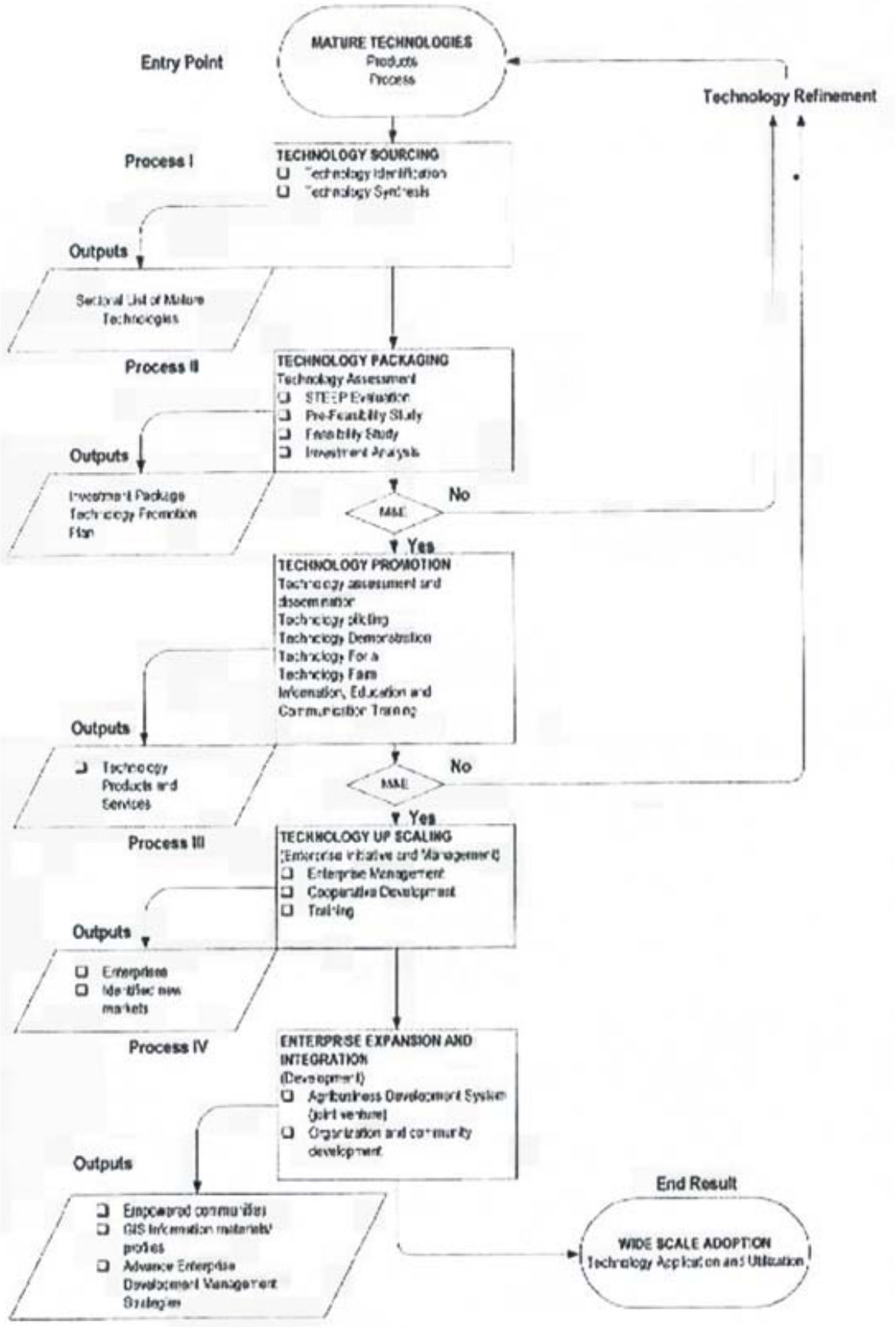

Figure 2 Technology Commercialization Process Flow and Framework for Agriculture and Fisheries Technologies

C. GUIDELINES FOR THE SELECTION OF TECHNOLOGIES FOR COMMERCIALIZATION

On the basis of the foregoing framework, the following criteria are recommended to identify and select technologies for commercialization at the same time used to evaluate Tech Com proposal for fund access

- Should meet the requirements of the technology transfer process (Technology Generation-Technology Adaptation-Technology Verification-Technology Dissemination) or their equivalent.
- The program/project must support existing specific commodity industries or potential industries for competitiveness.
- Should mediate and enhance the use of technologies for the agribusiness systems development.
- Should contribute to the improvement of production management system to increase its performance efficiency and effectiveness.
- Should institute mechanism to increase the complementation of technologies through commercialization.
- Should insure production cost-efficiency and improved product quality through technology synergy.
- Should have competitive positioning of products at the different levels of markets.

The foregoing constitutes the initial investment of BAR in formulating a framework for technology commercialization that can be used by BAR, partner agencies and NaRDSAF member agencies. BAR is tasked to discuss this framework with its Partners, so that our joint aspiration of having a unified approach to technology commercialization will be realized. It is hoped that this framework will be the basis for making concrete our mutual desire to unify our programs.

This Administrative Order is issued as guide and reference for all agriculture and fisheries technology commercialization program in the country.

This order shall take effect immediately.

DOMINGO F. PANGANIBAN
Secretary