Table 7-2 Types and Functions of Integrated Regional (AREA) Development Plan

Type	Objectives and Functions	Nature and Process	Requirements
A. Perspective Plan	a) Creation of a long-term vision of Development b) Indication of direction and speed of development c) Identification of resources and other requirements d) Exploration of development frontier	a) Problem identification b) Assessment of development potential c) Formulation of development scenario	a) Availability of sufficient statistical data b) Creative imagination Interdisciplinary approach c) No quantitative analysis and projections being required
B. Contextual Plan	a) Formulation of contextual framework of existing programs and/or projects b) Intersectoral coordination and integration of plans c) Formulation of spatial strategy	a) Inventory of programs and/or projects b) Goal-setting of sectoral plan c) Coordination of programs and/or projects d) Adjustment of implementation schedule	a) Detailed description of programs and/or projects b) Prioritization c) More sophisticated knowledge and skills of regional development plan d) Cooperation of implementing agencies
C. Comprehensive Plan	a) Problems identification b) Assessment of resources and constraints c) Strategy formulation d) Problem solution e) Formulation of intersectoral and spatial linkage and coordination	a) A comprehensive system framework of development b) Process: 1- Diagnosis & prognosis 2- Assessment of resources and constraints 3- Goal-setting 4- Alternatives & strategies 5- Sectoral & spatial goals and projections 6- Program and project planning 7- Inter-sectoral coordination 8- Implementation planning	a) Availability of primary and secondary data b) Quantitative analysis and forecast c) Interdisciplinary team of professionals d) A relatively long period of field work and research e) Validity of assumptions subject to question under changing circumstances.

7.3 The Methods Recommended for Bohol Integrated Area Development Plan

7.3.1 Type of Method Required for the Bohol Province

1. Problem Situation of the Bohol Province

The type of approach to be used for the Bohol Province is primarily to be determined by the kind of development policy objectives selected as the most critical areas and issues encountered by Bohol at present and in the future.

In order to identify these policy objectives and their priorities, it is thought imperative that the nature and type of the problems troubling the Bohol province must be first singled out.

Figure 7-2 indicates the following: 1) what are the major problems confronting Bohol; 2) how these problems are interrelated with each other in causing the "vicious circle" of development retardation in Bohol; 3) kinds of policy actions that are needed to rectify the critical links of the vicious circle inducing a higher level of economic development. The chart is self-explanatory but some brief comments may be needed to clarify the points:

1) Problem Structure

(a) The low level of Gross Domestic Product is caused by five major factors: 1) low endowment of natural resources, 2) insufficient development of physical infrastructure, 3) lack of financial resources, 4) lack of technical skill and management know-how, 5) institutional constraints, viz., centralism.

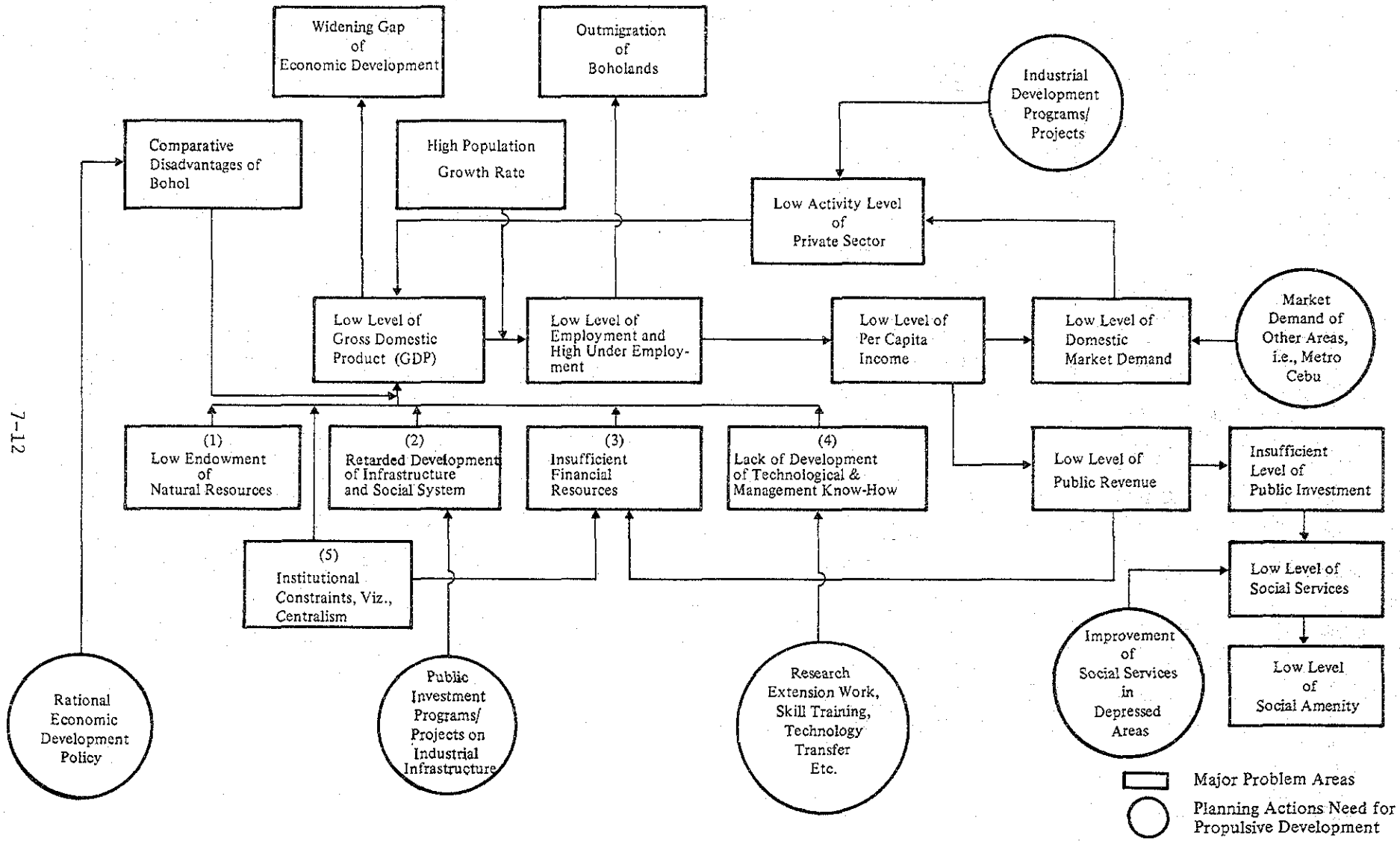
(b) The comparative disadvantage of the Bohol province can be considered as the combining effects of these five factors producing a widening gap of economic development between Bohol and the rest of the Philippines.

(c) The low level of economic activity, particularly lack of development of secondary industries with high labor absorption power, together with a high population growth rate, have brought about a high rate of unemployment and underemployment to Bohol resulting in the outmigration of the Boholanos.

(d) The low level of per capita income was an inevitable outcome which resulted from the cause-effect nexus of these factors. As a result, the domestic market demand within the province of Bohol stagnated. Because of this insufficiency of effective market demand in Bohol, the private sector of the Bohol economy has not in the past been given enough incentives to expand in Bohol. This has also been a contributing factor of the low level of GDP in Bohol.

(e) The low level of public revenue, caused in part by the low level of per capita income, left little financial resources

Fig. 7.2 INTER-RELATIONS OF PRIMARY PROBLEM AREAS & PLANNING NEEDS OF BOHOL PROVINCE



to the local governments of Bohol province which could be invested for the development of infrastructure and social services. The low level of social amenity should be conceived as the end result of these factors.

2) Policy Actions Required

In order to break up these problem linkages the primary policy planning must first be concentrated upon the most "critical areas" of the problem, and the following policy actions should be given high priorities;

(a) Public investment programs/projects on industrial infrastructure which directly contribute to a rise in the production of major industrial sectors in Bohol. Such public investment programs are:

- irrigation system
- ports facilities development
- power supply
- industrial water supply
- improvement of major roads
- fishing port developemnt

(b) Research, extension work, manpower training and technology transfer and diffusion which will contribute to the productivity increase such as:

- Pilot and demonstration farms
- Skill training for both industrial and agricultural workers
- Extension services
- Technical training

(c) Industrial development programs/projects which directly or indirectly activate the economic activities of the private sector in Bohol such as:

- Promotion of rational use of natural resources for agricultural development, e.g., land consolidation for irrigation, implementation of the Wahig-Pamacsalan irrigation project, promotion of urban oriented crop production and beef cattle production.

- Establishment of fishery processing industry

- Establishment of an industrial estate for factories using resources and materials locally available in Bohol.

- Activation of tourism industry.

(d) Outer-market oriented development policy

- Production of primary, industrial and consumer commodities directed to Metro Cebu, the major growth and consumption center in Region VII.

- Establishment of export-oriented industries, e.g., fishery processing industries, cottage industries.

(e) Rational economic development policy to alleviate comparative disadvantages of the Bohol economy such as:

- Characterization of the Bohol economy as a part of "growth corridor" of the regional growth pole of Metro Cebu.

- Adoption of the "growth pole or center" approach by which scarce resources are to be most effectively invested in strategic areas.

- Generation of an agglomeration economy.

2. Need for High Impact Programs/Projects

The aforementioned problem structure confronting the Bohol Province and the policy actions needed for solving critical problems have become widely known, not only to the policy planners, but also to the Boholanos. Because of this recognition, as will be described in the following section, a variety of development plans have already been drawn up on the Bohol province during the past several years. However, no significant policy actions have been taken yet to implement these plans so as to drastically change the fundamental nature of the Bohol economy, i.e., the breaking-up of the "vicious circle" which stagnates Bohol's economy. The cause of inaction may have primarily been the lack of financial resources to be invested as capital outlays for achieving the policy objectives.

It is our judgement that development planning is not enough. What is needed most for the province of Bohol is the identification and formulation of the programs/projects that could be immediately implemented within a short span of time and that could bring about tangible effects in Bohol's economy. These programs/projects are called in the present work "high impact programs/projects." In our present work a central focus will be placed upon the identification and formation of such a "high impact programs/projects" for Bohol.

The method adopted for the present work can, therefore, be characterized by the following factors:

1) A comprehensive and integrated area development plan is conceived as a "heuristic device" by which the high impact programs/projects are fruitfully identified and formulated.

2) A short term planning time horizon (1980 - 1985) is being used as the primary time frame.

3) The project identification are to be concentrated upon the problems areas which have critical importance to the betterment of life in Bohol.

4) The project identification and formulation should be made specific enough in terms of location, objectives, operational

activities and cost estimates so that they can become immediately subject to the "feasibility study."

5) Prioritization is to be made upon the "high impact programs/projects" which are to be selected from the sectors or subsectors on the basis of economic impact.

6) A set of "recommendations" or policy suggestions are to be made upon the problem areas which are not taken up as high impact programs/projects.

7) The medium and long term planning of the sectors have secondary importance in the present work, and their functions are to indicate general policy guidelines or strategies for the future development plan of Bohol.

8) The integrated area development plan is defined as the plan in which the high impact programs projects are coordinated and integrated with each other inducing the generation of cumulative development effects upon Bohol as take-off thrusts. It is conceived as a type of comprehensive development plan in short term goals i.e. the generation of initial thrusts or stimulation for further development.

7.3.2 Functions and Nature of High Impact Project Approach

1. A Summary Description of the High Impact Project Approach

The list of the high impact project approach is summarized in Table 7-3. As indicated there, the approach consists of the following component activities and tasks:

1) Evaluation of the problems

2) Assessment of development potentials.

3) Selection of sectoral objectives and targets of high priority order.

4) Formulation of sectoral development strategy and scenario.

5) Identification and formulation of the strategic programs/projects which will have high impacts.

6) Formulation of a set of recommendations as to actions and implementation plan.

However, while carrying out this high impact approach, the following characteristics should be kept in mind.

1) The general framework is basically the same with comprehensive regional development plan.

2) Primary attention will be placed upon selected problem areas

Table 7.3 Recommended Approach For the Bohol Integrated Area Development Project (BIAD P)

TYPE OF APPROACH	STEPS AND TASKS	CHARACTERISTICS	REQUIREMENTS AND CONSTRAINTS
Identification and formulation of "strategic" programs and projects of: a) High impact effects. b) Propulsive role, initial thrust, and catalystic functions. c) Demonstration effects. d) Large linkage effects. e) Serving as guidelines of development strategy. f) Long lasting effects. g) Multiple purposes.	a) Evaluation and assessment of problems and development potentials of Bohol from the objective point of view. b) Selection of sectoral objectives and targets of higher priority order. c) Formulation of sectoral development strategy and scenario. d) Identification and formulation of "strategic" programs and projects. e) Formulation of a set of recommendations for action and plan implementation.	Nature : a) Conceptual framework formulated according to "comprehensive" regional planning method. b) Heavier weight placed upon identification and formulation of "strategic" programs and projects. c) Five-year time span (1980–85) emphasized. d) Positive aspects accentuated. e) A suggestion of a "working paradigm" as to how Bohol could be developed as a viable regional economy. f) A balanced consideration given to "growth" needs and "basic human needs". Process : a) Basically same as the "comprehensive plan". b) Policy consideration of selected problem areas.	Requirements : a) Avoidance of duplication of existing plans i.e., on-going, proposed and pipeline projects. b) Consonance with regional development policy and framework of NEDA; viz., BIAD Plan. c) Acceptability to the Boholanos. Constraints : a) Lack of reliable primary data and secondary material. b) Limited time budget allocated to field work and research.

of strategic importance.

3) The approach can be practical and fruitful whenever it is found either premature or impossible to formulate a full scale comprehensive development plan due to lack of primary data, time constraints, etc.

2. Criteria of Identification of High Impact Proejcts

The criteria of selecting high impact programs/projects may differ depending upon the nature of the sectoral problems. The following is the criteria suggested for the sectors of industry, infrastructure, and social services.

1) Economic Sector

- Income generation
- Employment absorption
- Backward and forward linkage effects
- Population and/or area to be benefited
- Low input requirements, e.g., in energy, finance, etc.
- High speed in generating effects
- Full utilization of the resources of Bohol
- Demand-orientation within and outside Bohol.
- Long lasting effects
- Propulsive and catalytic functions
- Demonstration effects
- Technological innovation and diffusion
- Technical and economic feasibility
- Agglomeration effects,

etc.

2) Infrastructure Sector

- Direct contribution to a rise in productivity
- Meeting multiple utilities and purposes
- Meeting requirements indispensable for industrial activities
- Estimated to increase demand of services
- Optimal allocation of resources
- Cumulative effects,

etc.

3) Social Services Sector

- Meeting critical needs
- Alleviation of conditions in the most depressed area
- Hierarchical network of service requirements,

etc.

3. Types of Program/Project

It has often been the case that the policy planners use the terms "program" and "project" interchangeably. However, a clear distinction is made in the present report to avoid confusion arising from the inadvertent use of these two terms. The following are the

definitions used in this paper;

1) A "project" is distinguished from a "program" in terms of scale. Projects are shorter and less directly related to basic planning objectives. Projects have specific objectives, operational components (e.g, task, work, activity, etc.) and specific output and input.

2) A "program" can be considered to be comprised of a package of projects which in sum will aid in achieving the specific planning objectives. Programs are longer, more directly related to basic planning objectives and more open-ended with regard specific objectives and components.

The programs/projects be classified into various types according to the objectives, type of operation, input requirements, etc. The following typology is used as a bench mark to identify the different types of the programs/projects.

Types of Programs and Projects

- Income generating (production and services)
- Construction of physical facilities
- Primary and secondary, complementary and supportive
- A system and sub-system of functions
- A prototype, pilot, demonstration, experiment
- Urban and rural
- Large, medium and small scale
- Public and private
- New establishments, improvements and expansion, renovation, replacement and disposal
- Growth-oriented or stability oriented
- Labor-intensive or capital-intensive
- Resource-based or footloose
- Data-generation, research, feasibility study
- Manpower training (management, skill training), in-house training
- Consultancy and technical assistance, or technology transfer
- Export oriented or domestic market oriented, import substitution
- Energy and/or resources intensive
- Long, medium and short term
- Maketing, purchasing, warehousing, producing, maintaining, distributing, and promoting.
- High impact or long gestation, direct or indirect effects
- High or low investment
- Long or short life cycle
- Structural (routine) or unstructured
- High or low seasonal fluctuations
- Private or commercial, associational
- Fixed, mobile or portable
- Single or multiple purposes.

7.4 Regional Development Plans Related to the Bohol Province

It is imperative that a new integrated area development plan for Bohol should be formulated by taking into consideration the following factors or requirements.

1) Development objectives and strategies to be in line with those already established at the national and regional level.

2) Need for a close coordination with the existing plans, programs and projects which fall into the jurisdiction of various line agencies.

3) Objective evaluations of the development objectives, resources and constraints, development potentials and the people's real needs in Bohol.

4) A plan to be formulated on the basis of a realistic appraisal of the conditions necessary for implementation.

These are the general principles that the policy planners of Bohol Integrated Area Development must follow in their task. In the following brief descriptions are made upon the development plans related to the Bohol province to evaluate whether they meet these requirements.

7.4.1 Central Visayas (Region VII) Five Year Development Plan, 1978-1982

The five year development plan of Region VII was written by the Regional Development Council of Region VII and by the NEDA technical staff in September, 1977. The primary objectives and feature of this five year development plan are as follows:

1) To try to decentralize the regional development plan as much as possible to alleviate the defects deriving from over centralized regional planning in the Philippines.

2) To use the method of the Integrated Area Development whereby each province is divided into smaller planning units of Integrated Area Development (IAD) in which sectoral and sub-sectoral development plans are to be integrated with each other.

3) To be concerned primarily with: (a) the examination of the development potential of Region VII; (b) the identification of problems/challenges; (c) the setting of sectoral and sub-sectoral goals and the formulation of their development strategies.

The Five Year Development Plan is well written and documented to show in the most clear terms what must be done for the socio-economic development of this region in the period 1978 - 1982. This plan is used as the general frame of reference or as the starting point for the present work because the primary objectives of BIAD plan lies in the fact that the Bohol province needs to formulate its own integrated area development plan as an integral part of the Region VII's regional development plan. Nevertheless the plan for Region VII needs further

supporting work as follows:

1) Clarification of the economic roles that must be assumed by Region VII vis-a-vis the national economic development plan of the Philippines.

2) Method of implementation management and control of the plan.

3) Detailed examination of the economic role to be performed by Bohol within Region &, differentiated from that of other provinces.

4) Need for development plans for each of BIAD.

5) Need for an integrated area development plan of the Bohol Province as a whole.

The present work is primarily addressing itself to the last task since the others are already been taken up by other administrative organizations of the Philippine government or by international organizations.

7.4.2 Development of Metro Cebu as a Regional Growth Pole

Some of the questions raised in the previous section habe been addressed by NEDA in the document; "Regional Development; Issues and Strategies" published in 1978.[2] The policy objectives articulated in this document regarding Region 7 can be summarized as follows:

1) Regional disparities should be ameliorated.

2) Industrial dispersal policies must be implemented so as to divert industries away from Metro Manila Area.

3) Metro Cebu should be developed as the major growth pole in this region.

4) For the development of Metro Cebu the main thrust should be given to the promotion of foot-loose industries and the development of its mineral resources and associated industries.

5) Supporting infrastructure such as electrification and highway development should be given top priorities.

However, little mention has been made of what kind of economic role should be ascribed to the Bohol province from the strategic need to develop Metro Cebu as the regional growth pole.

7.4.3 Regional Development Investment Program (RDIP)

In the latter part of 1977, the Philippine Government and World Bank agreed on a regional development project using the Central Visayas as the target region. In early 1978, the concept of a Regional Development Investment Program (RDIP) evolved. The Project was carried out

in 1978 as a concerted effort of NEDA/UNDP/IBRD and the first draft raport of RDIP, written in August 1979, was made available to us by the kind support of Mr. Rey E. Crystal. Vice-Chairman of Regional Development Council VII, Regional Executive Director, NEDA. The purposes of RDIP are spelled out as follows:

1) To list all existing, on-going, pipeline and proposed programs and projects of local governments, line agencies and the private sector, whether locally or foreign funded.

2) To prioritize the programs and projects to assist in the achievement of the goals of the regional plan regarding employment, productivity, income and provision of basic services.

3) To serve as the instrument for coordinating and integrating development in the region from 1980 to 1986.

4) To use Integrated Area for Development (IAD), a concept newly established by RDC as the basic planning unit which is defined as a contiguous area, homogenous with respect to social, economic, political, cultural, physical and environmental characteristics.

In preparation for RDIP, a series of research work was undertaken beforehand by the technical staff members of Region 7, NEDA AND IBRD in identifying what kind of tasks are ahead of them and what type of method is to be used.[3] The data and information generated, compiled and analyzed in RDIP has proved to be of considerable value and help to our present work. However, it must be noted that RDIP does not concern itself with the following:

1) Formulation of a comprehensive and integrated regional development plan for Bohol.

2) Definition or characterization of the Bohol economy within Region 7.

3) Integrated Area Development plans for each BIAD (I-V).

4) Intersectoral and spatial coordination of BIAD economic development plan.

7.4.4 Bohol Integrated Area Development Plan of DPWTC

Independent of NEDA's five year development plan for the Central Visayas, Planning and Project Development Office, Department of Public Works, Transportation and Communications (DPWTC) put up its own version of Bohol Integrated Area Development. An interim report was written on this in February, 1976 which was intended to be a planning exercise for the development staff of DPWTC. The formulation of the plan is at the beginning stage and can only be roughly described in the following:

1) Assessment of resources available in Bohol.

2) Identification of major problems, e.t., low productivity, low per capita income, poor health standards.

3) Identification of development needs, e.t., irrigation, roads, port facilities, power.

4) Rough formulation of goals, objectives and strategies.

5) Project identification - Bohol Northeast Basin Development Project which is intended to be an integrated area development plan comprising various project components, viz., irrigation, compact farms, road improvement, thermal plant, Tubigon fishing port, livestock farms, fishponds development, agro-industrial estate, reforestation, coconut processing plants, hospital/ health center, agricultural/vocational school.

It must be noted that the Bohol Northeast Basin Development Project contained "Wahig-Pamacsalan Irrigation Project" as a high priority project.

7.4.5 Integrated Area Development Plans for BIAD I-V

In accordance with the recommendation made in Central Visayas (Region VII) Five Year Plan (1978 - 82), the Bohol province was divided into five Integrated Areas for Development (IAD) and the areas thus designated came to be called BIAD I, II, III, IV and V respectively (See Table 7-4). For each BIAD, the IAD Council was advised to be organized to have planning, coordinating, recommending and advising capacities on matters concerning the development plan. The BIAD Councils are supported by their IAD planning staffs to formulate their own BIAD comprehensive plans by taking into considerations the characteristics peculiar to each BIAD.

In order to facilitate this task, a planning workshop was held in the City of Tagbilaran in early 1978, organized and managed by NEDA Region VII and the Provincial Development Staff of Bohol. The purpose of this workshop was to formulate a coherent framework of the comprehensive area development plan to be used by each of the BIAD Development Council Staff members and also to give them the necessary training for acquiring knowledge and skills required for their work. The end result of this workshop was to culminate in the production of the comprehensive area development plan for each of the BIAD by taking recourse to the same format of theoretical scheme.

In August 1979, all of these BIAD comprehensive development plans were made available to us. However, their papers by no means succeeded in achieving the objectives due to the following reasons.

1) All papers were prepared independently without considering how each of the BIAD plans should be coordinated and integrated into a comprehensive area development plan for Bohol as a whole.

2) They did not depend upon reliable and valid primary data,

Table 7.4 Administrative Division of BIAD

BIAD NO.	BIAD-I	BIAD-II	BIAD-III	BIAD-IV	BIAD-V
Center	Tagbilaran	Tubigon	Ubay	Jagna	Carmen
Other Municipalities	1) Antequera 2) Maribojoc 3) Cortes 4) Balilihan 5) Corella 6) Sikatuna 7) Baclayon 8) Alburquerque 9) Loay 10) Lila 11) Loboc 12) Sevilla 13) Dauis 14) Panglao	1) Leon 2) Calape 3) San Isidro 4) Catigbian 5) Clarin 6) Inabanga 7) Buenavista 8) Jetafe	1) Talibon 2) San Miguel 3) Pitogo 4) Alicia 5) Mabini	1) Candijay 2) Guindulman 3) Anda 4) Duero 5) Garcia-Hernandez 6) Valencia 7) Dimiao	1) Bilar 2) Sagbayan 3) Danao 4) Dagohoy 6) Sierra-Bullones 7) Batuan
Total Municipalities	14 + Tagbilaran City	9	6	8	8

which caused the lack of basic data, a minimal requirement for planning. It was even found that they lacked the data essential for making an "area profile".

3) Too much stress was placed upon the strict adherence to the writing format prescribed to the development staff officers of BIAD, resulting in the fact that the plans tended to be written devoid of the major strategies or characteristics most suited to each BIAD.

4) The papers were written with varying detail and degree of technical treatment of subject matters, indicating that the planning capabilities of the BIAD planning staff have not yet been uniformly developed.

5) The papers lack a well thought out plan for major sectors or sub-sectors which have primary importance for each respective BIADs.

Despite these drawbacks of the BIAD plans, the serious efforts exerted in them should be highly appreciated. It is strongly urged that their efforts should be continued in the future.

7.4.6 Town Plannings Envisioned by the Ministry of Human Settlement for Region VII

Regional Multi-Year Human Settlements Plan 1978 - 2000, Region VII Central Visayas was prepared by the Ministry of Human Settlements in October, 1978 as a general policy guideline for a long range planning so as to indicate how Region VII needs to be developed to meet the national standards or objectives set forth for human settlement problems.[4] It appears that the human settlement problems are related, directly or indirectly, to every facet of life in the Philippines. The core philosophy of the Ministry of Human Settlement lies in the realization that a new town planning scheme should be carried out as one of the major palatives for the problems critical to life in the Philippines. However, it entails the establishment of an all-encompassing planning of the problems which fall into the jurisdiction of various Ministries of the Philippine Government.

Some of the major features of the Regional Multi-Year Human Settlements Plan 1978 to 2000, which are relevant to the Bohol province, can be spelled out as follows:

1) It tries to formulate objectives for the major sectors viz., economic, infrastructure and social services.

2) Tagbilaran, Talibon and Garcia-Hernandez are identified as the industrial areas of Bohol.

3) Bohol is identified as the major province within Region VII which has potential resources for the development of the tourist industry, and the tourist spots mentioned are: Maribojoc, Panglao, Dauis, Baclayon, Loboc, Valencia, Garcia-

Hernandez, Jagna, Anda, Mabini, Bilar, Sagbayan, Loon.

4) As growth centers in Region VII, Tagbilaran, Talibon and Garcia-Hernandez are cited as "minor centers".

It is clear that the town planning policy of the Ministry of Human Settlements needs to be coordinated in the future with the policy objectives of other planning agencies in order to avoid conflicting programs/projects that may be planned and implemented in Region VII as well as in Bohol.

7.4.7 Bohol Integrated Agricultural Development Project of JICA

A feasibility study was carried out by the Japanese Study Team from August to November, 1977 for the Integrated Agricultural Development Project in the province of Bohol in accordance with the Scope of Work agreed upon between the Philippine Government and Japan International Cooperation Agency (JICA), an official public organization of the Japanese Government for technical cooperation. The report was written in May 1978 and submitted to the Philippine Government. The following is the main gist of the Bohol Integrated Agricultural Development Project.

1) The Project should be considered to be one of the major component projects of the Bohol Integrated Rural Development Project (IRDP) which was initiated by the Planning and Project Development Office of DPWTC in 1975.

2) The Bohol IRDP comprises a package of priority projects which includes, inter alia, projects on irrigation, fishpond development, fishing port development, livestock farming, power plants and development of agro-industrial estate.

3) The Project, recommended to be feasible by the study, came to be generally known as the "Wahig-Pamacsalan Project" to be carried out in the area covering approximately 7,300 has., about 60 km northeast of Tagbilaran City.

4) The main components of the Projects are:

   (a) Civil Works

   - Irrigation and drainage
   - On-farm development
   - Roads
   - Hydropower

   (b) Agricultural Development

   - Irrigated agriculture
   - Supporting services
   - Institutional arrangement

5) By the Project the following was proposed:

(a) Total area of irrigation: 5,320 ha.

(b) Major facilities to be constructed:

- Pamacsalan dam with a storage capacity of 30.2 MCM
- Malinao diversion dam with a storage capacity of 3.4 MCM
- Canal and on-farm development, i.e., 113 km irrigation canal, 98 km drainage canal, on-farm development of 5,320 has.
- Hydropower (annual energy production of 5,175 MWH)

6) The Project costs were estimated to be as follows:

(a)	Foreign currency	US$25.2 million
(b)	Local currency	US$18.4 million
	Total	US$43.6 million

Footnotes

1) A large volume of literature has become available to regional development planners regarding the concepts and methods of "comprehensive and integrated" area development planning. The following are some of the reference materials that could be used by practitioners of regional development.

   (a) Kublinski, Antoni, ed., Growth Poles and Growth Centers in Regional planning, Morton, Paris, 1972.

   (b) Richardson, Harry W., Regional Growth Theory Macmillan, Londdon 1973.

   (c) Moseley, Malcom, Growth Centers in Spatial Planning, Pergamon Press New York, 1974.

   (d) United Nations Center for Regional Development, Methods of Planning for Comprehensive Regional Development, Nagoya, Japan, 1976; Uneven Development, Rural-Urban Transformation, and Regional Development Alternatives in Asia (ed,, by Lo, Fu-chen; Salih, Komal; Douglas, Mike;), Nagoya, Japan, 1978.

   (e) Lo, Fu-chen and Salih, Kamal, ed., Growth Pole Strategy and Regional Development Policy, Pergamon Press, New York, 1978.

2) National Economic and Development Authority, Regional Development; Issues and Strategies; Philippine Development Studies, No. 1, 1978.

3) The World Bank, The Philippines; A Development Strategy and Investment Priorities for the Central Visayas (Region VII), January, 1979; RDC and NEDA, Region VII, Central Visayas Regional Investment Program Project; Inception Report, July, 1978.

4) Ministry of Human Settlements; Regional Multi-Year Human Settlements Plan 1978 to 2000; Realizing the Vision of A New Society, October, 1978.

ECONOMIC SECTOR

CHAPTER 8
AGRICULTURE AND LIVESTOCK INDUSTRY DEVELOPMENT PROGRAMS AND PROJECTS

CHAPTER 8 AGRICULTURE AND LIVESTOCK INDUSTRY DEVELOPMENT PROGRAMS AND PROJECTS

8.1 Introduction

Since agriculture is the most important leading economic sector in Bohol, it requires intensive and detailed examination of the problems encountered by Bohol, realistic appraisal of the development potentials, and formulation of feasible and effective development programs and projects to provide major stimulai to the agricultural development in Bohol. However, it must be recognized that the agricultural development in any country should be viewed from a relatively long time framework, for many of their problems tend to emanate from sources deeply rooted in their institutional and structural constraints which cannot be easily resolved. For this reason, an extensive inquiry must first be made into every facet or aspect of the problem structure currently besetting the basic fabric of agriculture in Bohol.

In this chapter, a rather lengthy discussion is therefore presented first on the nature and types of the problems troubling the Bohol agriculture in order to identify the causes or roots which have stagnated agricultural development in Bohol. Secondly, evaluations are briefly made on the future developmental potentials of the Bohol agriculture centered around its prospective role to act as the supply depot of agricultural goods to Metro Cebu, the major industrial growth pole in Region VII.

Thirdly, the development objectives and targets of agriculture and livestock of Bohol are to be framed in line with the general guidelines established by the national government concerning the three basic problems: 1) food and nutrition, 2) agro-energy development, and 3) export generation and import substitution. In more specific terms, future production targets are set forth with respect to the major production items of the Bohol agriculture, namely, rice, corn, cassava, coconut, and beef and carabeef.

Fourthly, brief explanations are provided for the eight basic development strategies whose implementation are deemed necessary for the successful agricultural development in Bohol. They are 1) increase in agricultural productivity, 2) price stabilizing policy, 3) development of practical and profitable technology, 4) improvement of soil fertility, 5) establishment of research promotion center, 6) development of pilot farm, 7) development of urban oriented farms, and 8) Wahig-Pamacsalan irrigation project.

Fifthly, in conclusion, a set of "high impact projects" are formulated which are to be implemented within a relatively short span of time and will give initial thrusts to the agricultural development in Bohol. It must be emphasized that the "high impact projects" are designed to serve as major catalytic and/or propulsive functions for the early stage of the agricultural development of Bohol.

Although the latest official statistical data available to us on

the agriculture in Bohol is the 1971 Census of Agriculture of Bohol, which was published by National Census and Statistics Office of NEDA, relatively updated statistical data were nonetheless available to us which were published by various bureaus and line agencies of the Ministry of Agriculture on selected agricultural products and problems in Bohol. However, since the data base and sampling methods used by them were by no means uniform, there are some inconsistencies or contradictions observed in the information provided by them. Therefore, a caution must be made when one interprets the quantitative data presented in this chapter.

8.2 Analysis of Current Agricultural and Livestock Problems and Trends

8.2.1 General Background of Agriculture and Livestock in Bohol

The Province of Bohol, belonging to Region VII, is composed of the main island and many small islands including Panglao and Pitogo islands, with a total land area of 443,250 hectares. The main island's shape is almost oval and is surrounded by shallow coral reefs. The topography of Bohol is composed of a central plateau and plains along the coastal area. The plateau inclines from south to north, and karsts are formed in areas from hills to coasts. The coastal areas are commonly fringed with mangroves and nipa palms. According to 1971 Census of Agriculture of Bohol, the total area of arable land is about 73,333 hectares (ha.), out of the 142,070 has. of total area of farmlands. Most of the arable land scatters on the plateau and the coastal plains. The physical area of rice paddy is about 29,559 has. of which 11,593 ha. (39.2%) are farms with irrigation facilities.

Located off the typhoon and active volcano belts of the country, Bohol is relatively wet in its eastern side with more than 2,000 mm of annual rainfall, and dry in the west with an annual rainfall of around 1,500 mm. Bohol is reported to belong to the fourth type of climate, namely, a climate with rainfall more or less evenly distributed thoughout the year. The temperatures range from 25 to 35°C, with breezes from the southwest in the summer and from the northeast in the winter.

Streams and rivers running down from the hills and the plateau make a rather complicated topography. Of the rivers, Wahig and Loboc rivers are the longest ones and have side territories of irrigable area. As a common phenomenon in calcareous areas, water goes underground easily and its outlet is difficult to find.

The soils of farmland are mainly derived from limestone and lime-rich shale and sandstone. The soil derived from igneous rocks are distributed in the municipalities of Talibon, Trinidad, Ubay, Alicia, Mabini and Anda in a rather narrow extent.

The agricultural products of Bohol are mostly as follows:

Rice, corn, coconut, tobacco, sugarcane, citrus, vegetables, tuber, root and bulb crops, coffee, abaca, cacao, banana, pineapple, pulses and others. (For a comparative description of the main crops of the Region by province see Appendix 8-1.)

The Boholanos staple foods are rice (80%) and corn (20%).

Agriculture in Bohol was briefly described in the 1971 Census of Agriculture as follows:

1. Land Utilization

Of the total land area of the province, 142,070 hectares or 34.5% were farm areas. Out of this total farm area, 40.4% was planted with annual crops and 33.3% perennial crops. Land laying idle was 11.2%, permanent meadows and pastures 10.5%, all other land 2.7% and forest growth 1.9%.

2. Number, Area and Size of Farms

The total number of farms increased by 3.6% from 58,979 in 1960 to 61,107 in 1971. The total area also went up by 5.4% from 134,841 hectares in 1960 to 142,070 hectares in 1971, but the average size of farms remained the same, 2.3 hectares. Distribution of farm size is as follows: 23.9% were of sizes less than 1.0 hectare; 54.5%, 1.0 to less than 3.0 hectares; 16.8%, 3.0 to less than 5.0 hectares and the remaining 4.8%, 5.0 hectares and over.

3. Tenure

There was a preponderance of fully owned farms in the province. Of the total number of farm operators, about 58.5% were owner operators, 26.2% part-owners, 14.4% tenants, and 0.9% other forms of tenure.

4. Type of Farm

As of the 1971 Census of Agriculture, Bohol was considered a palay producing province. About 35.0% of all farms in the province were palay farms.

Next to palay farms were the other crop farms, 28.6%; coconut farms, 16.7%; corn farms, 14.0% and tuber and bulb crops, 3.1% and about 2.6% were utilized for sugarcane, vegetable, banana, other fruits, hogs and cattle farms.

5. Fragmentation of Farms

Farms in Bohol were fairly fragmented and only 29.6% or 18,097 farms operated on one parcel of land. Nearly 49.9% or 28,653 farms consisted of 2-3 parcels, 15% or 9,136 farms 4-5 parcels, and 8.5% or 5,221 farms 6 or more parcels.

6. Farm Production and Value

The total value of all crops produced in Bohol was ₱79,507,000 in 1971. With an effective crop area of 145,732 hectares, the average production was ₱546 per hectare and ₱1,301 per farm. Considering a farm household population of 358,931, the per

capita income was ₱222.

1) Palay

Palay ranked first in total value of production among the crops produced in Bohol, accounting for 48.7% of the total value of all crops in the province. Total production of Palay during crop year 1970 - 71 was 1,601,377 cavans worth ₱38,735,074. Broken down, this total production was equivalent to 36 cavans worth ₱860 per farm or 31 cavans worth ₱755 per hectare.

2) Shelled Corn

Corn accounted for ₱7,358,177 or 9.2% of the total value of all crops. Average production of corn was 10 cavans worth ₱235 per farm or 12 cavans worth ₱270 per hectare.

3) Banana

Banana contributed ₱5,717,006 or 7.2% of the total value of crops produced in Bohol. With a total of 41,129 farms planted and a total production of 29,284 tons, the production was approximately 712 kilos worth ₱139 per farm or 4,067 kilos worth ₱794 per hectare.

4) Cassava

The number of farms reporting cassava in Bohol in 1960 was 15,757 but this greatly increased to 25,039 or 58.9% in 1971. The total cassava production was 13,639 tons worth ₱2,167,373 which was 2.7% of the total value crop production in Bohol. A hectare of land planted with cassava yields about 2,450 kilos worth ₱641.

5) Coconut

In a span of 11 years, the number of farms that produced coconut increased from 50,406 to 53,009 or 5.1%. Similarly, area planted leaped by 32.7% from 29,581.4 hectares to 39,257 hectares. However, production of coconuts decreased by about 27.4% from 92,457,469 in 1960 to 67,112,356 in 1971. Value of coconut products amounted to ₱15,765,464 constituting 19.8% of the total value obtained from all crops in 1971.

7. Livestock

Livestock raised by farm households in Bohol in 1971 totalling 244,890 animals consisted of 126,524 hogs (51.7%), 73,035 carabaos (29.8%), 31,498 cattle (12.9%, 11,726 goats (4.8%) and 2,052 horses (0.8%).

8. Poultry

Poultry raised in the province was predominantly chickens. It

consisted of approximately 99.7% or 864,832 out of 867,783 total number of poultry.

9. Farm Population and Operator

Bohol had a total farm population of 370,157 out of which 94.1% or 348,360 of the farm population were concentrating in small holdings of 1.0 hectare to less than 3.0 hectares. A considerable portion or 24.5% of farm operators belonged to the 35-44 and 45-54 age group, and the overall average age of all operators was 47.5 years. Out of 61,107 farm operators, 82.5% had schooling. Of those who had been to school, 90.6% only had elementary education. All in all, farm operators had an average schooling of 4.5 years.

10. Farm Employment

Generally, most farm households, or 71.6% reported that agricultural work was done by its members. During the census week in 1971, it was found that 57.7% or 142,970 of the 247,579 farm workers were unpaid workers. More than 64.6% of the farms reported an average farm operation of 6 months.

11. Sources of Income

Out of the 61,107 farm households, 71.7% were dependent entirely upon their holdings as source of income while 20.4% were dependent mostly on their holdings, supplemented by income from other sources. The rest were dependent on other holdings and various off-farm employment. Of the latter households with off-farm employment, 40.5% were employed as craftsmen.

12. Farm Management Practices

1) Irrigation

Only 31.4% of the 61,107 farms in Bohol had irrigation facilities in 1971, increased in number by 30.9% from 14,677 in 1960. At the same time irrigated area increased by 339.2% from 7,811.2 hectares in 1960 to 34,307 hectares in 1971. Of the effective crop area irrigated, 85.1% made use of gravity flow while the rest used power pumps and other means.

2) Fertilizer

Of the total 61,107 farm operators, only about 52.8% used fertilizers; the rest did not apply fertilizer in the farms during the crop year. In terms of effective crop area, 31,553 hectares or 96.6% were treated with chemical fertilizer and a comparatively small area of 1,121.6 hectares with organic and other types of fertilizer.

3) Pesticides

Only 1,077 farm households or 1.8% applied pesticides while

60,030 or 98.2% had none, Application of pesticides was limited to 1,509.6 hectares.

4) Improved Palay Seeds

Improved palay varieties were used only by 33% of the 45,044 farm operators. Of the users of improved varieties, 74.4% used solely improved varieties, while 25.6% used both traditional varieties and improved varieties.

5) Farm Equipment

Plows and harrows were the most common farm equipment used in the farm, comprising 47% of the reported number of farm implements. It was reported that from 1960 to 1971 the number of plows and harrows increased by 14.7%. At the same time, other farm equipment like tractors, harvesting machines, motor vehicles, etc. increased considerably, indicating a growing responsiveness among farmers to technological innovations to improve farm productivity.

6) Intensity of Land Use

The 1971 Census of Agriculture indicated that a considerable number of farm operators made intensive use of their farmlands by adopting such practices as interplanting of crops, planting crops in succession or both interplanting and succession cropping. Interplanting alone was practiced by 7.7% of all farm households, succession cropping by 44.1% and both interplanting and succession cropping by 34.8%. It is reported that only 13.4% of farm operators did not practice interplanting and/or succession planting.

8.2.2 Agricultural Production System in Bohol

Some of the major features of the agriculture in Bohol are briefly described in the following sections in order to highlight the current agricultural production system of Bohol.

1. Land

Since land is the most fundamental and indispensible resource of agricultural production in Bohol, agricultural production in general is affected to a large extent by fertility, location and holding status of land. As of 1975, the farmland of the province is estimated at 152,610 hectares or 34.43% of the total area. Changes in land use of farmland (1960 - 75) are shown in Table 8-1.

Table 8-1 Changes in Area of Farms by Land Use - 1960, 1971, 1975

Land Classification	1960	1971	1975
Planted with annual crops	50,402.1 (37.4)	57,412.1 (40.4)	57,446.3 (37.5)
Planted with perennial crops	36,661.6 (27.2)	47,301.8 (33.3)	47,385.5 (31.0)
Permanent meadow and pastures	8,366.6 (6.2)	14,872.3 (10.5)	15,102.6 (9.9)
Idle Lands	34,113.1 (25.3)	15,921.2 (11.2)	15,120.3 (10.6)
Land covered with forests	3,788.8 (2.9)	2,772.5 (1.9)	7,780.9 (5.1)
All other lands	1,509.6 (1.1)	3,790.4 (2.7)	8,774.9 (5.8)
TOTAL FARMLAND	134,841.8 (100.0	142,070.3 (100.0)	152,610.5 (100.0)

Source: Census of Agriculture - 1960, 1971 - NCSO and Provincial Government Data

With the increase in the total area of farms, the area planted with perennial crops and those of permanent meadow, pasture and forest lands have increased considerably from 1960, whereas the idle land has decreased.

Based on the same distribution pattern of farmland recorded in 1971, the breakdown of farmland in each BIAD (defined by the NEDA) for 1975 could be estimated as follows:

Location	1971		1975	
BIAD I	19,852 has.	(14.0%)	21,365 has.	(14.0%)
BIAD II	27,699	(19.5)	29,759	(19.5)
BIAD III	41,407	(29.1)	44,562	(29.1)
BIAD IV	19,102	(13.4)	20,450	(13.4)
BIAD V	34,010	(23.9)	36,474	(23.9)
Total	142,070	(100.0)	152,610	(100.0)

According to the data compiled by BAECON, the breakdown of rice paddy area by each BIAD in 1975 was as follows:

Location	Irrigated		Rainfed		Total	
BIAD I	760 has.	(15.3%)	4,210	(84.7%)	4,970	(100%)
BIAD II	1,110 has.	(19.3%)	4,650	(80.7%)	5,760	(100%)
BIAD III	1,060 has.	(17.9%)	4,850	(82.1%)	5,910	(100%)
BIAD IV	3,985 has.	(50.9%)	3,850	(49.1%)	7,835	(100%)
BIAD V	4,100 has.	(37.1%)	6,950	(62.9%)	11,050	(100%)
Total	11,015 has.	(31.0%)	24,510	(69.0%)	35,525	(100%)

As shown above, out of the area planted with annual crops of 57,446 has., 35,525 has. or 61.8% of it is devoted to paddy fields. Rainfed paddies occupy 69% of the total paddy area of Bohol. The paddy fields of BIAD IV and V together account for 53% of the total irrigated area. The Wahig-Pamacsalan Irrigation Project is expected to cover 6,000 has. of irrigated area.

In addition to this, there is a wide gap among BIADs with respect to irrigable status. Less than 20% of the area of paddy fields for BIADs I, II and III are irrigable. On the contrary, the irrigable conditions in BIADs IV and V are almost comparable, with the national average of 46% in 1975. The paddy fields in these two areas occupy a larger share with 18,885 has. or 53% in the total province. Accordingly, these areas are to play a vital role as major rice producing districts.

2. Agricultural Productivity

With regards to the ratio of effective area by physical area, the land in Bohol was utilized in 1975 up to 171% by annual crops and 139% by the total land use.

The total value of all crops produced in the province was ₱82,243,600 in 1975. (BAECON, Corn Production Data) Taking the figures of the physical and effective area and the number of farms, the average production is then ₱785 per ha. of physical area, ₱564 per ha. by single cropping and ₱1,384 per farm. The figures obtained clearly indicate poor productivity of land and low income of farm, although the figures slightly increased as compared with those of 1971.

For measuring the total land productivity, the Crop Yield Index (CYI) of 8 selected major crops, including irrigated and rainfed rice, upland rice, sugarcane, coconut, corn, fruit trees and root crops, is calculated for each BIAD. (See Appendix 8-2). The results obtained are as follows:

BIAD I - 80%, BIAD II - 79%, BIAD III - 90%, BIAD IV - 104%, BIAD V - 84%, Total Bohol - 84%.

On the basis of the Crop Yield Index it can be judged that only BIAD IV reaches the national average level of land productivity

Table 8-2 Palay Production in Bohol, 1971

National/Regional Province/IAD	IRRIGATED			RAINFED			UPLAND		
	Area (Has.)	Production (M.T.)	Yield (M.T./Ha.)	Area (Has.)	Production (M.T.)	Yield (M.T./Ha.)	Area (Has.)	Production (M.T.)	Yield (M.T./Ha.)
Nation	1,226,176	2,159,141	1.8	1,373,724	1,706,701	1.2	367,809	320,068	0.9
Region VII	28,160	27,711	1.0	44,300	49,114	0.9	2,833	2,395	0.6
Bohol	20,163	17,745	0.9	30,165	36,051	1.2	978	1,013	1.0
BIAD I	1,550	821	0.5	4,410	4,436	1.0	122	26	0.2
BIAD II	2,556	1,829	0.7	7,446	8,066	1.1	162	435	2.7
BIAD III	3,161	2,396	0.8	9,645	11,468	1.2	433	363	0.8
BIAD IV	5,303	5,632	1.1	2,542	2,656	1.0	55	47	0.9
BIAD V	7,594	6,907	0.9	6,122	9,425	1.5	207	143	0.7

Source: 1971 Census of Agriculture

and others are below the level.

3. Rice Production

Very little up-to-date statistical data is available on rice production in Bohol. However, judged from the limited statistical information available to us, the following can be pointed out on the rice production in Bohol.

1) As indicated in Table 8-2, the productivity of irrigated palay production was extremely low, almost one half of the national average yield per hectare in 1971, although productivities of rainfed and upland palay production were more or less at the same level as the national average.

2) According to the supply and demand projection (1980 - 1986) of rice made by NEDA in Regional Development Investment Program (RDIP) for Central Visayas, Bohol is found to be the only province in Region VII which will be able to produce surplus rice in the future, 27,514 m/t in 1980, 33,314 m/t in 1983, and 38,410 m/t in 1986. The rest of Region VII, e.g., Cebu, Negros Oriental, and Siquijor is projected to show deficit in rice production and their rice deficiency will amount to 186,752 m/t in 1986 for the three province (See Appendix 8-3).

   A clear indication was not made as to how these projections were made. However, if the projections are judged correct, Bohol's future economic role within Region VII could easily be defined as the rice exporting province in Region VII.

3) The productivity of irrigated rice production in Bohol is judged to be low, and special measures must be taken so as to increase the rice productivity of irrigation facilities. In this regard, a priority consideration should be given to the Wahig-Pamacsalan Irrigation Project. It is planned that upon completion of the Wahig-Pamacsalan Irrigation Project, almost 6,000 hectares will be newly irrigated for rice production. If it is assumed to produce 100 cavans or 5 tons per hectare per year of rice, the Project area may have 30,000 tons of palay per year.

   The surplus rice production generated by the Wahig-Pamacsalan could be also expected to export to Cebu and other neighboring provinces in Region VII.

4) Of the rice producing areas, BIAD I, which includes the city of Tagbilaran (the major urban center in Bohol), will remain to be a rice deficient area in Bohol.

4. Corn Production

The production of corn in Bohol is faced with many problems, particularly, with the exceptionally low productivity of the soil. Bohol produces about 18,000 tons of corn annually with an average

yield of 680-750 kg/ha., while that of Region VII is 510 kg/ha., far less than that of Bohol. However, these figures are quite low compared with those of other countries in the world.

Supply and demand projection of corn within Region VII is indicated in Appendix 8-4. As indicated, a large deficit is estimated for the whole region: 227,000 tons for Cebu, 105,000 tons for Bohol, and 460,000 tons for Region VII as a whole. The estimation of corn consumption is based on a per capita food consumption of 146 kg/year.

However, according to the latest report (MDA 1978), the per capita consumption of the major foods of Region VII are:

Rice and rice products	43.6 kg
Corn and corn products	82.5 kg
Wheat	9.9 kg
Total grain	136.0 kg

Accordingly, the basic figure of 146 kg used for the projection is considered a little higher than that obtained by the latest report, even if the figure of 82.5 kg is converted to rough and unshelled corn.

If the report of MDA is correct, the demand may decrease somewhat, resulting in a decrease in the deficit. However, the total balance sheet will still show a large deficit, which means that more corn must be produced to meet the regional domestic consumption.

According to the BPI report, the major corn varieties used in Bohol are: BPI Var. 2, UPCA Var. 2, Phil. DMR 2, MIT 2, BPI Var. 1, etc. It should be noted here that the highest yield obtained in the Marcos Corn Experiment Station during the 1976 - 77 dry season was reported to be 3,648 kg/ha. The technology developed in the station should be transferred to the farmers in Bohol.

There is still room left for improvement in corn production. FAO Bulletin reported (Soils Bull. No. 21) that intensive cultivation in calcareous area of Lebanon in 1960 resulted in corn grain yields of up to 15.8 ton/ha., under the heavy applications of nitrogen and phosphorus with appropriate amounts of zinc, manganese and boron. In this case, the cost-benefit ratio might be very high. The application of micro-nutrients such as zinc, manganese and boron should be considered as a practical farming method by farmers, just as they practice the same measures for rice paddy.

In addition, an irrigation system should be introduced to upland fields for corn, sorghum, and other crops if water resources can be utilized. As it will be noted later, upland crops represented by corn in Bohol commonly show the symptoms of drought. Such short supply of water from the soil is mainly caused by shallow surface soils with impermeable bed rocks underneath which are common in Bohol, especially on plateaus. It is highly recommended to irrigate corn fields if possible. However, the use of following as

a means of increasing available soil nitrogen through breakdown of soil organic matter during the fallow period tends to decrease the level of soil organic matter over a period of time and is a wasteful use of land.

The use of green manure crops will tend to concentrate available nutrients for the next crop. For this reason, although green manure crops do not give cash incomes, it is recommended to plant green manure crops rather than leave the land fallowed. The cultivation of corn with the use of green manure crops may become one of the means to increase its production in Bohol.

5. Cassava Production

Cassava is a starch crop and most of its by-products are made into feeds for the swine industry. However, parts of tapioca starch are utilized as food stuff. The average yield of cassava in the country is 7.98 ton/ha., whereas those or Region VII and Bohol are as low as 3.63 and 2.03 ton/ha., respectively. Cassava production may not be profitable in Bohol because of the low productivity.

The low productivity might be caused by the worst characteristics of calcareous soils in Bohol; namely, the problems of nitrogen, phosphorus, zinc, manganese and boron and soil moisture.

However, it must be noted that cassava flour can be used for alcoholic industry. Pure ethanol can be used for fuel when mixed with gasoline - the alcogas. Bohol Province should have an ethanol fermentation plant with the purpose of supplementing car-fuel and increasing cassava consumption. The demand for cassava generated by the alcogas factory will raise the price of cassava which will in turn stimulate the production.

It is reported that cassava is suited to rather acid soil with pH 5.5 - 6.5. In Bohol, however, it has been planted mostly in calcareous soils which show higher pH levels, higher than 7. This may be one of the reasons why its yield is low. There should be a particular variety which is suitable to calcareous soils.

The international Cassava Research Institute in Peru has been undertaking various researches and experiments on cassava production. The technical information can be obtained from this institute as to how to raise the cassava production in calcareous soils.

6. Copra Production

Copra is produced all over the province and is the source of a stable cash income for the people. Coconut is planted over 39,000 has. and the copra production is estimated about 20,000 tons annually. The average copra production of Bohol is 1.05 ton/ha., 31% higher than that of the country. Coconut in Bohol belongs to the tall variety, mostly San Ramon, which can produce up to 80 - 100 coconuts per year. Usually, a spacing of 7 - 10

square meter is recommendable, but if soil fertility is poor, wider spacing is necessary. The average number of coconut trees in Bohol is about 140 per ha. with 35 bearing trees per year.

Most of the copra produced is brought to Cebu for oil-milling and in its return Bohol imports coconut oil from Cebu as food oil. This means that there is no way in Bohol to get sufficient amount of copra cake from which livestock can be fed. Another problem which results in a decreasing copra production is the coco inflorescence wine, locally known as "Tuba". This fermented juice is the common alcoholic drink in the coconut region, and the number of coconuts is decreased by this practice. It is recommended to stop the making of Tuba wine in order to protect copra production in Bohol.

It is pointed out that there are many reasons for the low productivity of coconut in Bohol; they are as follows:

- The trees are generally too old. They have gone beyond their productive period of production.
- The spacing is commonly too narrow.
- Most trees are old varieties.
- No fertilizers are used.

In order to raise the productivity level of copra in Bohol, there is a strong need for a governmental policy of replantating old coconut trees with new productive varieties. The policy should be accompanied with (1) subsidy for the purchase of recommended seed varieties, (2) establishment of a coconut nursery whereby the farmers can buy coconut seeds at low price, and (3) strategic promotion of BIAD III and IV as the main coconut production areas.

7. Vegetable Production

With the progress of industrial development in Cebu, demand is expected to increase for the vegetable consumption, especially for materials used for vegetable salad.

A general pattern of food consumption in the urban area is a gradual shift from staple foods to meat, vegetables and fruits. The following vegetables will become in great demand in the future; tomato, lettuce, cabbages, green-and bulb-onions, etc. Since freshness is required for vegetables, production areas should be close to consumption markets. It is judged that BIAD II in Bohol is geographically located in a better position to supply such vegetables to Metro Cebu.

Vegetable production, however, requires a rather higher and sophisticated technique not only for the farmers but also for the dealers or the middlemen. For instance, the quality of vegetables could easily be damaged by pest and disease and application of ferti-

lizers is needed for their growth. In order to keep them fresh, a strict measure of quality control is also necessary for packing, handling, physical distribution, and storage.

8. Livestock and Poultry Production

The number of principal livestock by kind and the animal unit are reported as follows by the BAI in 1978:

Carabao - 97,010 (97,010 A. U.), cattle - 59,150 (59,150 A. U.), swine - 220,680 (44,136 A. U.), chicken - 1,487,890 (14,879 A. U.) and duck - 5,560 (56 A. U.).

As compared with the statistics of 1971, the number of all livestock increased remarkably; carabao - 132%, cattle - 175%, swine - 173%, chicken - 170%, and duck - 220%.

However, it is observed that a majority of the livestock listed above in Bohol are raised in backyard farms and used for home consumption without almost any machinery. On the average, a farmer's family feeds about 1.2 heads of carabao which are used to plow the fields.

In the light of protein deficiency in Bohol as well as in Region VII, livestock is one of the major sectors which should be given incentives to increase production for domestic consumption as well as export to outside Bohol, particularly to Metro Cebu.

The number of livestock exported is: carabao - 2,962, cattle - 3,942, swine - 19,268, and poultry - 308,174. Their export shares are: 3% for carabaos, about 6% for cattle, 8% for swine and 21% for chickens.

Although the number is small, there are 121 farms which are classified into commercial and semi-commercial ones specializing in livestock and poultry business. About 90% or 109 farms raise cattle and poultry layers. Cattle farms are located exclusively in BIAD III and V where meadow and/or pasture lands are comparatively large. On the other hand, farms engaging in medium and small scale livestock raising, such as hog and poultry, are located in urban areas since these animals do not necessarily depend so much on land.

It is expected that cattle raising in BIAD III and V, hog and poultry raising in urban areas will play a leading role for the development of the livestock industry in Bohol.

8.2.3 Structure of Agriculture in Bohol

1. Demand and Supply Projection of Selected Commodities and General Structural Framework

The nature and type of problems confronting agriculture in Bohol were presented in the brief discussion presented in the preceding

sections. In order to highlight the demand and supply conditions of Bohol agriculture, a projection was made for some of the major agricultural commodities and the results are summarized in Table 8-3. The projections were made upon the assumption of per capita consumtpion of the commodities and population growth which are slightly different from those of NEDA previously mentioned. From the projected figures the following could be observed on the future state of affairs of agriculture in Bohol:

- According to the projections deriving from extrapolation of the past trend, it can be estimated that production of rice will become surplus amounting to 43,920 m/t in 1985. However, the corn balance is estimated to be in large deficit amounting to 101,690 m/t in the same year. From the food balance of Bohol it can be reasoned that: a) Bohol province can play a rice supplying role in the Region VII in the future particularly tailoring to the consumption needs of Metro Cebu. The volume of surplus rice exportable to outside Bohol in 1985 is the incremental production of rice expected from Wahig Pamacsalan irrigation project of about 30,000 m/t and projected production surplus of rice of 43,920 m/t. b) in return, Bohol may have to import necessary volume of corn for its domestic consumption of about 100,000 m/t from other provinces.

- As far as livestock and poultry balances are concerned, Bohol is expected to attain self-sufficiency in beef and carabeef but run short of pork and poultry meat. These deficiencies are not so large and Bohol would be able to attain self-sufficiency in them, if necessary measures are taken to increase their productions.

It must be noted, however, that the projected food balance in Bohol must be interpreted according to an overall framework of the problem structure of agriculture in Bohol. The general structure of agriculture of Bohol is schematically represented in Figure 8-1. Brief explanations should be made here with regard to some of the structural problems facing agriculture in Bohol.

Fig. 8-1 DEMAND AND SUPPLY FLOWS OF AGRICULTURE AND LIVESTOCK INDUSTRY

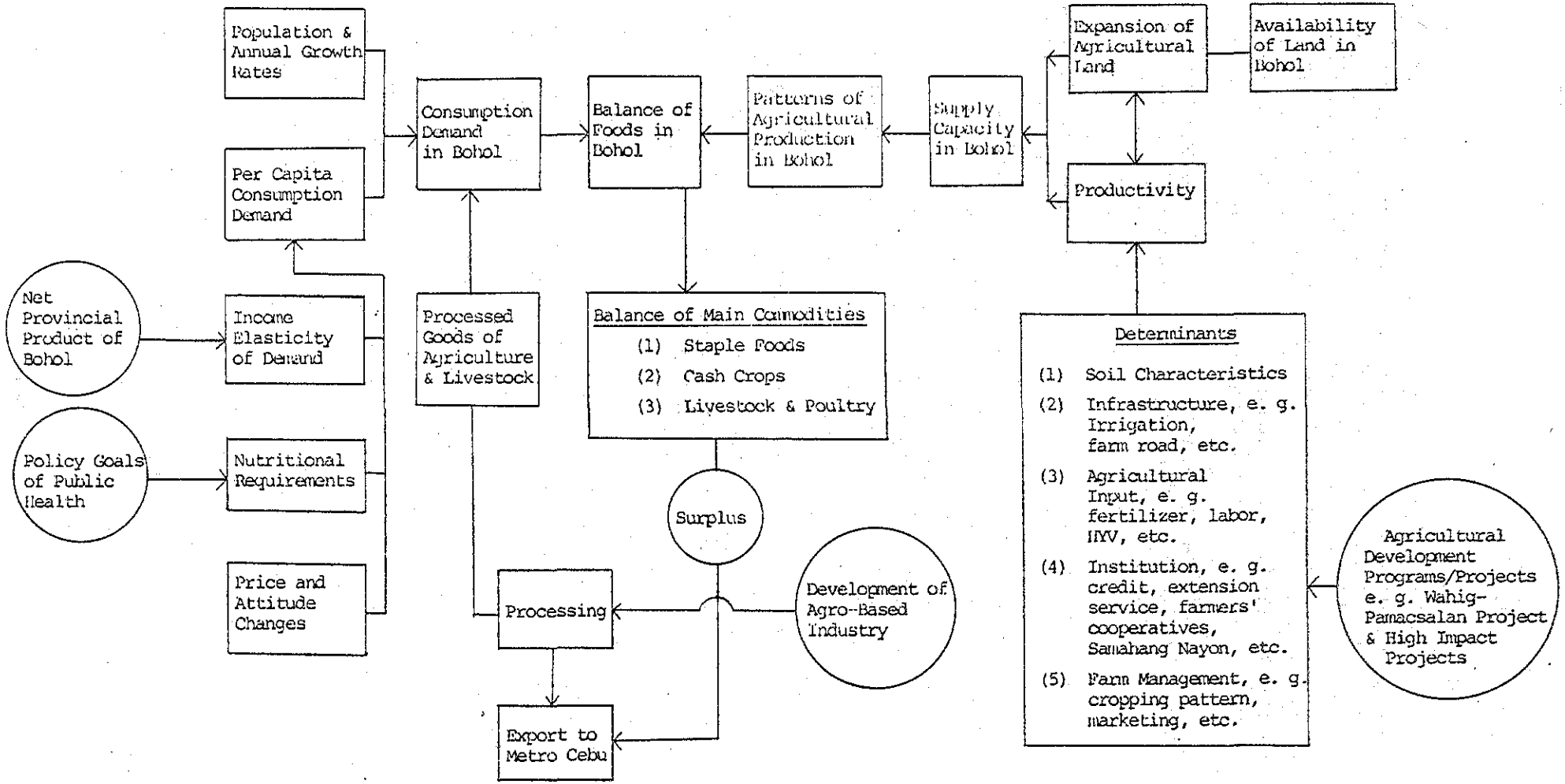


Table 8-3 Projections of Production and Consumption of Major Commodities of Agriculture and Livestock

(Unit: Metric tons)

		1980	1985	1990	2000
Rice	Consumption	58,620	63,380	69,200	82,490
	Production	90,340	107,300	135,650	
	Surplus	31,720	43,920	66,450	
Corn	Consumption	119,860	129,590	141,490	168,670
	Production	23,490	27,900	33,300	
	Deficit	(96,370)	(101,690)	(108,190)	
Beef/Carabeef	Consumption	2,870	3,110	3,390	4,040
	Production	4,870	5,660	6,600	
	Surplus	2,000	2,550	3,210	
Pork	Consumption	7,140	7,720	8,430	10,050
	Production	3,820	4,650	5,660	
	Deficit	(3,320)	(3,070)	(2,770)	
Poultry Meat	Consumption	4,930	5,330	5,810	6,930
	Production	580	700	850	
	Deficit	(4,350)	(4,630)	(4,960)	

Note: Based on per capital consumption of agricultural/livestock productions and population growth as shown below.

Crop/ Livestock Item	Per Capital Consumption (kg/yr)
Rice	71.4
Corn	146.0
Beef/Carabeef	3.5
Pork	8.7
Poultry Meat	6.0

Statistic Year	Population Growth
1975	759,370
1980	820,990 (est)
1985	887,610 (est)
1990	969,120 (est)
2000	1,155,270 (est)

1) Consumption Problems of Foods in Bohol

The consumption demand for foods in Bohol must be understood by taking into account a) increase in population, b) estimated amounts of per capita consumption of respective items, c) income elasticity for foods, d) policy goals of nutritional attainment of the Boholanos, e) price and attitudinal factors, etc.

Generally, the projections are made on the basis of assumption of per capita consumption of food items and estimated population growth. This is the method used by NEDA and various agencies or bureaus of Ministry of Agriculture. This method is considered rather crude, but is often used when necessary data are not available. A more refined method is to use an algebraic equation where the demand growth rate of a food equals income elasticity multiplied by economic growth rate plus population growth rate.[1)]

In Table 8-4 the first two columns list low and high estimates of income elasticity values of foods in the Philippines. If it is assumed that the elasticity values remain stable and the same values could be applied to Bohol, one can calculate from these values the demand growth rates of foods together with projected economic and population growth rates. For example, annual growth rates of 1.74% and 1.78% of rice consumption demand will be derived from the low estimate of income elasticity for the years 1980 - 1985 and 1985 - 1990. Similarly, when it is expected that the high estimate of income elasticity would be more appropriate, then annual growth rates of 2.19% and 2.38% could be estimated for 1980 - 1985 and 1985 - 1990. This algebraic expression of consumption demand simply implies that the increase in productivity of agriculture in Bohol must keep up with the increase in population growth.

There is another factor that must be considered; that is, the policy goal concerning the nutritional level required for the Boholanos. As will be explained in chapter 17, malnutrition is one of the major public health problem in the Region VII as well as in Bohol. At the national level, problems on nutrition such as protein calorie malnutrition (PCM), avitaminosis and other nutritional deficiencies are given a higher priority in the public health plan. Although little statistical information is available on the daily per capita food supply in Bohol, inferences can be made on the malnutrition problems in Bohol from those of Philippines. It is indicated in the Philippine Food Balance Sheet 1975, that the daily recommended per capita food allowances are not sufficiently met on the following food items: fruits and vegetables are deficient by 16.8%, fats and oils by 62.5%, meat and poultry by 51.7%, milk and milk products by 61.3%, eggs by 66.5%, etc. It is believed that similar nutritional deficiencies (particularly of animal proteins) are presenting themselves as serious for the health problems in Bohol. If this is the case, increasing the level of consumption of animal pro-

Table 8.4 Income-Quantity Elasticity: Selected Items of the Philippines, 1978

Item	Low Elasticity	High Elasticity	1980-1985 Demand Growth Rate		1985-1990 Demand Growth Rate	
			Low	High	Low	High
Rice & rice products (All)	0.03	0.13	1.74	2.19	1.78	2.38
Corn & corn products (All)	-0.65	-0.23	-1.33	0.57	-2.30	0.22
Wheat products (All)	0.35	0.60	3.18	4.30	3.70	5.20
Pork (All)	0.45	0.74	3.63	4.93	4.30	6.04
Beef, carabeef (All)	0.51	0.86	3.90	5.47	4.66	6.76
Processed meat (All)	0.80	1.17	5.20	6.87	6.40	8.62
Chicken meat (All)	0.41	0.85	3.45	5.43	4.06	6.70
Eggs (All)	0.43	0.71	3.54	4.80	4.18	5.86
Dairy products (All)	0.29	0.71	2.91	4.80	3.34	5.86
Fresh, frozen fish (All)	0.15	0.34	2.28	3.13	2.50	3.64
Dried/smoked fish (All)	0.03	0.19	1.74	2.46	1.78	2.74
Crustaceans/mollusks (All)	0.35	0.56	3.18	4.12	3.70	4.96
Fresh fruit (All)	0.21	0.44	2.55	3.58	2.86	4.24
All vegetables	0.01	0.25	1.65	2.73	1.66	3.10
Cooking oil	0.30	0.53	2.95	3.99	3.40	4.78
Sugar: White	0.22	0.62	2.59	4.39	2.92	5.32
Cocoa	0.55	1.08	4.08	6.46	4.90	8.08
Coffee	0.00	0.21	1.60	2.55	1.60	2.86
Salt	0.05	0.14	1.83	2.23	1.90	2.44

Source: Income and Food Consumption, Office of the Secretary, Department of Agriculture, 1978

teins of livestock and poultry in Bohol should be given a priority consideration.

Other factor that must be considered is the level of price of foods in Bohol. As noted in Part One, Engel's coefficient in Bohol was recorded as high as 63.8% in 1975. The income level is generally low as compared with the national level. It was observed in 1971 that about 53% of the Boholanos earned income less than ₱2,000 per year. In addition, the purchasing power of peso in Bohol has decreased to 0.53 in 1978 as compared with 1.00 in 1972 as a result of the annual inflation rate of about 11.3%. It must be understood that the Boholanos have been under economic pressure of high expenditure on foods. The rising price of foods would obviously curb their consumption demand in Bohol in the future. However, since the price elasticities of foods vary from one type of food from another, careful inquiry must be made in order to estimate the volume of demand of specific foods in Bohol.

2) Supply Problems of Agriculture in Bohol

In order to meet the rising domestic consumption and extra-regional export demand of foods, the agricultural production in Bohol must be expanded in the future. As noted in the previous section, the rate of the production increase must outweight that of the population growth plus incremental adjustment factors of economic growth and income elasticity. As shown in Figure 8-1, basically there are two methods whereby the agricultural production can be expanded: one is enlargement of farmland and the other is increase in farm productivity. As explained in Part One, the target annual growth rates of agriculture, fishery and forestry in terms of real net domestic product are 4.0% in 1980 - 1985, 4.2% in 1985 - 1990, and 5.9% in 1990 - 2000. If these rates are to be achieved, strong measures must be taken in the future to promote agricultural productivity since there is a limit for the expansion of farmland in Bohol.

In the following sections, some of the conditions crucial for the improvement of supply capability of the agriculture in Bohol are discussed.

2. Problems of Ecology

There are at least three important ecological conditions governing agriculture and livestock industry in Bohol, which may impede normal development of crops and cause low yields. These are 1) bad characteristics of calcareous soils, 2) soil erosion and 3) shortage of soil moisture supply due to shallow surface soils.

1) Poor Characteristics of Calcareous Soils

Soils derived from calcareous rocks contain calcium carbonates in general. Most of the soils in Bohol are calcareous and

only in part originated from igneous rocks.

Calcareous soils are usually low in organic matter and, as a result, nitrogen resultantly becomes the most limiting nutrient for crops. For most crops, nitrogen needs to be applied at rates from 1 to 1.5 times the anticipated removal in the crop, but less amount is estimated to be available in calcareous soils. Accordingly, the technology of nitrogen application to crops grown over calcareous soils is different from that of other soils, wihch would require skilled technology. In addition, soil phosphor may be fixed by calcium ions in the soil so that the phosphorus availability is generally low. The phosphor applied may quickly revert to an insoluble form.

The micro-nutrients such as zinc, iron, manganese and copper tend to become less available in soil with increasing pH levels, but the occurence of deficiencies in crops is highly erratic. However, use of atomic absorption spectrophotometry has greatly facilitated determination of the micro-nutrient cations. It is generally observed that zinc deficiency in calcareous soils is most pronounced in rice culture in the Far East and in maize growing areas of high population density in other countries.

Although, in general, relatively small amounts of zinc are required for plants, it is recommended that zinc sulphate is utilized, for its price is relatively lower than others. One application of zinc is usually sufficient for several years because zinc does not leach down.

Iron deficiency is more difficult to correct than zinc deficiency, for once it is applied in soil, it results in rapid reversion to unrecoverable forms. It must be also noted that some plant species, sorghum for example, are reported to be more susceptible to iron deficiency than others.

Manganese and copper are less apt to be deficient in calcareous soils than iron and zinc. Some calcareous soils may be deficient in boron, but irrigation may bring in considerable amounts of boron.

When adequate water and nutrients are supplied, the productivity of calcareous soils may become very high. Although natural productivity is low at present, it can probably be improved in the future. In the light of this, profitable and practical technologies on crop production which are suited to calcareous soils of Bohol should be developed. It is also important to introduce crop varieties such as rice, resistant varieties, IR 36 and IR 42 that may tolerate zinc deficient conditions in Bohol.

Another suggestion is to introduce new export-oriented crops which are inherently adapted to calcareous soils, such as cotton, olive, grape, alfalfa, etc. There are also many

vegetable crops suitable to soils of high pH levels and/or rich in lime.

2) Soil Erosion Problem

It is said that fifty years ago hills and plateaus in Bohol were well convered with thick wood forests, mostly teak and mahogany. However, as the forests gradually disappeared caused by slash/burn farming or "kaingin" and lack of reforestation effort, severe soil erosion started washing away surface soils and left almost non-productive areas dominated by cogon and brush-wood. The BS reported on the degree of soil erosion by soil types under the following erosion classes:

Erosion class-1:	Less than 25% of A-horizon removed.
Erosion class-2:	25-75% of A-horizon removed.
Erosion class-3:	More than 75% of A-horizon to 25% of B-horizon removed.
Erosion class-4:	All of A-horizon to 75% of B-horizon removed
Erosion class-5:	All of A-& B-& parts of C-horizon removed.

Results obtained from their survey are shown in Appendix 8-5.

It is clear that the areas defined as Erosion class-2 occupy more than 94.3% of the total land in Bohol. In fact, almost all of the soil surface seems to be washed away due to erosion. The Wahig-Pamacsalan Project area has also suffered from erosion, where it is at present covered with cogon. The most important challenge facing the farmers in Bohol, is how to recover the fertility from those eroded soils. For instance, organic recycling processes can be used just as the Chinese farmers do. Materials for making compost are readily available in Bohol such as rice straw, corn stalk, crop wastes, and others. They can be mixed with some nitrogen rich materials to produce compost. In this connection, even such as weeds cogon can be used as compost materials.

Soil reaction of pH of eroded soils is likely to change to acid side becoming less than pH5. However, as the soils in Bohol are derived from calcareous rocks, their reaction should be in direction of high alkaline side, producing more than pH7. This means that free calcium cations will be leached away from the surface together with other alkaline cations.

The erosion control measures commonly used are as follows:

(a) Land leveling. Although this measure needs heavy equipment and machines, soil erosion can be completely controlled. After the land is leveled, rice is commonly planted. Prior to leveling the lands, it is highly recommended that the surface soil, even very thin, should be removed and recovered after the leveling.

(b) Land terracing. For upland crops, a terrace making procedure is practical because of decreases in erosion damages and lower labor costs for farming.

(c) To cover the sharp slopes by planting quickly growing trees such as ipil-ipil, cajeput tree, common rue tree, etc.

(d) To plant coconut over drilled beds. Due to thin surface and hard pans underneath the surface, coconut is planted over particular beds of holes drilled by machine, in size of about 30 cm in diameter and less than 50 cm in depth, for the purpose of easier development of the root.

(e) Stripe farming. Planting crops in stripe rows. It is better to use single or two crops whose growth stages are different so that the land is always covered with crops.

(f) Others such as to wait for a change in the plant ecology. It takes a long period of time for the plant ecology to be changed.

Erosion control measures should be applied on the farm lands of Bohol which are registered as Erosion class-2.

3) Shallow Surface Soils

As a consequence of soil erosion, almost all of the areas in Bohol have lost their surface soils partly or completely. The surface soil now formed is of a very thin layer and immediately underneath it are hard pan-like sub-soils which are commonly made from shale, silt stone and/or sandstone. These rocks are mostly impermeable. It is therefore, believed that when rain falls, the land becomes easily inundated and for a few days without rain, the land is easily dried up, due to the shallow surface soil with impermeable sub-soils underneath. Evidence of this can be seen everywhere in the plateau of Bohol; for example, coconut and banana trees show their leaves withering.

The shallow surface soil problem presents itself as being one which is very difficult to solve and is without practical solutions, because the farming operation cannot be disrupted. Some of the possible solutions are indicated as follows:

(a) The soil erosion must be controlled completely.

(b) Every time the field is plowed the bottom of the surface soil should be scraped even as deep as a few milimeters.

(c) For coconut, the drilled bed method should be used.

Some of the measures mentioned above may be of little practical value due to the long period of time required for them.

The easiest and most practical method is to apply organic matter such as manure, compost, organic wastes, etc., to the surface soil as much as possible during every cropping period.

3. Problems of Socio-Economic Condition and Farming Methods

1) Farmland of Small Holding and Scattered Parcels

Like other provinces in Region 7, the average size of land holding in Bohol is small with an average of 2.3 hectares. As compared with the national level of 3.6 has., the land holding size in Bohol is less than the 70% level. Over such small size of land, common crops like rice, corn, cassava, coconut, etc., are planted.

In addition to the small size of land holdings, there are many land parcels scattered around the farms. As mentioned before, according to the 1971 Census of Agriculture, nearly 50% of all farms consisted of 2-3 parcels; 30%, 1 parcel; 15%, 4-5 parcels and 8%, 6 or more parcels. This situation has been almost left unchanged up the now. Moreover, most of the land is irregular in shape, undulated or rolling, and sometimes, it is far from the farm household. This makes it difficult to take care of the growing crops and to keep efficient work on the farm work.

As far as the tenure situation is concerned, a majority of farms in Bohol are operated by owner farmers and part-owners. Of the total number of farm operators, about 58.5% were owner operators, 26.2% part-owners, 14.4% tenants, and 0.9% other forms of tenure. The real problem, however, it that the part-owners and the tenants are cultivating land parcels in remote places whereas the owner operators hold their lands nearby. Under such a situation, the part-owners and tenants have always earned less than the full-owners. To give more incentives to the tenants, it is necessary that the parcels in remote areas should be relocated to places near their farm households.

2) Problems of Farming Method

Except for such equipment as plow and harrow drawn by carabaos or cattle, only a few farmers possess agricultural machinery. Fertilizers and chemicals are still used at a lower level than that recommended by the extension agents even in the case of rice production. Almost all farmers planting corn, cassava and coconut are reluctant to use input materials due to their high cost. These inevitably result in lowering the labor and land productivities.

3) Marketing Problems

No processing plants are located in or near the production area. Almost all of them are located outside Bohol, either in Cebu or Mindanao. The merchants have to transport the crop to such

remote places. This results in higher assembling and delivery costs, reducing net farm profit. There is only a limited market for fresh cassava in the producing area. Therefore, the majority of the crops must be dried even if the price is not so favorable due to the reasons mentioned above. These problems regarding the distribution of agricultural produce are also applicable for almost all kinds of farm commodities including vegetables and livestock products.

Cassava for example, is recommended to be planted more by the government. However, farmers are not given sufficient incentives to do so. For example, they are not provided with good farm-to-market roads to transport their products. Particularly during the rainy season, many of the cassava harvested during the rainy season rots easily, due to lack of mechanical driers and chopping machines. It must be noted that there is a sizable price differential in the cassava; for example, the price per kilo is ₱1.72 for smoking whereas ₱1.42 for sundrying in 1976 - 1977.

As is true in other provinces, four types of middlemen are usually involved in marketing of farm commodities in Bohol: Assembler-Wholesaler, Wholesaler, Wholesaler-Retailer and Retailer. According to the 1977 survey made by DA Marketing, the channels for dried cassava, fresh coconut meat and copra in Central Visayas are shown in Appendix 8-6 and 8-7.

Price spread at different stages of marketing on selected crops in Bohol was investigated and the results obtained are shown as following:

Price Spread for 1979 (₱/kg) - Bohol Province

Commodities	① Farmer	② Assembler	③ Wholesaler	④ Retailer	④/①
1. Palay					
a) Special	1.15	1.20	1.25	1.30	(1.13)
b) Ordinary	1.20	1.25	1.30	1.35	(1.13)
2. Rice					
a) Special	-	-	2.32	2.40	
b) Ordinary	-	-	2.38	2.45	
3. Corn					
a) Grain	1.05	1.15	1.45	1.60	(1.52)
b) Milled	1.05	1.15	1.50	1.60	(1.52)
4. Cassava					
a) Fresh	.20	-	-	.40	(2.00)
b) Dried	.60	-	-	.80	(1.33)
5. Copra					
a) Resecada	2.60	-	3.20	3.25	(1.25)

The greatest variation is for rice which goes up in price more than twice the amount when it moves from farmers' hands to retailers. Although palay becomes about one-half its weight when it becomes polished rice, there is an additional income from rice-bran.

In general, the development of marketing of commodities seems to be poor in Bohol. Farmers must just wait for the chance for the assembler to appear so that the price is likely to be one-sidedly determined by the buyer.

For reference purposes, data on approximate profits of selected farm commodities are provided in Appendix 8-8. It is obvious that rice produced under irrigation facilities could yield the highest profit among other crop products because irrigation fees are negligibly small. Cassava gives the second highest return. However, it should also be noted that cassava occupies land for the period of longer than 10 months whereas rice can be planted 5 times in a two-year period.

Although the government recommends to plant more corn, the net profit is minimal. Because of this, unless profitable technoligies on corn production are successfully exploited, farmers would not agree to plant more corn.

It seems that there are very complicated relations existing in the formation of commodity prices. It is suggested that farmer's cooperatives need to be formed on barangay or municipality bases in order to protect the farmers' profits from dissipation by middlemen.

4) Problems of Farmer Cooperatives

It is observed that Samahang Nayon, farmer's cooperative organization, has been by no means successful. For instance, the manager of the Rural Bank of Loon who was the president of the Samahang Nayon in the area related the following information. The Samahang Nayon in the area started in 1975. All farmers are obligated to become members because they are required to attend the seminar or training course for the farmers' organization. After finishing the training course, the farmer automatically becomes a member of the Samahang Nayon. It is pointed that the main problem confronting the farmers' organization is the lack of funds. There is the so called Monthly Barrio Savings Fund where each member has a mandatory contribution of 1 cav. of palay per hectare for each harvest time. Others who cannot afford this contribution are required to pay ₱5.00/month. However, many farmers cannot even meet this requirement to contribute to their Barrio Savings Fund. Nevertheless, the capital fund built up will be in part invested on area marketing cooperatives wherein each member will be benefited from their marketing services. However, because some farmers cannot pay their contributions, the establishment of the marketing of cooperatives in each area cannot easily be accomplished. Even if the marketing cooperatives are estab-

lished, farmers would find it more beneficial to sell their products to the middlemen because these middlemen give credit to the farmers. Because of this practice, when harvest time comes, their produce tend to go directly to the middlemen for payment of their debts rather than to be marketed through the farm's cooperatives.

5) Problems of Farmer's Credits

By far the most important special credit program provided for farmers in the Philippines is the Masagana 99, which was initially undertaken in May 1973 to aid recovery from damages to the rice crop in 1972 - 1973. It was designed to increase production by providing credit without collateral, improving extension services, and encouraging modern farming practices. Rice farmers cultivating seven hectares or less are encouraged to join an informal liability group called a "selda", with each member consigning for the others as a substitute for collateral.

The Masagana 99 was carried out through different phases. However, it is reported that the number of farm borrowers in Bohol of the Masagana 99 has decreased from the Phase IV to the Phase X. The reason that only a few farmers applied for the loan is because of the uncertainty in crop production. The high cost of production input also hindered the farmers from applying for a loan because they know that the loan was not sufficient to cover up all their production cost. Another reason is the low level of production which is brought about by the bad weather conditions, and the drought due mostly to shallow soils. The yield obtained is not even enough to pay for their loan.

This fact was pointed out by the bank manager who mentioned that the problem on low repayment rate was caused by the low production in the area. The yield per hectare of rainfed paddy and irrigated rice was 40-60 cav. and 70-80 cav./ha. respectively for the year 1974. No significant increase in yield was obtained partly because of the low application of inputs like fertilizers whose price continued to increase. Aside from the high cost of inputs, farmers also face the problem on shortage of its supply and the problems on transportation for delivery of inputs from dealers to the farm.

The Rural Bank of Loay is one of the banks participating in the Masagana 99 and Masaganang Maisan Programs. According to the bank manager, the program on the Masagana 99 has had some problems in their area covering 8 municipalities. This has reflected in the corresponding decrease in the total number of farm borrowers, from 1,810 in the Phase III to only 85 in the Phase VI. The bank has also a problem on loan repayment. It was pointed out that the repayment of loans did not exceed 50% of the total amount of loan granted.

The bank manager indicated that technicians are partly to be blamed for this because they sometimes connive with the

farmers in order to obtain a bigger loan. This is done by blowing up of the size of area. For example, if a farmer who owns a 1/2 hectare farm is to apply for a loan, the technicians just reports to the authority that it is a one hectare farm so that a bigger loan can be obtained. When harvest time comes, the harvest is so little as compared with the reported land area that farmers won't be able to pay back the loan. This practice was often made because the technicians were the ones filling up the applications for loans instead of the farmers themselves and the bank just approved the loan once the application form was checked by the technicians. The bank manager said that technicians were given monetary incentives depending on the number of farmers applying for loans, resulting in the practice that they did their best even to the extent of deceiving the bank in order to encourage more farmers to borrow or apply for loans.

8.3 Development Potentials of Agriculture and Livestock Industry in Bohol

It must have become clear to us now that agriculture and livestock industry in Bohol is beset with a host of problems, both in natural and socio-economic conditions. The discussions given in the previous section had made it abundantly clear that some of the problems will require a structural reform of long period of time, while others are problems that may easily be resolved by practical measures. In this section an overall assessment is presented as to what kind of development potential could be conceivable for agriculture and livestock industry under the given conditions prevailing in Bohol.

8.3.1 Evaluation of Problems

The fundamental gist of the problems described in the preceding sections are summarily defined as follows. First, a relatively high development potential exists for rice production in Bohol of which the estimated production surplus is large enough to be exported to outside Bohol. Second, development of agriculture in Bohol has been impeded not only by the physical conditions of Bohol, e.g., problems associated with calcareous soils, soil erosion and shallow surface soils, but also by institutional and farming method problems, e.g., parcelled and small scaled farmland, insufficient level of introduction of agricultural machinery and input materials, lack of marketing system of farm products and farmers' cooperatives, misuse and underutilization of farmers credit. In order for agriculture in Bohol to develop to the fullest extent possible, these obstacles must be overcome to materialize the development potential of agriculture in Bohol.

It is reported that after 1975, the Philippines has taken-off to self-sufficiency in rice. The per capita consumption of rice is expected to grow in the future, in accordance with the increase in per capita income. This trend will be accelerated by the ever increasing population. As a result, the top priority in agricultural development must be placed upon how to increase the production of staple food,

particularly of rice. In this respect, Bohol must play a vitally important role as a rice exporting province in Region VII. The balance of supply and demand projected for selected crops of Bohol was already indicated in Table 8-3.

According to this projection, Bohol is expected to produce a sizable amount of surplus rice which could be exportable to outside Bohol, particularly to Metro Cebu. However, the rice supply capacity of Bohol should not be overestimated, for if the corn eating population turned into rice eaters concomitant with a rise in per capita income, the amount of the rice surplus would drastically decrease. To accomplish the self-sufficiency of food in Bohol and also to play a vital role as a rice supplying province in Region VII, continuous efforts must be exerted upon the further development of agriculture in Bohol.

In general, three kinds of alternatives can be considered as the methods of agricultural development: 1) extensification, 2) intensification, 3) diversification.

In the following brief explanations are provided for these methods together with some other problems such as improvement of physical distribution system and promotion of livestock industry in Bohol.

8.3.2 Extensification; Expansion of Farmland in Bohol

Extensification, namely expansion of farmland, can be attained by converting non-farmlands to farmlands. The area proposed by the Ministry of Agriculture for the conversion and/or expansion of each BIAD is shown as follows:

Proposed Area of Conversion/Expansion by BIAD

(Unit: hectares)

	Paddy	Corn	Cassava	Coconut	Others*	Total
BIAD I	2,124	1,628	510	-	1,273	5,535
BIAD II**	-	-	-	-	-	-
BIAD III	2,810	75	1,241	6,311	2,050	12,487
BIAD IV	4,308	1,639	250	-	1,250	7,447
BIAD V	6,800	-	-	194	1,786	8,780
Total	16,042	3,342	2,001	6,505	6,359	34,249

* Others - root crops, i.e., gabi, ubi camote

** BIAD II - no report available.

So far, no data is available on BIAD II. Even if it is excluded there are still 34,249 has. of land available for expansion being exploitable or convertible. This is one of the major reasons why agriculture in Bohol still has a large potentiality for future development.

It is planed by the Ministry of Agriculture that expanded farmland is to be allocated for different crops. According to the plan, out of them, paddy field occupies the largest share with 15,242 has. or 44.5% of the total, followed by corn with 3,342 has. or 9.8%. BIAD III has the largest total land area of 12,487 has. or 36.5%, followed by BIAD V with 8,780 has. or 25.6%. These data show that BIAD III and V are to be considered as the areas of high development potentiality in the future.

In addition, there were 16,120 has. of idle land in 1975 in the province. Accordingly, top priority should be given to utilization of those idle or underutilized lands. To exploit or reclaim land into farm use, huge amounts of capital may be needed.

8.3.3 Intensive Cultivation of Land

To increase agricultural production in Bohol where the average size of land holding is relatively small, the following scheme must be understood:

$$Y = (Y/L) \times (L/A) \times A$$

where: Y: Amount of farm production

L: Farm labor input

A: Size of farmland

In other words, the amount of production is determined by the cross production of labor efficiency (Y/L), labor intensity (L/A) and size of farm. Needless to say, farm size cannot be enlarged quickly. Hence, to increase production in Bohol much emphasis must be placed upon raising labor efficiency and labor intensity.

As frequently mentioned, in order to attain high labor efficiency and intensity, the following measures are considered essential:

- Input of chemical fertilizers
- Type of seed varieties suited to the soil characteristics of Bohol
- Mechanization and use of farming methods such as inter and mulitple-cropping.
- Support of infrastructure, e.g., irrigation system, feeder roads
- Institutional support such as extension services and provision of farm credit.
- Consolidation of land
- Improvement of fertility level of soils caused by soil erosion and alleviation of physical characteristics inherent in calcareous and shallow surface soils.

- Strenghthening of farming industry organization, Samahang Nayon.

These measures mentioned above are the basic methods of agricultural development which should be utilized in any areas of the Philippines which suffer from low level of productivity.

8.3.4 Diversification and Development of Livestock Industry

In view of the fact that Bohol is located in geographic proximity of Metro Cebu which is expected to grow very rapidly in the future, agriculture in Bohol should be diversified to the extent that it can act as a supply depot of agricultural goods which will become in great demand in Cebu. In this regard, the development potential of urban-oriented vegetable and livestock growing should be seriously considered.

The merits of vegetable and livestock growing are: first, farmers can distribute their working days evenly throughout the year; second, income earning power will be raised through higher added value; third, when they are sold outside Bohol, Bohol can expect increase in cash inflows. However, the following cautions must be made particularly with respect to raising livestock in Bohol:

(a) Viewed from the long-run viewpoint, with the increase in accumulated capital at farms, the emphasis must gradually be shifted to the development of vegetable and livestock production.

(b) Vegetable and livestock enterprises are highly labor and capital intensive. As compared with such crops as cassava and coconut, farmers are required to equip themselves with more advanced technology.

(c) Feed generally occupies high proportion of costs, reducing net profit to a large extent. How to decrease feed cost is a serious concern for animal raising farmers.

(d) To obtain the feed, it is highly desirable that the forest land which is located in relatively steep area and idle or underutilized land should be converted into grassland, if the watershed problem can be solved.

(e) The natural grassland covered principally with cogon and brushwood should be improved as much as possible so as to increase the productivity of feed production. Production of seeds and seedlings of ipil-ipil and style should also be increased at BAI stations or centers and be distributed among farmers. [2)]

(f) In parallel with this, breeding, artificial insemination and dispersal activities should be strengthened to increase the productivity of animals.

(g) To increase the number of beef cattle, the "Bakalang Barangay" program, similar to Masagana 99 or Maisan project, which started several months ago, should be carried out.

(h) Unlike such temporary crops as rice and corn, it takes two or three years to fatten beef cattle. The price of beef tends to fluctuate, reducing the farmer's net profits. It must be noted that beef production is one of the most risky farming/livestock enterprises.

(i) Together with due technical guidance, favorable loan terms should be provided to farmers.

8.3.5 Development of Physical Distribution System

As explained before, grain, root crops and coconut are the major agricultural produce in Bohol. Unlike such highly perishable foods as vegetables and livestock products, they are relatively preservable. Since there are almost so significant storage facilities presently existing in the province, it is most advantageous to grow these crops for export. In accordance with the increase in the amount of production, processing or storage facilities must be steadily built. This will contribute not only to raising the price received by the farmers, but also to increasing added value and to absorbing the underemployed labor force.

8.4 Development Objectives and Targets of Agriculture and Livestock Industry in Bohol

The development objectives and targets should be set forth through identification of the needs and structure of agriculture in Bohol and realistic appraisal of its developmental potentials; they should also be formulated in harmony with the objectives established for the agricultural development of the Philippines as a whole. In this section, a brief explanation is provided first for the national development plan in order to shed a light upon the nature and type of the priority development objectives of the Philippine agriculture. Then, the short-medium and long term development objectives are presented for the agriculture in Bohol.

8.4.1 Development Objectives of Agriculture in the Philippines

In June 1979, Hon. A. R. Tanco, Jr., Minister of Agriculture, reported to President Ferdinand Marcos on the plan of action for the development of the food and agriculture sector in 1980's In the report, he stated that the food and agriculture development strategy for the 1980's will revolve around the following three main thrusts: 1) food and nutrition, 2) agro-energy development and 3) export generation and import substitution.

1. Food Nutrition

Shift of the nation's attention from rice to increased production of other carbohydrate sources such as edible root crops as well as animal and vegetable protein with the view of eliminating calorie-protein malnutrition among the people.

Recognizing the importance of nutrition, a comprehensive nutrition plan has been prepared by the MA. The plan which emphasizes the production side seeks to identify and produce indigenous crops which have high nutritive value and at the same time the greatest potential for increasing farm income. The objectives of each crop production are briefly summarized as follows:

1) Carbohydrate Originating Crops

- Rice

  To cope with the second-generation problems attendant to the surplus situation, that is, warehousing, storage, and bulk handling.

- White corn and feed grains

  To increase production of white corn for human and animal consumption under the Maisan 77 program, and attain self-sufficiency in yellow corn and sorghum by 1981.

- Root crops

  To encourage production of root crops such as white potato, sweet potato, and cassava, which will provide additional cheap, indigenous, income-generating calorie sources for malnourished population.

2) Protein Sources

While the nation's self-sufficient production of poultry and swine will continue to be a major source of animal protein for people, it is necessary to step up production of other protein sources which are still in short supply, namely, cattle, dairy, fish and protein-rich pulses such as mongo-bean, soy bean, winged bean (sigadillas), cowpea and peanuts.

2. Agro-Energy Development

To embark on a program to develop cassava, ipil-ipil and hog manure as fuel sources.

On agro-energy development, MA is preparing the following programs:

- Cassava production for alcogas plant

- Ipil-ipil production for dendro-thermal plant (wood-based steam generation)

- Hog manure for methane gas generation (Biogas by FAO)

3. Export Generation and Import Substitution

In view of the continuing escalation of fuel oil prices, the production of non-traditional exports such as yellow corn and sorghum, fruits and nuts (papaya, pineapple, mango, cashew), spices (garlic, ginger, pepper), coffee, cacao, palm oil, rubber, etc., should be intensified to earn additional foreign exchange in order to pay for the increasing fuel oil import bill of the country. At the same time the development of traditional exports such as coconut, sugar and fruits will be continued. Meanwhile, the development of traditionally imported commodities such as cotton and wheat which can be produced domestically should be undertaken to reduce foreign exchange expenditures.

In case of export generation and import substitution, MA outlines the following plan of action:

1) Short term export expansion

To increase yellow corn and soghum production under the Maisan 77 Program, and other crops such as solo papayas, fresh pineapple, mangoes, cashew and Macademia nuts, spices, medical plant essences, ornamental plants, arrow-roots and rattan.

2) Long term export expansion

To increase production of coffee, cocoa, palm oil, and rubber.

3) Import substitution

Production of cotton and wheat will be intensified.

8.4.2 Development Objectives and Targets of Agriculture in Bohol

As described in the previous section, the Philippines Government has determined a national direction on agriculture production in the 1980's. The agriculture development of Bohol should follow these policy goals as much as possible in the 1980's.

However, out of the three policy objectives of national agricultural development, it would be obvious that the first priority needs to be given to the attainment of sufficient level of food and nutrition and then to the development of agro-energy development. The policy objectives of export generation and import substitution will be less relevant to Bohol. The most crutial for the development of agriculture in Bohol is to achieve the objectives to produce a sufficient volume of agricultural produce or inputs which are either consumed as foodstuff or processed further as industrial materials. For this reason, the production objectives and targets are to be formulated with regard to the major agricultural products of Bohol, i.e., rice, corn, cassava, coconut, beef and carabeef.

The overall development objectives of agriculture and livestock in Bohol are schematically represented in Table 8-5.

1. Rice

1) Objectives

The goal for rice production in Bohol is to produce more than 140,000 to 160,000 tons after 1986, whose average yield ranges from 3.5 to 3.8 tons/ha./yr. or 70 to 76 cavans/ha./yr.

This is due to the fact that the surplus of the rice balance would easily disappear if the present corn consumers in Bohol changed into rice consumers in the future.

2) Projected Conditions

According to the supply and demand projection of rice prepared by the NEDA, about 50,000 tons of surplus would become available in 1986. However, the figure on consumption is computed on the assumption of a per capita consumption of 71.4 kg/year in Region 7, where the majority of people eat corn grit. If the rice consumption of the Boholanos increases, the balance of the supply and demand would become deficit. For instance, if the per capita consumption of rice in 1983 and 86 is assumed at 100 kgs and 150 kgs palay/year respectively, the balance sheet of Bohol will be as follows:

100 kg palay/year		150 kgs palay/year	
1983	1986	1983	1986
7,592	11,109	-37,417	-36,900 tons

It is shown in this calculation that when consumption exceeds more than 100 kgs of palay per capita per year, the balance will likely to become deficit. This means that the goal for rice yield in Bohol should be set at the level of over 70 cavans/ha./year. In this connection, the target spelled out in the Masagana 99 Program should serve as a bench-mark for the rice production in Bohol.

3) Methods

In the short term, rice production per unit area can be increased through the application of modern profitable techniques. It is highly recommended that more farmers in Bohol join the Masagana 99 Rice Production Program so that they can adopt and apply the package of technology, and that credit can be fully utilized for purchasing their input requirement machineries, and other things.

2. Corn

1) Objectives

The goal for corn production in Bohol in the 1980's should

Table 8-5 Development Objectives of Agriculture and Livestock in Bohol (1980-2000)

	Rice	Corn	Cassava	Coconut	Beef and Carabeef
Short Term Objectives 1980-1985	-Increase in production through Masagana 99 -Rise in productivity by means of input of chemical fertilizers and intensive cultivation -Development of agricultural cooperatives, etc.	-Effective implementation of the Maisan 77 Program and -Attainment of production target set by the Program	-Increase in production through replantation in fertile soils -Systematic cultivation -Use of improved varieties	-More application of fertilizers -Use of drilled holes in hard pan soils -Planting of HYV	-Increased production of fodders -Development of grazing and stock farm -Improvement of breeds
Medium Term Objectives 1985-1990	-Implementation of Wahig-Pamacsalan Project -Extra-Regional export, particularly to Metro Cebu -Dissemination of profitable agricultural technology -Development of urban-oriented farm	-Increase in production of feeds for poultry and animal husbandry	-Development of alcogas factories	-Production of coco-oil for consumption in Bohol -Increase in yield per hectare	-Expansion of production -Gradual increase in consumption of the Boholanos
Long Term Objectives 1990-2000	-Improvement of soil fertility -Advancement of farm technology -Farm management system	-Expansion of feeds	-Expansion of the capacity of alcogas	-Improvement of quality of coco-oil -Expansion of the production level	-Shift of animal protein sources from poultry, eggs, hog, and fish to beef and carabeef

be set to ensure attainment of the 2.0 tons/ha. yield and to attain the targeted yield to be able to participate in the Maisan 77. The corn production at the level of around 40,000 tons/year will require a slight extension of corn areas. However, a huge deficit on the balance sheet of supply and demand is still expected even though the production is increased to that level.

2) Projected Conditions

Corn production at present is very low in Bohol as mentioned before. The supply and demand projection in Region 7 given by NEDA also shows very high deficits for all provinces. Although the estimated per capita consumption for Bohol is rather high, the deficit may not decrease much even if it is assumed to be less than 146 kgs/year.

According to BPI the yield of corn in 1978 is estimated around 1 ton/ha. in Bohol. Although the figure may be considered to be realistic when the present low level of corn growth is taken into account, the yield is far too low as compared with the desired national level. For instance, the Maisan 77 National Program for 1979 sets forth its local yield targets as follows (tons/ha.):

	Financed	Subfinanced
White corn	2.83	2.01
Yellow corn	2.75	1.87

These target yields are far above the present level of production in Bohol.

3) Methods

The initial step should then be the participation in the Maisan 77 Program.

Generally, all the potential project areas of the Maisan 77 must meet the guidelines set by the National Maisan 77 Five Year Program. Some of these guidelines are as follows:

(a) Past production experiences showed yields of 2.0 tons/ha.

(b) Project areas having well-drained soil with the texture of sandy loam or clay loam type at flat level or slightly rolling topography.

(c) Soil pH ranges from 5.5 to 6.5.

Presently Bohol is not qualified to participate in the Maisan 77 program and is, therefore, deprived of all the benefits that will accrue to the participants of the Program.

3. Cassava

1) Objectives

The goal for cassava production is to increase the yield per unit area up to 4.0 tons/ha. in the early part of 1980's in order to supply the input volume necessary for the establishment of alcogas factory, and to 6.0 tons/ha. or more after the factory starts to operate. Total production may reach about 35,000 to 40,000 tons in Bohol, if farmers are given sufficient incentives to produce.

2) Projected Conditions

Cassava yield in Bohol is presently quite low with around 3.0 tons/ha. as compared with the national average yield of 7.98 tons/ha. In line with the government's thrust, cassava production must be extended in Bohol. However, land extension cannot be expected at the present stage so that the yield per unit area must be increased. Generally speaking, marginal areas are commonly used in Bohol for cassava, where the soils are quite shallow and easily get excessive or deficient moisture status.

3) Methods

Because of the strong potential demand cassava should be produced extensively in Bohol. Its advantage will be derived through the establishment of an alcogas factory in Bohol, which is proposed in Chapter 15 of this report. Cassava farmers will be provided with guidelines by the factory with regards to the quantity and quality for the purpose of smooth management of the plant. The capacity of the proposed plant will be about 30,000 tons cassava/year, and after the final stage almost 70 to 80 percent of the cassava production will be used for that purpose. Because the factory will purchase cassava under the precise plan of management, farmers can supply the raw materials required with the expectation of cash income.

However, it must be noted that the alcogas factory should be built as a pilot plant at the initial stage and then gradually expand its plant capacity corresponding to the increase in the production in Bohol.

4. Coconut

1) Objectives

Primarily because of the coco-oil supply policy of the Philippine government, accurate and reliable statistical data are not available concerning detailed productivity figure of copra in Bohol so that the production target of coconut production in the 1980's cannot be indicated for Bohol. In 1971 the quantity of coconuts produced was 67,112 thousand nuts and

the average number per tree was 27 nuts.

The increase in coconut production should be achieved through inter alia: 1) replanting old trees by HYV, 2) extension of coconut land, 3) improvement of spacing and application of fertilizers. In view of the reason mentioned below, the expansion of coconut plant land is most effective. As the main objectives it should be enlarged from the present size of 39,000 has. by 7,000 or 8,000 has. in the 1980's.

2) Projected Conditions

The yield of copra is estimated about 715 kgs/ha., calculated from the total number of nut production divided by 3,300 nuts which is assumed to be equal to one ton of copra. This level of copra production should be considered relatively low.

In order to increase the copra production in Bohol as well as in the rest of the Philippines, the Philippine Coconut Authority plans to put into operation its replanting scheme in 1980 with a subsidy of ₱1,000/ha. PCA hopes to increase copra production intensively due to a very strong demand of the plant's oil in the world. Their guidelines for increased copra production are: a) to replant old, unprofitable trees with new productive varieties, b) to extend planting areas where new varieties will be planted, c) to fix the price of copra so that farmers can sell without any confusion, and others.

However, it must be noted that after the replanting, the plant starts bearing nuts only after 4 to 6 years, though the number of bearings is expected to increase by 60 nuts/year due to the use of new varieties. However, the copra per nut is to drop from about 222 grams to 162 grams, or a 27 percent decrease. As a result, increase in the total copra production will not be so drastic.

3) Methods

In conclusion, an increase in copra production may be expected mainly by the extension of farming land and not by the yield per unit area or tree. It is suggested that the northeast area such as Ubay, Talibon, Trinidad and Buenavista municipalities should be selected for the extension of coconut. At present, the total area planted with coconut is about 39,000 has. It can be extended by 7,000 up to 8,000 has. within the period of the 1980's. Accordingly, the goal of copra production should start from the extension of coconut land, especially in the northeastern municipalities.

5. Beef and Carabeef

1) Objectives

In order to supply a vitally important animal protein to the

Boholanos, beef and carabeef production should be increased in the 1980's onward, gradually attaining a proper level of the supply mix of the protein sources, i.e., mix of beef and carabeef with poultry, eggs, hogs and fish.

The target production for beef and carabeef production should be put at an annual rate of 3.5% in the early part of 1980's in order to meet their increasing consumption in Bohol. Whenever new technical innovation of grass fodders is developed, the rate should be increased to about 4% annual growth rate.

2) Projected Conditions

From the point of view of calorie supply, the share of meat and poultry is presently only 4.9% of the total per capita calorie supplies of about 2,100 cal/day in the Philippines, and the per capita protein supplied by meat and poultry accounts accounts for around 13% of the total per capita supply of protein.

Respective shares of the protein supplies by them are: 51.9% from pork, 17.5% from poultry, 13.3% from beef, and 17.3% from carabeef, horse meat and others.

The country imports about 40% of its beef requirement. The supply and demand relation on beef and carabeef of Region 7 shows a slight surplus, but that of Cebu shows a large deficit every year. A relatively large surplus of beef and carabeef is, however, expected for Bohol, about 2,000 tons in 1980.

3) Methods

Production of beef and carabeef is generally considered as one of the profitable sector in agriculture. However, the most important factor for the livestock industry is to produce cheap fodders of enough quantity and of good quality. In Bohol, there is a difficulty in growing grass fodders due to poor soil fertility. Consequently, the production increase in beef and carabeef may be limited at a level of 3.5% annual rate. Whenever new technology on the grass fodder development is introduced in the future, the production rate may go up to a 4% level or over. However, it would take a relatively long period of time for such a technology to be applied in Bohol.

8.5 Agricultural Development Strategies

In order to materialize the development potential of Bohol to the fullest extent possible, rational and systematic strategies should be framed on the basis of realistic assessment of the prevailing conditions and of the future prospects. In the following paragraphs, brief remarks are made upon a set of policy goals and strategies which are to be considered for the future development of agriculture in Bohol.

8.5.1 Strategy One: Increase in Agricultural Productivity

To increase production in Bohol under the condition of small-size land holding, much emphasis must be placed upon raising labor efficiency and labor intensity. To attain this, there are three kinds of strategies which should be taken into account: 1) fertilizer subsidy, 2) credit and 3) infrastructure. In short or medium term, the first two are the most effective. From the long-term viewpoint the improvement of infrastructure with investment of social capital including land, irrigation and drainage facilities, barangay roads, etc., will become the most important and indispensable strategy. Thus, farmers can simultaneously increase labor efficiency and intensity. When it is viewed from the socio-economic viewpoint, the implementation of public work in rural areas such as dam construction, etc. may greatly contribute to the creation of employment opportunities in Bohol.

8.5.2 Strategy Two: Price Stabilizing Policy

In accordance with the economic development, the Bohol agriculture may become subject to the problems stemming from the change in growth stage from "food problems" to "farm problems". When the price of farm commodities will tend to go down, it will cause wider income gaps between urban and rural areas. In this sense, the price support policy for selected farm products must be introduced to attain even income distribution among the rural population. At least, the farm price covering the average production and marketing costs must be guaranteed. In order to achieve this, the farmers' cooperative movement should be strengthened to a large extent so as to help farmers obtain stronger bargaining power.

8.5.3 Strategy Three: Development of Practical and Profitable Technology

Another strategy adopted for the agricultural development in Bohol is to exploit new technology of production which is based upon the scientific evaluation of productive interrelationship among soil, crop and water to be used. The farmers should be imparted a new technological package that is sufficiently profitable at the farm level to provide an incentive for them to adopt technological innovations.

However, it must be noted that a wide spread of the technological innovations in Bohol becomes possible only when they are effectively supported by extension services carried out by competent workers with technical knowledge and experience. In this respect, this strategy has to be incorporated with Strategy Five below.

8.5.4 Strategy Four: Improvement of Soil Fertility

As frequently mentioned before, the soils of the province are mostly calcareous. It is noted that the characteristics of such calcareous soils have not yet been fully clarified and the interrelation existing between the soils and crops has not been sufficiently examined. Moreover, the problems on moisture stress which hinder smooth growth of

plants need urgent practical solutions. Nevertheless, it is by no means easy to develop a new technological package which can overcome such constraints.

Difficulties involved in the development of such a technological package can be attributed to the following:

- Research on new technology needs a rather long period of time, of perhaps more than 5 years.

- Analysis of sample data of different composition cannot be carried out at remote places, but must be strictly done in Bohol. However, not many research scientists are available in the province.

- The research involves all of the factors and/or components affecting crop production. However, the research scientists belonging to different fields of administration sometimes create barriers for their fruitful cooperation.

- Modern equipment are needed for the studies but they are commonly expensive.

These limiting factors impeding scientific research on the improvement of soil fertility in Bohol must be rectified.

8.5.5 Strategy Five: Building-Up of Research Promotion Center

In order to develop the technology package of practical application value, the establishment of a research promotion center is most needed. For developing such a research institute, the following consideration must be made:

1) Brains and technique for studying profitable technological package can be gathered at a suitable institute in Bohol, if the following conditions are given:

   (a) Extra bonus for working in a remote place

   (b) Good accommodations

   (c) Ideal atmosphere for research work

2) Modern reserach equipment should be provided such as atomic absorption spectro photometer, etc.

3) Special budget allocation for the management of the whole research system plus extension system must be provided lasting for the educational period of at least 7 years.

4) The biggest problem on the settlement of the research promotion center is undoubtedly the recruitment of the best people from different bureaus serving under a precisely formulated plan of research work. A general coordinator should be responsible

for all the research work and management of human affairs. Research officers from the BPI, BS, BAI, BAEX, BAEcon and other related ministries may join. When some of the research work is achieved, the extension officers should help establish demonstration plots in appropriate area under the design based on the research.

5) It is ideal that the research promotion center is located at the President Marcos Corn Experiment Station, where 100 hectares have already been allocated for the center.

8.5.6 Strategy Six: Establishment of Pilot Farm

For rice production, practical technology has already been extended among the farmers in Bohol. They have applied zinc sulphate to their paddy fields according to the instructions of the package programs given by the MA and IRRI.

Although the new technology of zinc application is familiar to farmers, the whole technological package is not applied yet. This is mostly due to the economical reason that the inputs requested such as fertilizers, etc., are quite expensive for them. This is the exact reason why rice yield is still low. The Pilot Farm will be able to show how to manage rice production based upon the package program and the direction of Masagana 99. Accordingly, the Wahig-Pamacsalan Rice Irrigation Pilot Farm can be suggested as an area through which profitable technology can be transferred.

8.5.7 Strategy Seven: Development of Urban-Oriented Farm in BIAD II Area

The vegetable and fruit growing farms should be developed in the BIAD II area which is close to the urban area of Metro Cebu due to the following reasons. First, the demand for urban consumer oriented agricultural produce will be expected to increase in proportion to Cebu's industrial progress. Farmers in BIAD II area must effectively respond to this demand. Second, the sea traffic has gradually increased in recent years between Bohol and Cebu and the small sized ships currently used will be replaced by ships of larger tonnage in the future, resulting in the reduction of transportation cost. Third, farmers in Bohol will be able to have comparative advantage over those in Cebu in respect to quality and price, if sufficient development measures are taken in Bohol.

8.5.8 Strategy Eight: Implementation of Integrated Rural Area Development Plan for Wahig-Pamacsalan Irrigation Project

A high priority order consideration should be given to the integrated rural area development plan proposed for the Wahig-Pamacsalan Irrigation Project. A detailed description of this project is provided in the Feasibility Report on Bohol Integrated Agricultural Development Project which was presented to the Philippine Government in May, 1978 by Japan International Cooperation Agency (JICA). The Wahig-Pamacsalan

Irrigation Project should be implemented within the earliest possible time as an integral part of Bohol Integrated Area Development Project Proposed in this report, particularly due to the following reasons:

- Incremental rice production effects estimated at 30,000 m/t per year.
- Establishment of a modern farming and management system in a core agricultural area of Bohol.
- Institutional development of farmers' cooperatives which are in charge of purchasing, storing and distributing agricultural input and output.
- Establishment of a pilot farm through which the farming technology package could be disseminated all over Bohol.

8.6 Formulation of Development Programs

In the preceding sections, brief explanations are made concerning the three basic program objectives of national agricultural development, i.e., 1) improvement of the food nutritional level of the Philippines, 2) development of agro-energy in face of the rising price of oil, and 3) export generation and import substitution. The first two program objectives were considered most relevant to Bohol, and to attain these objectives at the provincial level, an indication was made that Bohol should exert its efforts to the fullest extent possible upon the expansion of the major agricultural outputs, namely, rice, corn, cassava, coconut, and beef and carabeef. In addition, a suggestion was made in the previous section that the set of eight development strategies should be considered as a policy mix. viz., 1) increase in productivity, 2) price stability, 3) development of practical and profitable technology, 4) improvement of soil fertility, 5) establishment of a research promotion center, 6) establishment of a pilot farm, 7) development of urban-oriented farm, and 8) implementation of Wahig-Pamacsalan Irrigation Project.

However, it must be noted that the production objectives and/or targets, and strategy alternatives should be closely coordinated and integrated with each other within a coherent framework of the agricultural development objectives. In view of this, a long term development objectives should be briefly reiterated here in order to shed a light upon the development stages through which agriculture in Bohol must go in the future. In addition, a summary remark should be made upon a variety of programs/projects which are proposed, ongoing, and pipelined by the governments in the Philippines.

8.6.1 First Priority Program Objectives: Improvement of Food and Nutritional Status in Bohol

1. A Proper Mix of Cereals

In order to attain the recommended allowance per capita per day

indicated in the Philippine Food Balance Sheet and advised by the Food and Nutrition Research Center (FNRC), a proper balance of the foods, particularly of vegetable origin should be maintained by the Boholanos in the future. However, the eating habits of the Boholanos have been lopsided toward the consumption of cereals, particularly of corn. This situation must be rectified as soon as possible.

As mentioned earlier, corn-grit consumption as a staple food has been common in Bohol. This was simply due to the fact that corn-grit is much cheaper than rice. The eating habit of the Boholanos may gradually change when their economic level rises. Rice is presently exported, although in a small amount, in spite of the fact that the potential demand for rice seems to be high.

2. Need for Intake of Proteins

The consumption level of meat, egg and other animal protein sources is quite low in Bohol due to their high prices. In order to lower their price levels, either their supplies should be expanded or their price must be controlled. In addition, as a temporary or substitute measure, it is highly recommendable that leguminous crops especially pulses should be planted intensively, such as mongo, cowpea and peanuts as their protein sources. Moreover, these pulses fix nitrogen, resulting in the improvement of fertility of soils for the successive cropping. In this connection, nitrogen fixing activities of nodule bacteria, if found for each of these pulses, should be fully utilized.

In view of the double functions served by the pulses, protein sources supply and nitrogen fixing, their production expansion should be given a high priority consideration. However, it must not be forgotten that people have a fixed preference of palatability of foods. If the pulse is found to be disliked by the people, alternatives should be sought for peanut and mongo.

8.6.2 Second Priority Program Objectives: Establishment of Alcogas and Biogas System

1. Development of Alcogas Factory

Although the current production level of cassava is relatively low, the production could be raised if enough incentives are given to farmers in Bohol. It may be argued that the production potential of cassava is not high enough to ensure the establishment of a large scaled alcogas factory in Bohol. Nevertheless, the development of alcogas factory of appropriate scale is very much welcome for the Bohol agriculture in the sense that it will not only serve as supplement of fuel for increasing gasoline consumption but also give incentives to farmers to earn cash income, which will in turn bring about the production expansion of cassava in Bohol. A detailed description of the technical feasibility of alcogas factory is provided in Chapter 15.

2. Development of Biogas System

As a practical measure to supply energy in rural areas in Bohol, the development of a biogas system is highly recommended for Bohol.

The biogas system of methane gas utilization can be undertaken by the use of the so-called organic wastes as its raw materials. As the mechanism of producing methane gas is controlled by activities of bacterias, the materials used are divided into two groups:

1) Bacterial food stuff - carbon rich organic materials such as rice, straw, corn stalk, crop residues, leaves, paper, etc.

2) Bacterial protein forming stuff - nitrogen rich organic materials such as cattle dung, hog manure, chicken manure, and even human waste can be used.

The biogas system should be initiated in a small size at the grass-root farm level, whose capacity of fermentation tank may be 6 to 8 or 10 cubic meters. These capacities can supply enough methane for domestic cooking and one or two lightings. There are two types of systems in the world: the Indian and Chinese types, but the latter is much cheaper as far as construction cost is concerned. It is recommended that a pilot farm should first be established to show how an actual biogas system can operate even in small size so that farmers can construct their own system.

A large biogas system can be built at a suitable place in the Wahig-Pamacsalan Irrigation Project area for the purpose of providing the produced energy to rice mill and other processing plants. For this system, rice straws produced in the area and dung from cattle and hogs can be used. The animals can also be fed with rice brans produced at the mill. The tank capacity of the biogas plant may depend on the plan of milling and processing factory of palay.

8.6.3 Third Priority Program Objectives: Development of Export-Oriented Crops

1. Export of Rice to Metro Cebu

For Bohol, one of the export-generated crops is rice in as much as Region VII has heavy deficit in rice. A main economic role of Bohol is to act as a supply depot of agricultural goods in Region VII, particularly to Metro Cebu which is characterized as becoming one of the major industrial growth poles in the Philippines after Metro Manila Area (MMA). Rice is one of the main agricultural items to be exported to Metro Cebu whose demand for consumer goods will rapidly expand in the future as population migrates from neighboring areas.

2. Fruits

Except for rice, fruit crops seem to be profitable as export items such as mango, cacao and cashew nut. Mango is the famous fruit of

Cebu so that the Boholanos should adopt the techniques of mango production originated by the Cebuanos. So far as cacao is concerned, the cacao production needs an estate farm system of a wide hectarage of area.

Although almost every farm is planting one or two cacao plants, the development of cacao plantation on a large scale is a different matter. It is necessary that a study should be initiated in Bohol as to how the cacao estate can be developed and managed.

3. Vegetables

A similar effort must also be made for vegetable export. With the expansion of consumer market in Metro Cebu, the demand for fresh vegetables will increase rapidly. The selection of types of vegetables grown in Bohol should carefully be made by taking into consideration the factors such as 1) palatability to the Cebuanos, 2) technology and marketing skills and facilities required, 3) physical characteristics required for soils and fertilizer input necessary. The most probable choice of export vegetables are tomato, lettuce, cabbage, green and bulb onion, etc.

8.6.4 Development Programs/Projects Proposed and Pipelined by the Philippine Governments

It must be remembered that a large number of development programs and projects have been carried out or proposed by the Philippine governments for the agricultural development in Region VII as well as in Bohol. Any long term development programs/projects should therefore be framed in close coordination with the on-going processes and/or effects of these government programs. Some of them have undoubtedly contributed to the development of agriculture in Bohol. Since their technical descriptions are furnished in the government publications, a list of the related development programs/projects is provided here for the reference purpose.

1. National Programs

1) Agriculture

Masagana 99 Rice Production Program
Maisan 77 Corn and Sorghum Production Program
Gulayan sa Kalusugan
Palayan ng Bayan
Corporate Farming
Green Revolution Program
Beef/Carabeef Development Program
Coconut Replanting
Cooperative Development
Barangay Revolution Project

2) Forestry

Program for Forest Ecosystem Management (PROFEM)

2. Line Agencies Project

1) Ministry of Agriculture

- Bureau of Agricultural Economics

  Data Collection

- Bureau of Agricultural Extension

  Promotion of Farm Management, Practices & Methods
  Agricultural Extension Information and Education Services

- Bureau of Animal Industry

  Research and Development Services for Livestock, Poultry and Dairy Industries.
  Animal Disease Control Services
  Livestock and Poultry Development Services
  Diagnostic and Laboratory Services
  Animal Feed Control Services
  Meat Inspection Services
  Purchase and Expansion of Breeding Stock

- Bureau of Plant Industry

  Agricultural Research
  Seed and Plant Production Services
  Field Trials Services
  Crop Protection Services

- Bureau of Soils

  Soil Survey and Classification
  Soil Conservation
  Soil Research
  Laboratory and Special Services

2) Ministry of Agrarian Reforms

Agrarian Legal Assistance Services
Land Surveys and Delineation Services in Agrarian Reform Areas
Land Tenure Improvement Services
Resettlement and Rehabilitation Services
Land and Home Development and Improvement
Loan Assistance.

3) Ministry of Natural Resources

Bureau of Fisheries and Aquatic Resources
Bureau of Forest Development
    Forest Resources Management
    Reforestation and Afforestation

3. Pipeline Projects

1) Bohol Integrated Rural Development Project - Wahig-Pamacsalan Irrigation Project, about 6,000 has., JICA funding.

2) Land Settlement Project - Dagohoy, about 23,000 has.

4. Proposed Projects by Line Agencies

(a) Rainfed Agriculture - Pilar, Ubay, Carmen

(b) Stockfarm Rehabilitation - Ubay

(c) Water Impounding Projects

(d) Agro-forestation; Loboc Watershed plus 11 municipalities

(e) Bohol Resettlement Project; Buenavista, Jetafe, Talibon, Trinidad, San Miguel, Dagohoy and Danao - 20,000 has.

8.6.5 Agricultural Development Programs Recommended for Bohol

1. Development Program Stages

On the basis of the background information provided thus far, a comprehensive agricultural development program should be formulated for Bohol in line with the development objectives, strategies, and program objectives spelled out for the agriculture and livestock industries in Bohol.

However, it must be granted that agriculture development in Bohol may have to go through two stages, namely:

First stage: Agriculture may be stagnated in its development, while all efforts should be focused on scientific researches on profitable technological package most suited to the soil characteristics in Bohol.

Second Stage: The extensive development should be aimed at through the application of profitable technology all over the province.

The period of the first stage may take several years ranging from 3 to 5 years since the basic research works need a rather prolonged period of gestation.

The two staged development frameworks are deemed necessary for the agriculture in Bohol, for a practical research work on the soil characteristics hindering the agricultural production in Bohol must be tackled first prior to the implementation of other development measures. This necessity must be clearly understood.

As frequently mentioned earlier, the soils covering the major

farmlands in Bohol are commonly very poor in plant nutrients and heavily eroded, causing extremely low crop productivity. In addition, plants show clear symptoms of deficiency on some nutritional elements and/or on moisture stress due to shallow surface soils. Careful examination of these physical aspects is a matter of necessity.

In addition, the following measures should be given a priority consideration:

1) Systematic development of infrastructural support, namely, need for implementation of irrigation projects.

2) Promotion of vegetables and fruits that could be exported to the main consumer markets in Region VII, i.e., need for the development of urban oriented farm business in Bohol.

3) Introduction of new crops suited to the soil conditions of Bohol, i.e., need for a careful examination of comparative advantage and disadvantage of Bohol.

4) Development measures for livestock industry for the purpose of both supplying the required animal proteins to the Boholanos and Providing cash income earning opportunities to farmers in Bohol.

2. Development Programs/Projects Recommended for Bohol

1) A list of Recommended Programs/Projects (See Table 8-6)

In conclusion, a set of development programs/projects, briefly explained in the following table, is recommended to be carried out in the future.

The Provincial Government and other related line agencies should cooperate with each other to exert all their efforts to materialize these programs/projects. However, it is necessary to establish at least one research institute in order to have a consolidated system.

(a) To consolidate all research results carried out by scientists of different fields to one research project, namely, the exploitation of new profitable package of technology suitable to soils in Bohol.

(b) To effectively respond to all practical problems of agriculture such as pest and disease, excess or deficiency of plant nutrients, and a host of other problems.

Considering its functional location, the President Marcos Corn Experiment Station seems to be the best institute suitable for the establishment of a consolidated research promotion center. The station presently holds about 100 has. which is large enough to build new offices, houses, storehouses, garages, workshops; dormitory, and other necessary facilities.

Table 8-6 Recommended Development Programs/Projects

Programs/Projects	Area (has.)	Location
Program I. Promotion of Rational Use of Natural Resources for Agriculture Development in Bohol		
Objective (Rational Use of Land Resources for Agriculture Development)		
Project 1. Promotion of Basic Research on Land Characteristics and their Improvement	Farmland	Tagbilaran
Project 2. Exploitation of Profitable package of Technology over Calcareous Soils - Settlement of the President Marcos Agriculture Promotion Center	100	Ubay
Project 3. Promotion on Land Consolidation in Relation to Irrigation		Wahig Project Area
Objective (Rational Use of Water Resources for Agriculture Development)		
Project 1. Wahig-Pamacsalan Irrigation Project	6,000	Pilar, Sierra Bullones, Dagohoy, Ubay
Project 2. Communal Irrigation Projects	600	Tubigon
Project 3. Wahig-Pamacsalan Rice Irrigation Pilot Farm	12	Pilar
Program II. Promotion of Urban Oriented Crop Production Program		
Project 1. Settlement of the Vegetable Promotion Center	5	Tubigon
Project 2. Settlement of the Fruit and Other Tree Crop Promotion Center	10	Clarin
Program III. Introduction of New Crops Adaptable in Bohol	5	Talibon
Program IV. Promotion of Beef Cattle Production Program		
Project 1. Beef Cattle Development with the Use of Fodders instead of Cogon	15	Ubay
Project 2. Beef Cattle Development Drive in Cooperation with Grain Crop Farmers		
Project 3. Cooperative Institutions		

The Station should be renamed as the President Marcos Agriculture Promotion Center.

In the management of the Center, BPI must be selected as the executing agency but it is recommended that a steering committee on the organization of this institute should be formed. After the establishment, the committee should be changed to a managing committee on research work.

2) Areal Location of the Programs/Projects

Areas where all the programs/projects should be located are shown in the following map (Fig. 8-2).

3) Recommended Implementation Plan

A detailed implementation plan of three large projects are shown in a flow chart of Table 8-7, namely, the President Marcos Agriculture Promotion Center, the Wahig-Pamacsalan Rice Irrigation Pilot Farm and the Vegetable Promotion Center.

For other projects which are selected as "high impact projects", detailed descriptions will be provided in section 8.7. However, it is recommended that the priority for the investment should be given in the following order:

- Wahig-Pamacsalan Irrigation Project (6,000 has.)
- Exploitation of Profitable Package of Calcareous Soil Technology and Establishment of President Marcos Agriculture Promotion Center.
- Wahig-Pamacsalan Rice Irrigation Pilot Farm
- Cahayang Communal Irrigation Project (Feasibility Study)
- Vegetable Promotion Center
- Basic Research on Land Characteristics and Improvement
- Beef Cattle Development through Replacement of Cogon with Fodders

4) Expected Effects

Since the types of the development programs/projects recommended here in general belong to the experimental research with the exception of irrigation projects of the Wahig-Pamacsalan and others, the socio-economic effects deriving from them cannot be spelled out in quantitative terms. Nevertheless, the following general observation will be made:

First, although a large number of national programs on crop and livestock development have been carried out in Bohol, the effects expected to come from these projects in Bohol may not be significant due to the extremely poor conditions of soil. An exceptional case may be the rice production with zinc application carriedout by the Masagana 99 Program in Bohol. The zinc application has given very high effects on rice production. It has made possible through the introduction of

Fig. 8.2 PROPOSED PROJECT LOCATIONS
(JICA TEAM 1979)

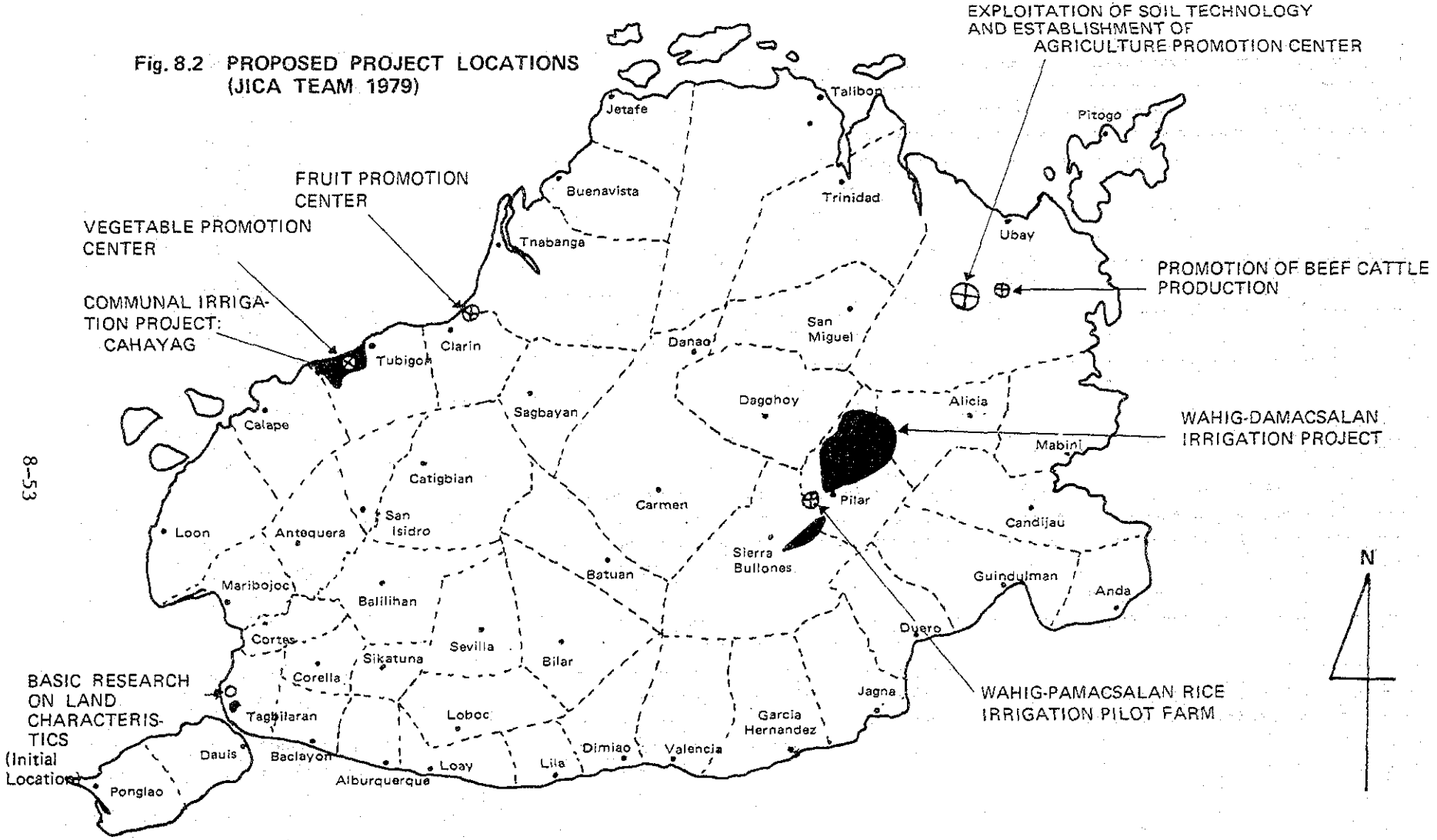
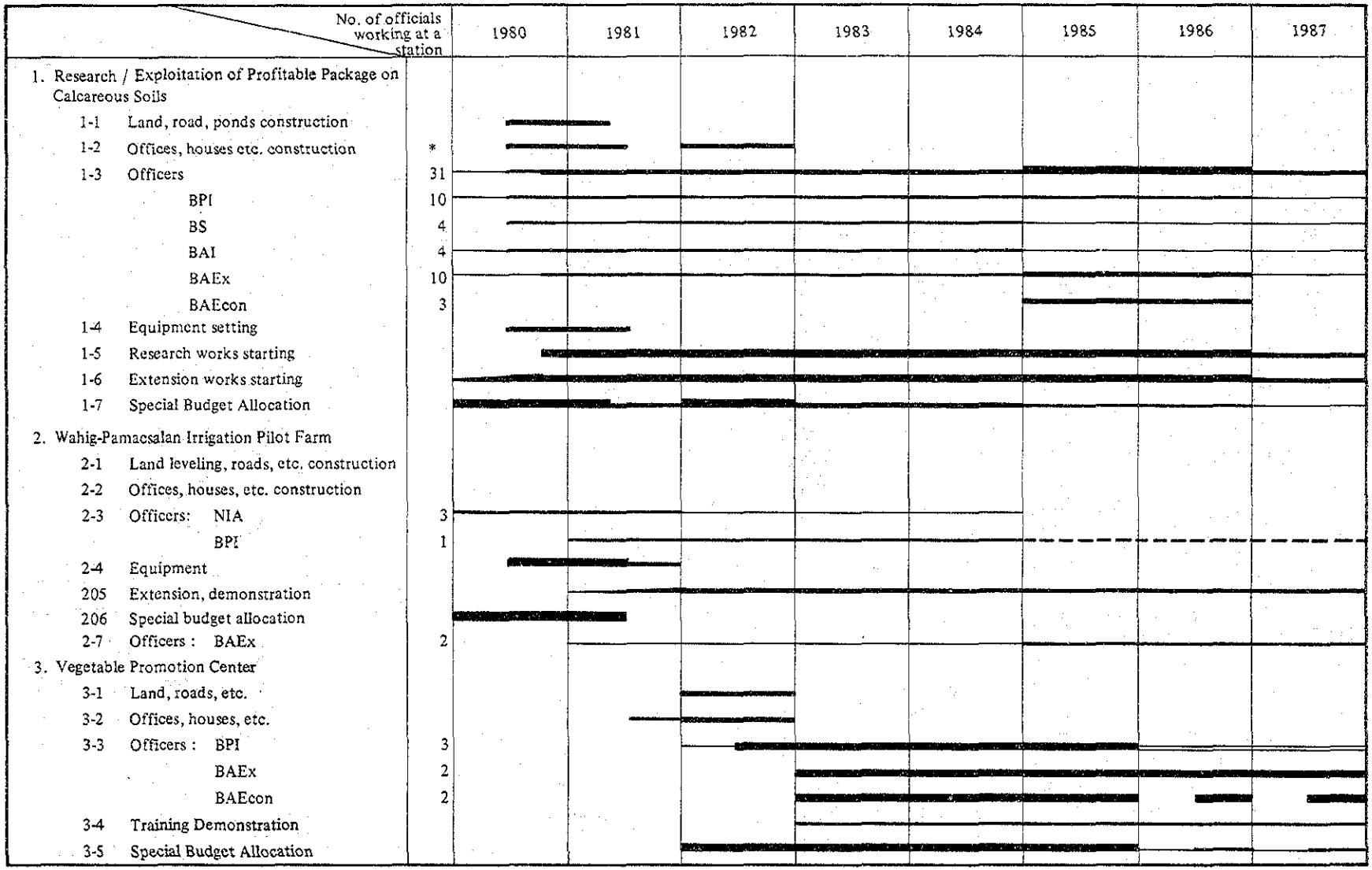


Table 8.7 Implementation Plan on Three High Impact Projects



Remarks : Intensity of activities are shown by the width of the black line.
A dotted line shows the possibility of international cooperation.

some of the high yielding varieties (HYV's) such as IR 36, IR 42, etc., and application of fertilizers of certain quantity with an assured effect.

Second, except for the yield of rice, those of other crops are generally low. It may mostly be due to the fact that the soil fertility is extremely low. Accordingly, once the problem of soil characteristics is cleared away, crop yields are undoubtedly expected to go up. When this technique is combined with irrigation, crop production will jump up three or four times more than the present level.

Third, technical innovations would give enough incentives to farmers so that they may study the physical characteristics of their own lands, farm practices or management suited most to their farm development. This is the first step towards the development of a more advanced agricultural society.

Fourth, after the proposed projects would have been implemented successfully, the national programs should take the leading role in promoting agricultural development in Bohol. The projects of various line agencies will have to be coordinated effectively with those of the national programs.

8.7 High Impact Projects for Development of Agriculture and Livestock in Bohol

8.7.1 Selection of High Impact Projects

In order to give an initial stimulus to the development of agriculture and livestock in Bohol, a set of high impact projects, which can be implemented within a relatively short span of time, was selected from the list of development programs indicated in Table 8-6. Viewed from the expected linkage and priority order and roles to be played in integrated area development plan of Bohol, at least one project was selected form each of the development programs described in the previous section. Such development programs are: 1) promotion of rational use of natural resources for agricultural development in Bohol, 2) promotion of urban oriented crop production, 3) introduction of new crops adaptable in Bohol and 4) promotion of beef cattle production system.

However, as indicated in the previous section, the first program is divided into two types in terms of objectives: the first type is the rational use of land resources and the second is the rational use of water resources. Since a detailed explanation will be given on the latter in chapter 13, it is not included in the present list of high impact projects of the agriculture and livestock sector. In addition, the third program of introduction of new crops suited to Bohol should be regarded as one which should be implemented at the later stage of development. In consequence, this program is also to be excluded from the list of high impact projects.

A summary description of the high impact projects thus selected is

provided in Table 8-8, and in the following sections brief explanations will be made upon them with regard to their objectives, operations and functions, cost estimates of capital outlay, required equipment, recommended location and other technical components of the projects.

8.7.2 High Impact Project 1: Promotion of Basic Research on Land Characteristics and Improvement

1. General Background on Soils

Since soils in Bohol are mostly calcareous derived from limestone and lime-rich shale, siltstone, and sandstone, they tend to be low in organic matter and phosphorus, and sometimes zinc and iron. Due to its alkalinity, the soils tend to become deficient in manganese, copper and/or boron.

Soil chemical analysis is the only way to identify the following: a) what are the deficient elements, b) where are the deficient areas, and c) how much they are deficient. In conjunction with these analyses, plant analyses should be made to examine what kinds of productive relations exist between the soil characteristics and the type of plants to be grown. For both analyses, the atomic absorption spectrophotometer is an excellent piece of equipment. Improvement measures need to be introduced to the deficient area from the results obtained by soil and plant analyses.

2. Operations and Functions of the Required Laboratory

To carry out these two types of research, a chemical laboratory needs to be built. The activities and equipment required for this laboratory are briefly explained below:

1) Soil and plant sampling:

Soil sample is taken from the surface layer of a farmland at the rate of one sample for every 10 hectares. Plant sample is taken only when the need arises.

2) Chemical Analysis

The type of chemical analysis to be carried out at the laboratory depends on the accumulation of information on the soil elements so that in the earlier stage elements should be analyzed as many as possible and later only the particular elements of high relevancy must be selected and analyzed. The elements to be analyzed are zinc, iron, manganese, copper, boron and other. In addition, the soil pH, available phosphorus, potassium and magnesium in the soils must also be analyzed.

Table 8.8 High Impact Project Summary

Programs/Projects	Cost Estimate Unit: ₱1,000	Location	Executory Agency	Remarks
Development Program I:				
Promotion of Rational use of Natural Resources for Agricultural Development				
Type A : Rational Use of Land Resources				
Project 1 : Promotion of Basic Research on Land Characteristics and Improvement	₱500	Tagbilaran	Bureau of Soils (BS)	Soil and plant sampling, Chemical analysis and extension work
Project 2 : Exploitation of Profitable Package of Technology over Calcareous Soils and Establishment of the President Marcos Agriculture Promotion Center	₱5,000	Ubay	Bureau of Plant Industry (BPI)	100 hectares used for research on farming technology, demonstration, and seed-multification, grazing cattle and carabaos
Type B : Rational Use of Water Resources				
Project 3 : Wahig-Pamacsalan Irrigation Project	*	Pilar, Sierra Bullones, Dagohoy, and Ubay	National Irrigation Administration (NIA)	Description given in chapter 13
Project 4 : Cahayag Communal Irrigation Project	*	Tubigon	NIA	Description given in chapter 13
Project 5 : Wahig-Pamacsalan Rice Irrigation Pilot Farm	₱3,000	Pilar	NIA	12 hectares used for transfer of technology to farmers
Development Program II:				
Promotion of Urban Oriented Cros Production				
Project 6 : Establishment of the Vegetable Promotion Center	₱3,300	Tubigon	Bureau of Plant Industry (BPI)	Farming land of 5 hectares used for experimentation and training of vegetable production
Development Program III:				
Promotion of Beef Cattle Production				
Project 7 : Beef Cattle Development Through the Use of Fodders	₱2,000	Ubay	Bureau of Animal Industry (BAI).	Development of grazing farm by use of cheaper fodder grasses, started with initial land area of 15 has.
TOTAL	₱13,800			

* Note: The costs of Projects B-1 (₱328,500) and B-2 (₱11,000) are excluded from the total cost since they are included in the cost estimate of the high impact projects of Water Resources Management Development Program

3) Coordination and Extension Work

How the research findings are coordinated to be bought into productive use is a most important procedure for the research. Improvement measures for farming method will be determined according to this procedure. In addition, an administrative system must be devised in such a way that the results obtained and the technical recommendations deriving from them should be extended to the farmers immediately for their practical application.

3. Suggested Location of the Laboratory

At the earlier stage analyses should be carried out at the chemical laboratory of the BS in Tagbilaran. However, after the completion of the President Marcos Agriculture Promotion Center, the laboratory should be transferred to the Center.

4. Equipment Required at the Chemical Laboratory

The chemical laboratory must be equipped with modern machines and equipment to carry out quick and accurate soil and plant analyses.

At least the following equipment must be provided: atomic absorption spectrophotometer, emission flame spectrophotometer, and their accessories, other laboratory equipment in order to carry out "quick analyses". An electric generator driven by gasoline engine must also be installed as a standby power unit and, in addition, one vehicle for sampling and other uses is required.

5. Cost Estimated

₱500,000 (US$68,500)

8.7.3 High Impact Project 2: Exploitation of Profitable Package of Technology on Calcareous Soils and Establishment of the President Marcos Agriculture Promotion Center

1. General Background on Technological Research

The objectives to increase agricultural production in Bohol will be achieved only through the efforts to develop suitable technologies, especially technology best suited to extraordinarily poor soils of Bohol. The development of such a technology should be firmly based upon the soil characteristics, rainfall distribution, slope of the field, traditional farming systems, labor flow, and particularly the type of crops grown in Bohol. The newly developed technology must be practical, productive, and, most of all, profitable.

There are presently three research stations and one extension office which engage in the development of agricultural technology and improvement of productivity in Bohol. These are:

- President Marcos Corn Experiment Station - BPI
- Soil Conservation Station - BS
- Ubay Stock Farm - BAI
- Agricultural Extension Office, Tagbilaran - BAEX

2. Need for Effective Linkage of Practical Technology with Farming Method

An effective link of these research units with rural development programs is one of the critical steps to be taken for agricultural development in Bohol. As agricultural production increases in Bohol, so the research carried out in different fields have to be correspondingly changed. Such systematic research work of broader policy objectives, therefore, needs to be distinguished from the ordinary agronomic trials conducted on individual crops that frequently fail to take account of the system effects.

For instance, it is often proven to be insufficient that one of the improved inputs for rice production is introduced to a farmer's field, such as a recommended variety, if it is without any supporting services provided to farmers. A high yield variety may increase its productivity only under the given conditions and with sufficient instruction given by the extension agent. Many farmers misunderstand this point. It must be recognized that sometimes an implementation of profitable technology requires drastic changes in the farmer's attitude.

In this respect it is essential that a close link should be established between the adaptive research and extension work. Often the extension service fails to appreciate its role in identifying the farm-level constraints which can be removed through research. Feedback of information given to the research side concerning the problems impeding the practical application of adaptive technology should be noted as one of the important roles of the extention agent, for it is through the extension work that the technology can be refined so as to become more adaptive and productive.

3. Problems to be Resolved

There are a large number of problems that the research and extension team has to solve, but at least the following should be resolved through the development of new profitable technologies.

- Very low fertility of soils
- High erodability
- Poor supply of farming inputs due to low level of farm income
- Vigorous growth of weeds
- Shortage of labor at the peak period of farming
- Mis-management due to incomplete transfer of technology

- Very low usage of agricultural credit systems.

Many people believe that the socio-economic problems in the rural sector such as poor supply of inputs cannot be solved from the production side. It is not always true. These kinds of problems can be solved step by step; once farmers concentrate to perform all the required farming practices, the final yields should be very high. The high yield will give more incentive to do farming and, finally, enough income to farms to assure a greater use of modern inputs.

4. Project Objective: Establishment of the President Marcos Agriculture Promotion Center

It is recommended that official support should be given during the early stage of development of practical technology. The emphasis should be placed on the optimal combination of three research stations existing in Bohol to utilize their manpower to apply new profitable technologies at the grass-root level. For this purpose it is strongly suggested that an agricultural promotion center be established as an integrated research and extension system in order to fully develop profitable and productive technologies for agricultural production in Bohol. The President Marcos Corn Experiment Station is the best office for such a center since it has the best location and holding hectarage.

1) Development of New Administrative System

In the President Marcos Corn Experiment Station (PMCES), the research work is now being carried out by the three stations and the extension services are carried by the branch office of BAEX. All the these should be transferred to the consolidated institution of the President Marcos Agriculture Promotion Center.

One General Coordinator should direct all business with the help of a certain number of personnel sent by the Department Directors. The allocation of a sufficient level of finance and manpower are deemed essential especially during the period of strengthening the organization. Machines, equipment, vehicles, houses and other necessities for the work must be provided.

2) Use of Land

The land of 100 hectares held at present should be used for;

- Research on profitable and productive technology on farming systems.
- Demonstration and seed-multiplication.
- Lots for grazing cattle and caraboas.
- Official houses, impounding ponds, feeder roads, etc.

5. Main Research Activities

1) Research Work

At the Center practical and advanced technology should be studied on the principal factors affecting productivity of crops. In addition, fundamental research and survey should be carried out, but they should be completed in a short-period of time because of the farmers' eager desire for production and because of limited time of financial support.

At the same time, extension services should be provided to farmers by the Center for profitable techniques and improvement of traditional farming.

The major research fields are divided into the following two groups:

(a) Principal factors:

- Soil Characteristics, especially location and degree of deficiency of micronutrients.

- Exploitation of fertilizer and its uses.

- Changes of elements in soil and plant during the period of typical rotation.

- Methods of estimation of crop productions over Bohol.

- Survey of socio-economic patterns in farming communities.

- Others.

(b) Integrated farming technology:

- Crop rotation systems; combination of corn and other leguminous crops, especially pulses.

- Successive farming systems of corn, cassava, or sorghum.

- Irrigation techniques for crops.

- Others.

For these study subjects, research scientists in different major fields should be mobilized and work together to form an interdisciplinary team under coordinated management.

2) Extension Work and Recruitment Problem of Qualified Personnel

The project aims at formulating new profitable package of technology to be carried out over the particularly low fertility soils in Bohol through the consolidated efforts of scientists in various special fields. The scientists are

required to direct their studies on the formulation of new technology within a rather short period of time, because of the fact that all farmers wish to apply newly developed package of technology as quickly as possible. All efforts, therefore, are needed to be concentrated on the smooth performance of research and trial work and the development of new technology.

Once the results from research works are ready for practical application, there are two ways by which extension services may be channeled:

(a) The research results can be applied directly to farmlands and conclusion obtained from the application should be reported back to the extension agents, and

(b) Trials are conducted on several farmlands to confirm the results, only after which the results are submitted to the extension agents.

The biggest problem at the beginning of the project will be the availability of highly trained scientists recruited from various special fields. It is highly recommended that only the best personnel in their respective fields should live in the Center. It is suggested that a remote area bonus should be given to them as a financial incentive for living there.

6. Machines and Instruments Required for the Center

The following types of machiens and instruments should be provided for the Center:

1) For research fields:

- Atomic absorption spectrophotometer with accessories
- Spectro and flame-photometers
- Nitrogen analyzer
- Chemical analysis equipment
- Tools and small equipment for crop science
- Grain dryers in large and small sizes
- Incubators, refrigerators, and sample dryers
- Microscopes with accessories and other necessary equipment for the study of crop pests and diseases
- Filing and computing system equipment
- Others

2) For farm maintenance:

- Heavy machine vehicles, pick-ups and jeeps
- Tractors with accessories and harvester
- Storage and seedstock yards, workshops, etc.

- Motor pumps, sprayers, etc.
- Others

3) For extension service:

- Motor vehicles and minibus
- Audio system, movie camera and projector, etc.
- Communication tools
- Recording and filing systems for computation

4) For houses and facilities:

- Repairing main roads and construction of feeder roads
- Main office, research labs, computer room, meeting and lecture rooms, other supporting houses
- Warehouse, seed house, machine houses, workshop with welding machine, drying ground, etc.

7. Total Costs Estimated

₱5,000,000 (US$685,000)

8. The Project Implementation Plan

It is suggested that the project should be implemented in 1980 because of the strong need expressed by the farmers in Bohol. The construction works for building office warehouses, garage, laboratories, experimental farmlands, feeder roads, irrigation channels, water pumps with driving engine, and others should be started earlier. The budget related to the construction should be allocated first.

In the latter part of 1980, personnel recruitment should be started, noting that it requires special allocation of the budget as mentioned before. The machines and equipment are generally purchased at the beginning of the year so that the maintenance expenditures are also requested at this time.

The construction work should be finished within one year. Research work can be started from 1981 or earlier in special cases such as experimental field soil survey, inspection and occurrence of crop pests and diseases, trials, etc.

Research studies to be performed in the Center should be carefully controlled by a special committee which supervises design of experiment, allocation of duty, data collection and others. The general coordinator should control all the committees conducting different types of studies. Extension officers should be placed also under the supervision of the Coordinator.

8.7.4 High Impact Project 3: Wahig-Pamacsalan Irrigation Project

Since the details and technical explanations for this project were already provided in the feasibility report, only brief remarks will be made here in order to highlight some of the important aspects of the project which are of direct relevance to the agricultural development plan for Bohol.

A feasibility study was already conducted on the project in 1977 by JICA. The significance of the project is clear. The service area of the irrigation project is about 6,000 has. and the projected rice production is estimated at 30,000 tons/year according to the program. It is observed that the Boholanos have a strong wish to implement the project as a spring board for agriculture development in their province.

The engineering works and crop production aspects of the Wahig-Pamacsalan Irrigation Project can be completed within a few year's period. In addition, it is highly recommended that a feasibility study on land levelling and consolidation within the project area must be carried out because the topography of the area is mostly rolling and farmland must be levelled in each terrace along the contour line.

It must be cautioned that in the surface levelling work, ploughable soil must first be scraped to one side and after the levelling work is finished, the soil should be placed back again.

The costs in this engineering work may be very high and cannot be funded at the farmers' level. This is the reason why a comprehensive feasibility study on land levelling and consolidation is much needed. The feasibility study on land levelling and consolidation in the project area must be started in 1980.

8.7.5 High Impact Project 4: Communal Irrigation Projects

It is planned that the communal irrigation systems are to be included in the high impact projects of the development plan. Since a technical description will be given on them in chapter 13, no explanation is given here. However, it must be simply stated that the communal irrigation projects are very important program components for the agricultural development plan of Bohol.

8.7.6 High Impact Project 5: Wahig-Pamacsalan Rice Irrigation Pilot Farm

1. General Objectives

Before starting rice farming in the Wahig-Pamacsalan Project area it is absolutely necessary to transfer the recommended technology of rice to the farmers who will move into the area. It is anticipated that there will be many technical difficulties encountered at the beginning of the pilot project. Among them will the problems of how to determine the following:

- The variety to be used on the land just after the levelling works.
- The recommended level of fertilizers application under different farm conditions.
- The occurrence of crop pests and diseases and their control measures.
- The economic and rational methods of irrigation to conserve water.
- The cost and benefit that can be expected when traditional practices are applied.

It is highly recommended that a pilot farm should be established to answer the many technical problems that may occur. It is also suggested that the pilot farm should be built before the farmers move into the service area.

2. Project Description

The pilot farm should be laid out in a 12-hectare site, with the demonstration trial farms occupying 2 to 3 hectares. The rest are intended for seed production of the recommended varieties. At the pilot farm, the targeted rice yield should be higher than that of Masagana 99, which is 99 cavans per hectare per year or 5 tons/ha./year. Only with high yield can a demonstration trial serve its purpose.

The proposed site of the Pilot Farm is suggested to be located near the municipal office of Pilar. The proposed area is with undulating topography and is stretched along by a small stream. The needed water will be pumped up from the nearby Wahig River. Office, warehouse, garage, and other houses will be located in a higher place from which all fields can be seen.

The Farm will be managed by an officer from the NIA based in Tagbilaran with the help of two to three assistants. Frequent consultation with the BPI and BAEX regarding the Masagana 99 program is deemed necessary.

As mentioned, the demonstration trials and seed production are the main responsibilities of the pilot farm.

3. Cost Estimated

₱3,000,000 (US$411,000)

The cost estimated is about ₱3,000,000. (US$411,000.) which includes construction works for land levelling and consolidation, feeder roads, houses, pumping facility with piping and others. Moreover, tractors, cultivators, harvesting and drying machines, vehicles, etc., are also included.

8.7.7 High Impact Project 6: Establishment of the Vegetable Promotion Center

1. General Objectives

With the increasing industrialization in Cebu, the demand for fresh vegetables and fruits will increase rapidly. Vegetable production, therefore, should be promoted to meet the demand. Northern parts of Bohol are found most suited to produce vegetables. With the proposed communal irrigation project in Tubigon, the vegetable production in this area will be expanded because the irrigation water intended for paddy fields can also be utilized for vegetable production.

2. Executing Agency

The executing agency will be the BPI in cooperation with the provincial government.

3. Location and Hectarage

The proposed project area is located in the municipality of Tubigon; land occupancy needed is up to 5 hectares.

4. Project Description

The Center consists of the following components:

- Farming land of about 5 hectares which will be the training ground for vegetable production.
- Training courses, observation tours and seminars on vegetables production and maeketing.
- Offices and lodging house for the trainees.

If necessary, foreign experts on vegetable production and/or marketing should be invited to the Center.

5. Project Output

The Center is geared to train 20 persons per year who will go back to their own farms and work for vegetable production. Some of them will work on the marketing side to ensure a smooth flow for their products.

6. Machines and Facilities Required

The Center needs to be provided with tractors and cultivators, packing machines, 3 vehicles, offices and houses.

7. Cost Estimated

₱3,300,000 (US$452,000)

8.7.8 High Impact Project 7: Beef Cattle Development Through the Use of Fodders instead of Cogon

1. General Objectives

In order to raise the production level of beef cattle in Bohol, ample and stable supply of cheap fodder grasses must be secured. The project aims primarily at the expansion of fodder supply in Bohol.

Cogon lands in Bohol occupy at least a hundred thousand hectares. These fields must be converted either to crop lands or pasture lands and the cogon eradicated completely.

2. Main Activities

Beef cattle production should be increased in Bohol, but the main obstacle of development is how to supply cheaper fodder grasses during the grazing time. The area now covered with cogon needs to be replanted with ipil-ipil and other quick growing plants. Whenever these plants grow well, the weed's growth is suppressed and will eventually be eradicated. However, this method does not work as simply as planned. A comprehensive study on how to eradicate cogon must be carried out.

The complete eradication of cogon can be made by the two methods: either through the cogon areas replanted with fodder plants such as ipil-ipil or the areas converted to grazing and pasture land.

3. Executing Agency

The BAI will be mainly responsible for the execution of this project in cooperation with the BS, BPI and Provincial Office.

4. Location and Hectarage

The project should be located in Ubay Stock Farm or within the irrigation project area in Pilar. The first year will cover 15 hectares of sloping land which would then be transferred to its proposed area in the second year. However, the transfer would all depend on whether the cogon fields have been successfully replanted with leguminous fodder crops like ipil-ipil.

5. Machines and Facilities Required

The project will need heavy tractors, drilling machines, laboratory equipment, office and barns, 3 vehicles, water pumps, etc. About 50 to 60 improved grades of cattle will be requied for this projects.

6. Cost Estimate

₱2,000,000 (US$274,000)

It includes the purchase of 50 to 60 head of cattle and the support for three fellowships to study abroad on weed control and pasture management.

Footnotes

1) In general, demand increase of food in a counting $\overline{D}$ can be expressed in the following way:

$$E_1 = (\Delta d/d) \div (\Delta I/I) \qquad (1)$$

Where: E_1 : Income elasticity of food
Δd : Increment of demand for food
d : Amount of demand for food
ΔI : Increment of Income
I : Income

Substituting $(\Delta I/I)$ with g, or the growth rate of economy, we can derive the following equation.

$$\Delta d/d = E_1 \times g \qquad (2)$$

Accordingly, $\overline{D}$ can be obtained by equation (3).

$$\overline{D} = (1 + E_1 \times g)(1 + p) - 1 \doteqdot E_1 \times g + p \qquad (3)$$

Where p indicates the growth rate of population.

2) In 1977, the production and distribution at BAI centers in Region VII is as follows:

	Unit	Target	Realized	Realized (%)
A. Production				
1. Seeds				
a. Ipil-ipil	kgs	100	120	120.0%
b. Style	kgs	4,000	3,100	77.5%
Total		4,100	3,220	78.5%
2. Seedlings				
a. Ipil-ipil	kgs	50,000	60,000	120.0%
B. Distribution				
1. Seeds				
a. Ipil-ipil	kgs	50	95.5	191.0%
b. Style	kgs	2,950	2,600	88.1%
2. Seedlings				
a. Ipil-ipil	No.	10,000	7,500	75.0%

Source: "Annual Report for CY 1978, Region VII", BAI

APPENDIX

Regional Integrated Agricultural Thrust by Province
CY–1979

Scale	PROVINCES			
	Bohol	Cebu	Negros Oriental	Siquijor
High	rice cassava cattle nutrition	multiple cropping base corn fruit poultry, coconut nutrition goats, vegetables	coconut vegetables cattle nutrition corn	coconut root crops corn nutrition
Medium	corn coconut goats fiber	cattle carabao grapes rice sugar cane	swine poultry multiple cropping base sugar cane carabao sorghum	rice fruits cattle
Low	poultry swine vegetables feedgrains fruits (mango, pineapple, banana)	tobacco fibers dairy root crops	fiber root crops goats mango and bananas	multiple cropping

Revised after the 3rd Management Conference

Appendix 8–2 (1)

Crop Yield Index -- 1971 for Bohol

	① Yield of Bohol	② Yield of Nation	③ Comparative Productivity ①/②	④ Area	⑤ Comparative Productivity ③ x ④
Irrigated	0.9	1.8	0.50	20,163	10,082
Rainfed Rice	1.2	1.2	1.00	30,165	30,165
Upland Rice	1.0	0.9	1.11	978	1,086
Sugarcane	37.9	29.8	1.27	262	333
Coconut	27	27	1.00	2,486	2,486
Corn	0.7	0.8	0.88	2,663	2,343
Fruit Trees	3.7	3.8	0.97	9,302	9,023
Root Crops	2.1	2.6	0.81	13,040	10,562
Total Bohol				79,059	66,080

C.Y.I = ⑤/④ x 100 = 84%
Source: Bohol 1971 Census on Agriculture, NCSO, 1974

Appendix 8–2 (2)

Crop Yield Index – 1971 for BIAD I

	① Yield of Bohol	② Yield of Nation	③ Comparative Productivity ①/②	④ Area	⑤ Comparative Productivity ③ x ④
Irrigated Rice	0.5	1.8	0.28	1,550	434
Rainfed Rice	1.0	1.2	0.83	4,410	3,660
Upland Rice	0.2	0.9	0.22	122	27
Sugarcane	37.9	29.8	1.27	9	11
Coconut	27	27	1.00	479	479
Corn	0.7	0.8	0.88	6,370	5,605
Fruit Trees	3.7	3.8	0.97	902	874
Root Crops	2.1	2.6	0.81	1,935	1,567
Total BIAD I				15,777	12,657

C.Y.I. = Total ⑤/Total ④ x 100 = 80%

(Continued)

Appendix 8-2 (3)

Crop Yield Index – 1971 for BIAD II

	① Yield of Biad II	② Yield of Nation	③ Comparative Productivity ①/②	④ Area	⑤ Comparative Productivity ③ x ④
Irrigated Rice	0.7	1.8	0.38	2,556	971
Rainfed Rice	1.1	1.2	0.92	7,446	6,850
Upland Rice	2.7	0.9	3.00	162	486
Sugarcane	18.5	29.8	0.62	90	56
Coconut	28	27	1.04	614	639
Corn	0.7	0.8	0.88	7,266	6,394
Fruit Trees	2.2	3.8	0.58	2,210	1,282
Root Crops	1.6	2.6	0.62	3,166	1,963
Total BIAD II				23,470	18,641

C.Y.I. = ⑤/④ x 100 = 79%

Appendix 8-2 (4)

Crop Yield Index – 1971 for BIAD III

	① Yield of Biad III	② Yield of Nation	③ Comparative Productivity ①/②	④ Area	⑤ Comparative Productivity ③ x ④
Irrigated Rice	0.8	1.8	0.44	3,161	1,391
Rainfed Rice	1.2	1.2	1.00	9,645	9,645
Upland Rice	0.8	0.9	0.89	433	385
Sugarcane	59.2	29.8	1.99	46	92
Coconut	21	27	0.78	499	389
Corn	0.7	0.8	0.88	2,006	1,765
Fruit Trees	3.1	3.8	0.82	2,158	1,770
Root Crops	2.9	2.6	1.12	3,299	3,695
Total BIAD III				21,247	19,132

C.Y.I. = ⑤/④ x 100 = 90%

(Continued)