

vehicles due to lack of roads. People living in the interior areas have either to hike or to go on horseback.

External traffic between the island of Marinduque and other islands is either by sea or airplanes. There are six ports in the province, the most important being two national ports located in Balanacan, Mogpog and in Buyabad, Sta. Cruz. The other ports are two municipal ports and two private ports. There is a daily ferry boat service between Balanacan and Lucena which is run by a private company. The national port of Buyabad has an average of 70 ship calls per month. The annual volume of cargo is 25,660 tons while embarked passenger traffic is recorded at 76,800. The existing port facilities are not adequate to meet the increasing demand of cargo and passenger traffic.

There are two airports in Marinduque, a public airport at Gasan and private airport at Sta. Cruz. The Philippine Airlines has a daily flight to Manila and additional three flights per week. (refer to Appendix G-2.)

3.6.4. Social Infrastructure

a) Health/Medical Facilities

There are two public hospitals, eight rural health units, and 41 Barangay health stations with a total bed capacity of 125 in Marinduque. Every municipality has at least one rural health unit and four Barangay health stations. The medical services of these public health institutions are maintained by 31 medical doctor, nine dentists, 45 professional nurses, 43 midwives, 11 rural sanitary inspectors, four medical technologists and 110 other staff. The medical doctor rate per 1,000 population is the highest in Boac, which is 0.48 and the lowest in Buenavista, Gasan, Mogpog, Torrijos, between 0.03 and 0.07.

The medical facilities, medical equipment, and medical supplies in these health facilities are all insufficient. Infant mortality rate in the province stood at 21 per 1,000 live births. As of 1988 pneumonia ranks first among the ten leading causes of mortality. As to morbidity, diarrhea ranks first, due to poor quality of drinking water. The existing healthy manpower to population ratio is within the standard level set by DOH. However, the health facilities are noticeably concentrated in the town centers and are inaccessible to the rural people, particularly during the wet season. (refer to Appendix I-2-4)

b) Education

The formal education system consists of elementary, secondary, and tertiary levels. Elementary education is being provided in 19 school districts constituting 110 complete elementary, 41 complete primary and 15 incomplete primary schools. The total number of classrooms, enrollment and teaching personnel are recorded at 958, 34,161 and 1,211, respectively, with a classroom-pupil ratio and a teacher-pupil ratio of 1:36 and 1:28, respectively. There are 41 secondary schools in total, of which 30 are public schools and 11 are privately owned. The total enrollment in high schools is 13,226. With 454 teachers, the teacher-pupil ratio is 1:29. The education facilities are inadequate and concentrated in the town centers making them inaccessible to pupils and students coming from remote Barangays particularly during the rainy season.

The majority of the school buildings are damaged by typhoon. Likewise, school furniture, tools and equipment and school supplies are insufficient. And a significant percentage of students are dropping out of school due to poverty, the need for family labor and the poor conditions of school facilities. So the administration is making efforts to rehabilitate and replace schoolhouses and increase the number of school teachers and buildings. But progress is slow because of insufficient funds and uncertainty of budget allocation.

As for higher educational institutions, there are two public colleges and two private colleges. The two public colleges are Marinduque Institute of Science and Technology and the Marinduque Community College. The two private colleges are Sta. Cruz Institute and Immaculate Conception College.

c) Housing

There are 33,184 dwelling units in Marinduque, of which 32,168 are occupied. The occupancy rate is 96.9%. Compared with other provinces, Marinduque is ranked second lowest as compared with number of dwelling units. Almost all houses are built by wood and bamboo. They are frequently damaged by typhoons.

d) Communication

The province has postal, telephone and telegraph services and radio communication. The usual form of communication is the postal service. Each municipality has a postal station. There is no public telephone service in Marinduque, but there are commercial telephone services in Boac and Mogpog. Long distance calls to and from outside the province are available only at the municipality hall of Boac and a public telephone operated by the private company PILTEL. There are no telephone lines between each municipality.

On the other hand, telegraph is being served by the Bureau of Telecommunication (BUTEL), a governmental agency and a private company in Boac and Sta. Cruz, respectively. The radio communication is transmitted by BUTEL, through its network in Boac to Buenavista, Torrijos, Sta. Cruz and Lucena city. (refer to Appendix I-2-4.)

e) Welfare

Welfare in Marinduque is classified into four areas; Family and Community welfare, Child and youth welfare, Women's welfare, and Disabled person's welfare.

The family and community welfare program can be summarized as follows;

- i) Livelihood assistance for family and other adult in need.
- ii) Practical skills development.
- iii) Family planning motivation.
- iv) Self-employment assistance.

The program on child and youth welfare is as follows:

- i) Practical skills development, non-formal education.
- ii) Supplemental feeding.
- iii) Pre-marital counselling.
- iv) Family planning and sex education.

The women's welfare program is:

- i) Livelihood development.
- ii) Leadership training for women.
- iii) Day care service.

The disabled persons' welfare program is presented as follows;

- i) Rehabilitation of their physical and mental health.
- ii) Job placement suited for them.

Based on these programs, provincial social welfare offices are working on a plan to remedy problems of poverty, especially child malnutrition, but their work is limited because of the insufficient funds.

3.7. Aquaculture

3.7.1. Background

a) Role of Fish as Food

Fish forms the major part of the Filipino diet for people of all income classes throughout the country. Fish products provide over 50% of the animal protein for the population. Fish is by far the largest single source of animal protein. Per capita consumption of fish and other animal protein in the Filipino food ranges between 26% and 41% of the total. The national average was recorded at 31% in 1982. Fresh fish is generally preferred in the Philippines, though salted, dried and smoked fish are widely consumed, particularly in the rural areas inland.

The food supply from the fisheries sector was at its peak in 1983 with a total production of 2.1 million MT after that the production is not increase. In 1981, the total domestic production of fish products increased significantly and as a result, per capita supply increased by almost 15%. The supply of fish production from the sea has grown at a slower rate than other fishery products. The share of aquaculture production in fish supplies grew from 6.8% in 1975 to 21% in 1985. Post harvest loss of fish products from the sea is estimated to be about 20% due to lack of ice and cold storage facilities and inadequate handling. (refer to Appendix H-1)

b) Aquaculture

Recently, the quantity of marine products in the Philippines has declined considerably due primarily to the rising costs of fishing equipment and over-exploitation of traditional fishing grounds. As a consequence, production from the sea is unlikely to meet the future demand for fish. On account of the under-supply of

fish resources, the potential for increasing the catch through the introduction of more efficient fishing technology is restricted.

On the other hand, the Philippines has a long tradition of brackish water aquaculture. Only in recent years emphasis has been given to the development of brackish water aquaculture together with the introduction of high intensive technology. The country has some 210,320 ha for fish and shrimp culture, of which the greater part is brackish water fish ponds. Also there are at least 240,000 ha of undeveloped swampland suitable for brackish-water fish and/or shrimp culture and 115,000 ha for fresh water swamplands.

The importance of aquaculture has to be seen from the viewpoints of source of animal protein - food for people, foreign currency earnings from export of fish, shrimps and related products, and increasing employment opportunities and supporting the population outside the major urban areas, etc.

c) Aquaculture Technology

1) Shrimp Culture

The technology used in the Philippines is chiefly of the extensive method. However, since the beginning of the 1980s, black tiger shrimp (*penaeus monodon*) by intensive culture technology, developed in Taiwan, has been introduced to several large enterprises in the Philippines. Since the mid 1980's, the shrimp pond has been harvesting an average of 2 to 4 tons per harvest per ha for a total of 6 to 12 ton annually, with an intensity of three crops per year. This is much higher than the 370 to 700 kg achieved through traditional methods. These highly intensive technologies were provided by the College of Fisheries, University of the Philippines, the fisheries institution of BFAR and SEAFDEC, etc. The technology developed by these institutions has reached a high level by international standards.

2) Bangus Culture (Milkfish)

In the Asian/Pacific region, the leading Bangus producers are the Philippines and Indonesia. In the Philippines, production rose sharply from about 107,000 MT in 1975 to about 173,000 MT in 1980. Bangus production is usually 700 to 1,000 kg/ha with the traditional methods. A 2,000 kg/ha yield, using improved technology, is a good harvest for fish ponds. Moreover, through application of fish pen (cage culture) and intensive aquaculture method with feeding, a harvest of from 5,000 to 10,000 kg/ha can be expected.

3.7.2. Fish Culture in Marinduque

a) Present Situation

The fish cultures are generally located in the swamp and mangrove area with a total estimated area of about 6,000 to 7,000 ha distributed in the north western and north eastern parts of the Island, extending to the east coast of Torrijos. Of these areas, about 1,500 to 2,000 ha of mangrove and/or swamp areas in total could be developed as fish and/or shrimp culture ponds by preserving the natural environment which play an important role in the reproduction of various aquatic animals such as Bangus, shrimp, Lapu-Lapu (*Groupe-E. Hata-H. Epinephelus s.p.p.*) and other species. Fish and/or shrimp culture ponds in Marinduque has recorded a rapid rate of growth for the past ten years.

Existing Bangus and shrimp culture ponds (700 ha) are allocated to 55 operators with 6 to 15 ha each. About 84% of brackishwater ponds were used for Bangus culture with average production ranging from 800 to 1,000 kg/ha, and the estimated total production reached 507 tons per year. The remaining 16%, about 99 ha, is used for Black tiger shrimp culture with an average production of 1.1 ton/ha per year which is about 440 kg/ha/harvest with 2.5 crops per year. This figure is considerably lower than the figures in other

provinces of the Region-IV. There are shrimp hatchery facilities in Marinduque and shortages of supply from wild sources is due to the lack of technology for catching wild fry. The PLSs are bought at the commercial shrimp hatchery plant in the other province at price ranging from 450 to 500 pesos per 1,000 PLS. This is very expensive for shrimp farming for commercial purposes. The price should be less than 150 pesos per 1,000 PLS. The wild mother shrimp can be caught in the coastal mangrove areas.

(refer to Figure 3.7.1 and Appendix H-2-1)

b) Present Fish Culture Technology

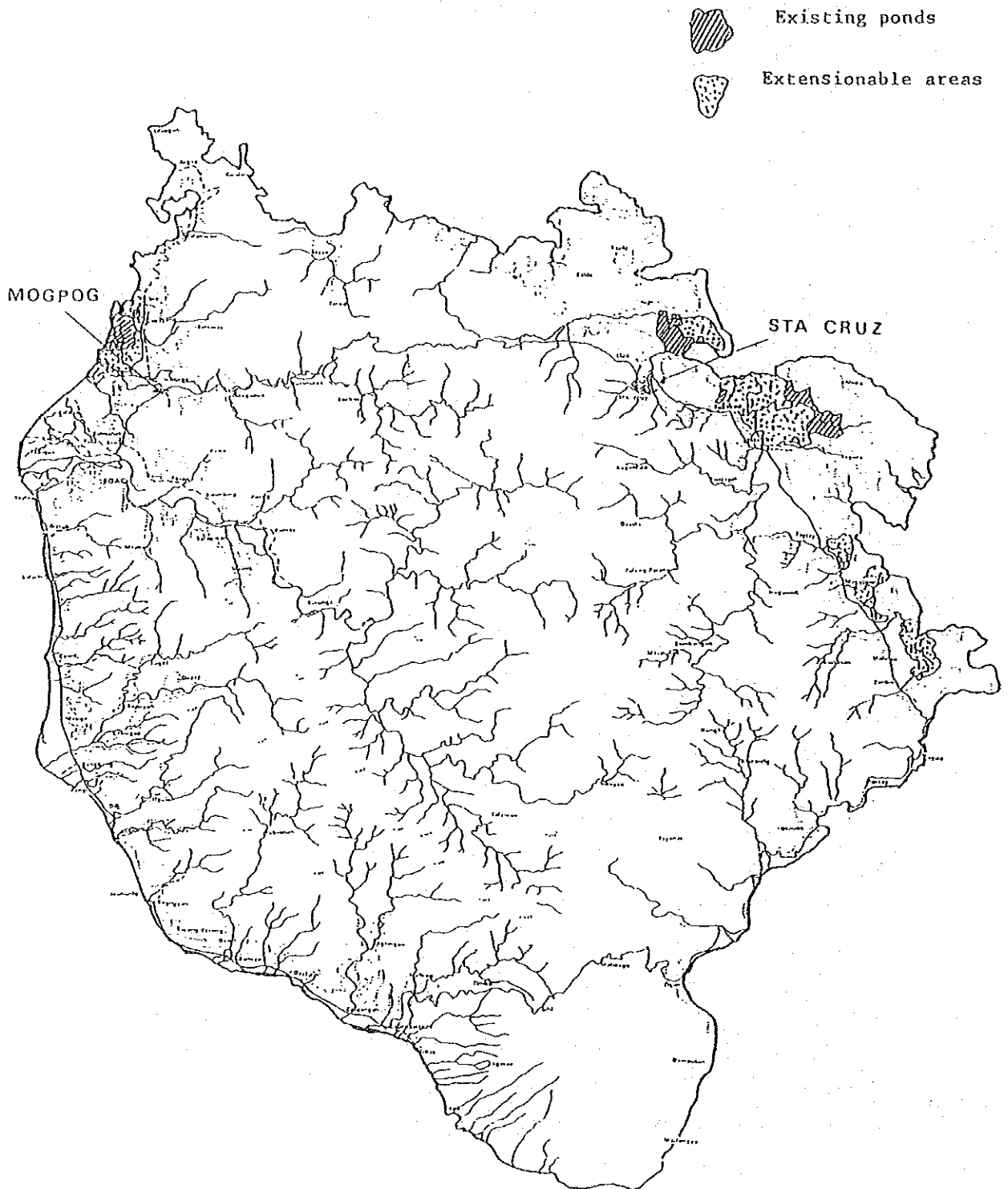
Technology for Bangus culture used in Marinduque is, in general, the extensive method, which has been traditionally used for many years without any feeding. Production under this method ranges between 800 and 1,100 kg/ha only. Infrastructure is roughy and carelessly constructed without provisions against heavy rainfall and typhoons, and also without protection against digging of banks by mud crabs, which results in the escape of both fries and fish.

c) Brackishwater Fish Culture Demonstration Farm (BFCDF)

The Brackishwater Fish Culture Demonstration Farm in DA Region-IV exists in Sta. Cruz. The Farm has 4.7 ha of fishpond with another five ha for expansion of buildings, offices, a laboratory and dormitory and seminar hall for training local technicians in future. However, due to lack of finances for the operation and improvement of the facilities (including laboratory equipment), the expansion has not achieved its purpose. Three biologists are working as staff of the farm. However, their equipment is limited to a thermometer, a PH meter and a saline meter. The training course for local technicians has not yet started. The banks of the ponds are not constructed properly, and therefore, it is difficult to transport materials for fish and shrimp culture along the pond. Also many parts of the bank have collapsed in a recent typhoon that

hit the Island. The last experiment made on the shrimp culture resulted in an increase of production which reached 1.2 MT/ha/crop for 120 days. This production level is still lower than the production in other provinces with highly intensive technology. The mortality rate in this experiment is only 10%.

Figure 3.7.1 Location Map of Existing and Potential Fish Ponds



3.8. Forestry

As of 1988, the total forest land which belongs to the government is approximately 21,600 ha, of which 18,700 ha are upland forest and 2,900 ha are swamp forest. The major forest products in Marinduque are Arangan, Apitong, Dungon-lake, Bacauan, Red lawaan, Palosapis and so forth.

There are three reforestation projects being conducted by DENR. The Marinduque reforestation project, which started in 1937 covers an area of 4,885 ha with six nurseries in three municipalities of Torrijos, Sta. Cruz and Buenavista. The area planted under these projects is 3,681 ha as of 1988. The Gasan reforestation project which started in 1980 covers an area of 2,055 ha in the Gasan municipality. Three nurseries were established and 364 ha were planted by 1988. The integrated social forestry (ISF) projects which are composed of five sub-projects at different locations have developed an area of 450 ha with a total of 418 participants.

The province of Marinduque, however, has no existing watershed projects to prevent the forest from deforestation. Therefore it seems that the area for forest protection should be identified in order to set up rehabilitation projects for watershed treatment purposes and keeping ecological balance as well.

3.9. Inquiry Survey

An inquiry survey was carried out in the Study Area in order to grasp the felt needs of the inhabitants. There are 218 Barangays in the province of Marinduque, 50 Barangays of which were selected at random for the survey. The Barangays located in the poblacion were excluded because of the more progressive nature of the area. The inquiry survey consists of 20 items related to the farmers' activities such as conditions of daily life, housing, rural water supply, rural electrification, daily goods, farming tools, transportation system, farm roads, farmland, agricultural facilities, public facilities, agricultural production, education system, health and welfare, communication, employment opportunity, farming systems, aquaculture and needs of the inhabitants.

The questions consist of three parts. The first question makes the priority for development and/or implementation or problem clear. The second question presents the degree of importance or non-importance of the items in the development plans mentioned. The third question is aimed at obtaining data to indicate the number of years that people hope for a certain project or items to be realized or be implemented.

The inhabitants' priority is the development of a water supply system followed by rural electrification, roads, and general upgrading of the standard of living. The problem on farming tools for agricultural production still exists as it is considered the sixth priority by the respondents. The provision of employment opportunities, social welfare and social infrastructure were also considered necessary.

For the development of water supply, considered as the first priority among 20 items, the construction of household faucets is strongly desired, while the improvement of water quality and an increase in the amount of water to be supplied were considered

second and third priorities, respectively. The main problem concerning improvement of water quality is desalinization where the wells are near to the sea coast. Regarding rural electrification development, Barangays without energy strongly desire electricity. The second desire is the reduction of the minimum electricity charge (at present 10 kwh or 25 pesos). For farm-to-market road development as the third priority, pavement of farm-to-market roads is requested.

On items of agricultural production, an increase of farm production and up-grading the quality of farm products were considered. Since the inhabitants cannot horizontally expand their farm area in order to increase farm incomes due to geographical constraints, it seems that they must follow intensive farming techniques on the limited farmland.

An analysis was also carried out based on three density groups, i.e. high density group (more than 600 persons/sq.km), middle density group (200 to 600 person/sq.km) and low density group (less than 200 persons/sq.km). Needs and priorities among groups are not very different, that is, three groups show almost the same trends regarding their needs. The major findings are as follows.

- (1) The improvement and rehabilitation of social infrastructure for the inhabitants gets the first priority followed by agricultural development.
- (2) The inhabitants strongly desire to improve the water supply system, followed by rural electrification, road system and transportation system. They need individual installation of faucets in each house.
- (3) The inhabitants in the low density group want to improve farmland and roads. The farmers want to construct farm roads to their fields. The inhabitants want to have roads paved to make them all-weather road.
- (4) The inhabitants in the high density area have desires to increase agricultural production to improve their living standards. They wish to earn more income from high quality farm products.
- (5) Creation of employment opportunities has a higher priority in the high density group.

CHAPTER 4 . INTEGRATED AGRICULTURAL DEVELOPMENT FRAMEWORK

CHAPTER 4. INTEGRATED AGRICULTURAL DEVELOPMENT FRAMEWORK

4.1. Agricultural Development Targets

4.1.1. National Economic Development Targets

As clearly mentioned in the Medium-Term Philippine Development Plan (covering 1987 - 1992), the national development goals are: (a) alleviation of poverty; (b) generation of more productive employment; (c) promotion of equity and social justice; and (d) the attainment of sustainable economic growth. In order to achieve the goals, the Philippine economy is projected to grow at the rate of more than 6% (6.5 to 6.8%) in terms of real GNP. Growth rate of per capita GNP is projected to be about 4% (4.4% in the original MTPDP and 4.1% in updated MTPDP) in relation to the estimated population growth rate of 2.3% per annum.

To conform with the national development goals, the agriculture sector has been given the highest priority in the MTPDP, with the annual sectoral growth target to be achieved by 1992 at 5.5%. The objectives of MTPDP in the agricultural sector are to: (i) enhance small farmers' income; (ii) increase productivity; (iii) distribute the requirements of production equitably; (iv) sustain food sufficiency for improved nutritional well-being; (v) increase agro-based employment opportunities among the rural population; (vi) improve the delivery system for agricultural products, farm inputs and services; and (vii) strengthen farmers' organizations.

In the formulation of the integrated agricultural development plan for Marinduque, due attention should be paid particularly to the agriculture sector, so that the objectives of MTPDP, could be well reflected in the proposed plan.

4.1.2. Targets in Regional Development

In the Medium-Term Southern Tagalog Regional Development Plan (1987 - 1992), emphasis was put on: (i) harmony in the rapid regional economic growth and equal distribution of growth, (ii) the attainment of self-sustaining regional economic structure, and (iii) reinforcement in achieving balanced intra-regional structure through a continuation of integrated rural/agricultural development. Based on these basic principles, the regional economy is expected to grow at an annual rate of 6.74% on average, which corresponds to an annual increase in per capita GRDP of roughly 3.62%. (refer to Chapter 2)

In the agriculture sector, development efforts are directed towards laying the foundation for equitable, efficient and ecologically sustainable growth. Development in the agricultural sector is designed to seek to increase the number of rural families above the poverty line by 20% by the end of 1992. The plan therefore seeks to improve and diversify agriculture and food production to meet nutritional requirements; attain self-sufficiency; ensure food security; market surplus from production; effect an equitable distribution of the factors of production; increase the agro-based employment opportunities among the rural population and institutionalize farmers' participation in agricultural development through cooperatives and other community-based organizations.

Due attention will be paid to the development goals and targets as set out in the Region IV Development Plan for the formulation of the Master Plan in Marinduque.

4.1.3. Targets in Master Plan

In line with the objectives and targets of the national as well as regional development plans, the targets of the plan are as follows:

a) Target Year

Implementation period of the proposed master plan will be for 20 years, from 1990 to 2010. The implementation period of 20 years will be divided into three stages, i.e. short-term (5 years), medium-term (10 years) and long-term (20 years) period. The year 1995 will be the target year for the short-term development, 2000 for the medium-term development and 2010 for the long-term development.

b) Attainment of Food Self-sufficiency

As a result of the analyses of the present situation in Marinduque, the primary goal will be the attainment of self-sufficiency in food through intensification of rice and vegetable cultivation. Achieving this target will inevitably lead to higher income levels for the people residing in the Study Area.

c) Population and Number of Farm Households

In the target year, the estimated total population and the number of households will reach 305,500 and 56,700, respectively, based on the annual population growth rate of 1.9%. The number of farm households will be 28,800, with an agricultural labor force of 47,400.

d) Target of Land Reform

After the land reform work in Phase I is completed, Phase II and Phase III programs should be carried out according to schedule. The programs under Phases I, II, and III are as follows:

Phase I (1988 - 1992)

- Land reform of paddy and corn according to Presidential Decree No. 27

- Land reform of idle and abandoned land
- Private land voluntarily offered
- Land foreclosed by Government financial institutions

Phase II (1988 - 1992)

- Land reform of alienable and disposable agricultural land
- Public agricultural land to be opened
- Land reform of all private agricultural holdings in excess of 50 ha insofar as the excess is concerned

Phase III (1992 - 1998)

- Land reform of private land from 24 to 50 ha
- Land reform of private land from 5 to 24 ha

e) Target for Employment Generation

Generation of employment opportunities is one of the most important objectives in development planning. The labor force in Marinduque is projected to increase from 76,000 in 1987 to approximately 90,000 in 1995, 117,000 in 2000, and 141,000 in 2010. The number of employees in 1995 is estimated to be 80,000 on the assumption that the unemployment rate will decrease to 12.5%. Likewise, the employees in 2000 will be 117,000 with an unemployment rate of 10%, and the employees in 2010 will be 135,000 with the unemployment rate of 4%. The number of employees will increase by 23% in 1995, 80% in 2000, and 208% in 2010 compared to the 1987 figures. (refer to Table 4.1.1.)

f) Target of Economic Growth

In order to achieve the objectives as mentioned above, the family income level of 18,330 pesos in Marinduque, which is the second lowest in Region IV, will be targeted to increase to 21,875 pesos in 1995 (which is the average income level of rural families in the Philippines), 29,985 pesos in 2000, which is the level of Region IV, and 46,137 pesos in 2010 in terms of 1985 price levels. In order to achieve the target, real growth rate shall be set at 6.5% per annum during 1995 and 2010. Assuming a population growth rate of 1.9% per annum, gross income in Marinduque is targeted to increase at a rate of 8.4% per annum.

Table 4.1.1 Forecast of Employment

Year	Working Age (15 years and over)	Economically Active (Labor Force)			Economically Inactive
		Total	Employed	Unemployed	
1975	89,504	49,227	41,736	7,491	40,277
1980	96,304	55,856	45,654	10,202	40,448
1987	123,000	76,000	65,000	11,000	47,000
1995	145,141	89,987	79,936	10,051	55,154
2000	179,712	116,813	107,814	8,999	62,899
2010	216,930	141,005	135,365	5,640	75,925

Source: 1. Integrated Survey of Households, NCSO, Oct., 1988.
 2. 1980 Census of Population and Housing, Marinduque.
 3. Estimate of the Study Team.

4.2. Area Development Plan

In cooperation with the proposed land use plan as a vertical plan, the suitable and optimum development plans which will maximize benefits under the minimum investment would be formulated. Taking account of present land use, the present farming level, water resources, soil and land capability conditions etc., the following area development plan is proposed. The area development plan is one of the horizontal development plans. The Study Area is divided into the following three districts based on the above conditions.

- (1) Northern District (Mainly northern part of Boac, Moggog, Sta. Cruz and northern part of Torrijos)
 - Present condition There are wider lowlying areas, enough amount of water resources, high population density and ports for import and export of farm inputs and outputs.
 - Development plan Major agricultural crops are palay and vegetables, the core of propagation of new and improved farming techniques in Marinduque. The swampy areas should be developed for aquaculture. Not only irrigation but also flood control, rural water supply, hydropower generation and inland fishery should be considered for the development of the district.

- (2) Southern District (Mainly southern parts of Torrijos and Buenavista)
 - Present condition There are big cogon grasslands in the hilly areas. The poor water resources and soil erosion are found. Semi-cold and high land is observed at the foot of Mt. Malindig.

- Development plan The main farming practices are animal husbandry and vegetable cultivation. The cogon land would be converted to pastures. Where the area has irrigation water resources and suitable soils, the group farming of diversified crops would be promoted. Facilities for artificial insemination and an animal clinic, and a pilot or model farm of grassland development would be introduced on the semi-cold and high land. For the cottage industry of wood carving, forest resources would be considered.

(3) Western District (Mainly Gasan, southern part of Boac and northern part of Buenavista)

- Present condition Many small river basins present discharge through the year. Coconut plantations on the flat land are seen along the coastline.
- Development plan The major crops are rice under irrigation facilities and vegetables grown in the coconut plantation as intensive land use. In some area which could reserve irrigation water, a double cropping system is proposed.

4.3. Proposed Land Use

4.3.1. Land Use Plan

In Marinduque Island, mountains and hilly land occupy most of the land area. Very little water resources are available and only minimum social infrastructure such as a road network, etc., have so critically limited the agricultural development in the area that intensive farming techniques should be applied as the most effective method in the limited potential land. In other respects, an ecologically proper and effective land use plan should be formulated for long-term planning. The proposed overall land use plan for Marinduque has been worked out in consideration of the prevailing soil and water resources conditions, as well as socio-economic conditions in the area together with those municipal development plans which have already been formulated.

The long-term agricultural development plan for the province aims at the development of the hilly land as well as the low-lying land. (refer to Figure 4.3.1 and Table 4.3.1)

a) Low-lying Cultivation Land (Slope of less than 8%)

At present, most of the low-lying cultivated land is cropped, and there is little room to develop new cultivation land therein. As a consequence, so-called vertical development is essentially required; in other words, stress shall be given to the possibly intensive land use by carrying out various improvement in farming works.

Flatland with a slope of less than 3% shall be used as irrigated and rainfed fields. The irrigated fields will be double cropped with paddy or two crops a year with paddy and vegetables. Introduction of Azola to the fields will be effective for raising the soil fertility. The rainfed fields will be cropped with mungbeans, groundnuts, and other wet field vegetables in addition to

paddy. Under the coconut trees of the coconut plantation, which are abundant in the area, vegetables, corn, and other crops can be grown in rotation.

The gently sloped land, with slope of 3 to 8% is mostly occupied with coconut plantations with some room for growing corn and other crops in the vicinity. Under these conditions, vegetables, corn, and pulses will be cropped under the existing coconut trees in rotation. In the rotational cropping system, organic matter will be applied in addition to pulses cropping.

b) Hilly Land (Slope 8 to 15%)

The hilly land is presently occupied with coconut plantations and cogon grassland. On the hilly land, there are land areas which can be horizontally developed; in other words, areas with development potential for farmland expansion. These land areas will be selected as coconut-based farmland with perennial crops and other cash crops. And, for sheltered land from wind, under-tree cropping will be practised with tree crops of calamansi, banana, pineapple, and vegetables, upland rice, root crops, etc. Coconut currently has a very low yield, and it is therefore necessary to practice seedling planting. In windy fields, silage/fodder cropping shall be practised to introduce animal husbandry.

c) Sloping Land (Slope 15 to 18%)

The development plan for sloping land farming shall be worked out in concert with the long-term planning. Development in the past highlighted lowland farming, whereas future development of the area will place importance on hilly land farming as well, diversified farming will be carried out in these hilly areas with the established soils and water conservation systems. Under the circumstances, the provincial office of DA will give positive guidance to encourage farming with tree crops of ipil-ipil, calamansi, rotational farming with ipil-ipil and vegetables/corn/

pulses, and furthermore, introduce animal husbandry with silage fodder crops grown under the tree crops for soil erosion control. For successful development, experiment/demonstration farms shall be provided so as to carry out adaptability/market ability tests of the related crops to the plan.

d) Forest Land (Slope over 18%)

The existing mountain forest land will be left intact, and reforestation shall be carried out to prevent ecological and environmental degradation.

e) Marsh Land

The tidal marsh land shall be left intact as reserved forests of mangrove and nipa, which can play an important role in securing fish habitats and tidal protection forest. A small-scale felling of these trees for firewoods or thatching is permitted, although felling is commonly prohibited. Some parts of the tidal marsh along the inlets of Mogpog, Sta. Cruz, Matuyatuya could be developed into aquaculture development areas.

4.3.2. Soil Conservation

In principle, countermeasures to be taken against soil erosion are to reduce the velocity of the surface runoff water as much as possible, to increase percolation capacity of soils as much as possible, and to cover soil surface with vegetation so as to reduce the shock of raindrops on the ground surface.

In addition to afforestation of the existing bare land, the following practical measures for soil conservation will be considered. Vegetation coverage, nepier grass, vitiver, ipil-ipil, pueraria etc. shall be planted to cover soil surface for prevention

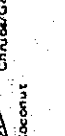
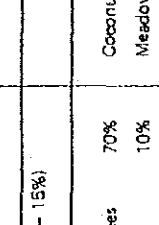
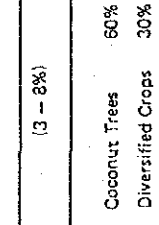
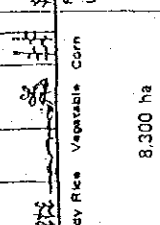
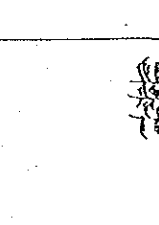

of erosion. In addition, the rotational cropping of the aforesaid plants can ensure the soil percolation capacity by improving soil texture. And the heavy surface runoff discharge after rainfall can be prevented by providing green belts with ipil-ipil, vitiver, etc. planted along the contour line at intervals of three to five meters together with stripe cultivation and storage ponds.

Table 4.3.1 Present and Proposed Land Use

Land Use Category	Present		Proposed			
	ha	%	Medium-Range		Long-Range	
	ha	%	ha	%	ha	%
1. Agricultural Area						
Paddy	5,400	6.7	5,580	6.9	5,650	7.0
Diversified crops	4,020	5.0	4,200	5.2	4,300	5.3
Coconut	32,470	40.3	31,000	38.5	29,550	36.7
Meadows, others	2,810	3.5	3,320	4.1	4,000	5.0
Fruit, Industrial	-	-	1,100	1.4	2,100	2.6
<u>Sub-Total</u>	<u>44,700</u>	<u>55.5</u>	<u>45,200</u>	<u>56.1</u>	<u>45,600</u>	<u>56.6</u>
2. Forest Area						
Shrub/Grasses	24,370	30.3	15,800	19.6	7,300	9.1
Forest	5,530	6.9	13,500	16.8	21,500	26.7
<u>Sub-Total</u>	<u>29,900</u>	<u>37.2</u>	<u>29,300</u>	<u>36.4</u>	<u>28,800</u>	<u>35.8</u>
3. Wetland Area						
Mangrove/Nipa	3,540	4.4	3,130	3.9	2,730	3.4
Fishponds	700	0.9	1,100	1.4	1,500	1.9
Minespit site	670	0.8	670	0.8	670	0.8
<u>Sub-Total</u>	<u>4,910</u>	<u>6.1</u>	<u>4,900</u>	<u>6.1</u>	<u>4,900</u>	<u>6.1</u>
4. Others						
River, road built-up area, etc.	<u>990</u>	<u>1.2</u>	<u>1,100</u>	<u>1.4</u>	<u>1,200</u>	<u>1.5</u>
<u>Total</u>	<u>80,500</u>	<u>100.0</u>	<u>80,500</u>	<u>100.0</u>	<u>80,500</u>	<u>100.0</u>

Notes:	Paddy rice	ha	ha	ha
	Irrigated	900	2,260	2,670
	Rainfed	4,500	3,320	2,980
	Intercrop in coconut plantation	-	310	1,240
	Upland rice	3,500	3,500	3,500

Figure 4.3.1 Proposed Land Use Pattern

	TIDAL SWAMP AREA	RICE & VEGE.-BASED FARMING AREA	VEGE. & CORN-BASED FARMING AREA	COCONUT-AREA	AGRO-FOREST AREA	FOREST-AREA
						
Area (Gross)	4,700 ha 5.8%	8,300 ha 10.3%	7,200 ha 9.0%	12,500 ha 15.5%	17,500 ha 21.9%	30,200 ha 37.5%
Predominant Slope	(0%)	(0 - 3%)	(3 - 8%)	(8 - 15%)	(15 - 18%)	(18% <)
Proposed Land Use	Mangroves/Nipa Fishponds Coconut Trees	Paddy Rice Coconut Trees Diversified Crops	Coconut Trees Diversified Crops Paddy Rice	Coconut Trees Fruit Trees Diversified Crops Meadow Grass	Coconut Trees Meadow Grass Shrubs/Grass Foreste Fruit Trees	Foreste Shrubs/Grasses Coconut Trees
Major Soils	Hydrozol Beach Sand	San Manuel Sand Loam Mogpog Clay Loam Mogpog Silt Loam Gasan Loamy Sand etc.	Maranig Clay Banto Clay Loam Banhigan Clay Loam Tagum Clay Loam Beac Clay Loam etc.	Maranig Clay Banto Clay Loam Banhigan Clay Loam Faraon Clay Lacastellana Clay Loam	Maranig Clay Banto Clay Loam Banhigan Clay Loam Balanscan Clay etc.	Maranig Clay Banto Clay Loam Banhigan Clay Loam Timb Clay Loam
Major Present Land Use	Mangroves/Nipa Fishpond Coconut Trees	Paddy Rice Coconut Trees Upland Crops	Coconut Trees Upland Crops Paddy or Upland Rice	Coconut Trees Shrubs/Cogon Grass	Coconut Trees Shrubs/Cogon Grass	Forest Shrubs/Cogon Grass
Remarks	Reserved Tidal Forests more than 50 m wide along the Coast			Soil Conservation Measures	Soil Conservation Measures	Reforestation

4.4. Water Resources Development Plan

In the integrated agricultural development plan, the water resource development plan is one of the basic elements. The available amount of water is occasionally the basic constraint to the scale of the development plan and can decide the character of the agricultural development plan.

a) Water Utilization Condition

The amount of annual average rainfall in Marinduque Island (the island area is 935 sq.km), is estimated to be 2,800 mm by the isohyetal map. Based on this rainfall, the total amount of water resources could be calculated at 2,620 MCM, of which about 10% of the resources (260 MCM) will be used for retention of groundwater. On the other hand, the evapotranspiration from the ground is estimated to be 1,100 mm per annum, so the total amount of evaporation is 1,030 MCM per year. The total amount of surface runoff discharge is calculated at 1,330 MCM with an average runoff coefficient of 51%. Surface runoff has not been utilized for the effective purposes for inhabitants. There are some CISs which could utilize a part of the surface runoff discharge of 17 MCM annually. Apart from drinking water of less than one MCM, other uses for water are not found. The water utilization rate has reached about 1.0%, with 99% pouring into the sea as an unused water source.

b) Water Resource Development Plan

The water resource development plan would be formulated with a view to economic efficiency, as far as possible. The irrigation development plans among various plans in the Master Plan will need a greater amount of water than for other plans. In the preliminary calculation, a total amount of 100 MCM consists of 75 MCM for the irrigation projects of 3,910 ha, 7 MCM for rural water supply (beneficiaries 306,000 persons) and 19 MCM for other purposes under the proposed Master Plan. Consequently, the water utilization rate will rise to 8%.

CHAPTER 5. SECTORAL DEVELOPMENT PLAN

CHAPTER 5. SECTORAL DEVELOPMENT PLAN

5.1. Agricultural Development

5.1.1. Development Method

The agricultural development plan has been formulated after taking into consideration the various bottlenecks and problems encountered in the development of the different proposals. The proposed agricultural development plan consists of the (1) agricultural production scheme and the (2) farmer's organization scheme.

For the agricultural production scheme, an intensive farming system is proposed promoting rice and vegetable crops cultivation as priority for development. Other crops are also proposed for development and improvement. Farm management systems and techniques for each crop would be developed and introduced to the farmers.

The farmer's organization scheme would entail the organization and revitalization of farmer's organizations in Marinduque. These farmer's organizations would not only promote and develop agricultural cooperatives and production, processing and marketing systems but also provide other services such as credit, operation and maintenance of facilities (irrigation/drainage, farm roads, etc.) and other services deemed necessary by the farmers themselves. Farmer leaders would be trained and developed as well as farmer members for the successful organization and management of the organizations.

Government support for extensive research and experimentation through demonstration farms would be provided specifically on cultivation of vegetables, industrial crops, fodder, and others.

Technical services on animal husbandry and agro-processing would also be provided. In order to introduce and promote crop farming and farm management techniques, water management on irrigation and/or drainage, soil and/or fertilization, farm mechanization, livestock breeding, agro-industries, post-harvest, farm economics in the Area, not only Philippine Government support but also foreign assistances would be required for quick transfer to technicians in Marinduque, if necessary. Training the technicians outside the Island will also produce a multiplier effect on technology transfer.

5.1.2. Farm Technology Development Scheme

a) Farm Technology Development

For the development of farm technology, the following crop cultivation/technology is proposed. For all crop cultivation, it is necessary to introduce improved varieties (HYV, pest-resistant and insect-resistant varieties), to develop seed production and seed storage methods, to practise deep plowing cultivation (fertilization of soil), to introduce light-intercepting characteristics (fertilizer plan and cropping management), to practise ecological pest control (total fallowing of paddy fields, etc. for ecological pest control), to introduce proper planting density (thinning practised, if necessary), to improve fertilization process and methods (green/backyard manure making, chemical fertilizer application at the proper times in adequate quantities, to introduce rational water management (water management to meet the growing stages and needs of the plants), to improve all management works (proper intertillage, weeding, and thinning), to improve farmland soil (application of organic matters etc.), and to establish the farm technology and its systematic application.

For vegetable cultivation, it is necessary to introduce high ridged vegetables cultivation (ridges for each crop), to establish

techniques for straw mulching, disbudding, training, trimming, etc., and to develop a rotational cropping system to meet local conditions.

For tree-crop and industrial crop cultivation, to introduce a raising method of nurseries, to introduce grafting (compatible with pest-resistant action and stock), and to develop trimming techniques (trimming and exposure to sunshine).

In line with the above-mentioned proposals, research work and studies would be undertaken, so that technical manuals for each crop and crop cultivation calendars would be developed. The proposed main crops to be introduced and cultivated in Marinduque are as follows:

b) Crops to be Introduced

In considering various conditions of natural environment, soils, and topography of the area, promising crops in Marinduque are pechay, mustard, cabbage, chart, onion, garlic, ginger, radish, taro, okura, tomato, eggplant, squash, cucumber, water-melon, ampalaya, bottle-gourd, sponge-gourd, snap bean, hyacinth bean, sigadillas, and winged bean. These vegetables are recommended, while abaca and bamboo as industrial crops are also recommended.

As tree crops, coffee, black pepper and cacao can be recommended for Boac, Mogpog and Sta. Cruz, while mango, cashew and atchiswito for Buenavista and Torrijos. On the other hand, guava, jack-fruit, avocado, calamansi, lemon, and orange can be recommended for the entire province.

As root and stem crops, ube, cassava, arrow-root, and sweet potato are recommendable.

As cereal and fodder crops, paddy, upland rice, corn, sorghum, soybean, mungbean, groundnut, alfalfa, cowpea, sunflower,

rosegrass, napier grass, etc. can be recommended. Other crops recommendable are pineapple, banana, and vanilla.

The crops to be introduced should be selected on the basis of those with high demand and higher profit. For vegetable cropping, those kinds cultivable by primary farming technology in the early development stages, and those requiring higher technology shall be introduced in proportion to the local farmers' techniques.

The fruit-crops shall be selected on the basis of those which have hard skin to protect the contents and to withstand long distance transport and yet are croppable by comparatively simple technology.

The export-oriented crops shall be those which can be stored for a period of time and which can withstand long distance transport.

5.1.3. Crop Production Scheme

a) Proposed Cropping Pattern

The proposed cropping pattern according to land category has been worked out taking into consideration the following points. For the flat land with slope of 3 to 8.0%, the proposed development is through increased cropping intensity. Since there is no more room for area expansion for paddy irrigated area, intensified use of Package of Technology (POT) is recommended so that the production per unit area could increase.

For rainfed areas, the cropping pattern recommended is an upland crop (vegetable or legumes), dry seed rice (DSR) - wet seed rice (WSR) - and Transplanting Rice (TPR). For upland fields, the main crop encouraged, is vegetables. However, gramineous crops like

paddy and corn, or pulses like mungbeans and groundnuts are recommended to be intercropped with vegetables, so as to retain soil fertility.

In the coconut plantations with slopes of less than 8.0%, vegetable crops are recommended. Land with more than 8.0% slope should be cropped with industrial and fruit-crops planted under the trees. For vacant cogon/shrublands with slopes of more than 8.0%, fruit crops with wind breaker plants such as permanent crops (ex. moluccausan, pilli nuts, giant ipil-ipil, etc.) would be recommended, since the surface soil layers would be developed as pasture land or for fodder crops cultivation. (refer to Figure 5.1.1.)

b) Paddy Production Plan

For the paddy fields, irrigation facilities will be introduced amounting to 3,910 ha, increasing from 900 ha at present. A proposed yield of 4.0 ton/ha and a cropping intensity of 175% would be proposed. While for rainfed paddy fields of 2,800 ha, a yield of 2.5 ton/ha and a cropping intensity of 110% would be proposed. While for the upland rice field of 3,500 ha, with 100% cropping intensity and 0.9 ton/ha of yield would be proposed. With the above conditions, the total amount of paddy would reach 38,700 ton, which is equivalent to 2.3 times more than at present.

In the target year of the Master Plan, the palay demand will be 42,300 ton per annum compared to a population of 305,500. With a per capita annual consumption of 90 kg, the milling rate will be 65%. Additionally, there will be about 3,000 tons of palay needed, including 600 tons of seeds estimated for 12,000 ha of total paddy/upland rice fields for 50 kg/ha, taking into account other use and loss of 7%. The ground total of palay demand will reach about 45,000 tons. The estimated self-sufficiency rate of rice in 2010 will remain at 84% with the above forecasted demand, although the realization of the various development plans will result in a palay production increase to 2.3 times the present production. (refer to Appendix E-2.)

c) Diversified Crops

In accordance with the progress of farming technique development, various crops will be introduced to the area and the yield of the crops will also be increased.

In the Project, the cropping acreage will be expanded to about 1,500 ha including 700 ha of inter-cropping areas under coconut trees. This proposed cropping area will be about five times as much as the currently existing 300 ha.

The crop acreage of corn will be increased by 2,700 ha (or 2.6 times the present) from the current 1,020 ha. This includes an intercropping area of 700 ha in the coconut plantations. The acreage of pulse/legumes will also be increased to 1,800 ha (or four times the present) including an acreage of 700 ha of intercropping in the coconut plantations, up from the current area of 450 ha. Upland crop cultivation area will also be expanded to 6,000 ha (excepting the upland paddy areas) from the current 2,470 ha.

The proposed yields of corn, pulse/legumes and vegetables will be increased to 1.5 ton/ha from 0.63 ton/ha at present, 1.1 ton/ha from 0.68 ton/ha and 3.1 ton/ha from 10.0 ton/ha, respectively.

On the assumption that the annual vegetable consumption is about 20 kg per capita, in future, about 610 ha of upland cropping fields will be needed because the estimated demand will be about 6,100 tons per annum in the year 2010. The production of upland crops such as corn, mungbeans, etc. will be increased in the range of two to six times owing to expansion of cropping acreage, rotational cropping, soils improvement, etc.

d) Fruit Crops

Under the development plan, the acreage of fruit gardens will be increased to 1,600 ha and the intercropping area of coconut plantation will be increased to 1,700 ha including the currently existing 960 ha. The total acreage of fruit gardens will be proposed at 3,300 ha. The yield of banana will increase to 12 ton/ha from 7.13 ton/ha at present. The total production, therefore, will be to 9,600 tons from the present 4,600 tons. Other fruits represented by calamansi, with a current production of 400 tons will be increased to 17,500 ton. The surplus will be exported in order to increase farm income. (refer to Appendix E-2.)

e) Coconut and Industrial Crops

The present coconut acreage of about 32,500 ha is expected to decrease to about 29,600 ha in the target year. However, the production of coconut will be maintained at present levels because of the fertilization of crops planted under coconut trees and the replanting of coconut trees themselves. To increase the production of arrow-root, ubi, etc., it will be necessary to increase the cultivation area of these crops by utilizing upland and idle land along hilly or sloping areas. The production of coffee, cacao, black pepper, etc. is also estimated to increase together with the increase in area of about 2,000 ha, utilizing space beneath coconut trees.

f) Fodder Crops

To produce fodder of about 32,000 tons annually as hay, about 8,000 ha of pasturelands should be planted with improved grasses. Also, the planting of silage crops such as sorghum, etc., in the upland areas would add another 20,000 to 30,000 tons of fodder per year.

5.1.4. Animal Husbandry Development Plan

The strategy for increasing animal husbandry products should be as follows: 1) increase in number of animals, 2) increase of useful feed grasses in grazing land/pasture, 3) application of farming by-products and condensed feeds, 4) upbringing of livestock breeding technicians. All this work should be carried out simultaneously. Successful application of the strategy will require the generic improvement of animal species, feed production increase, effective use of farming by-products, encouragement of artificial insemination, and introduction/growing of superior species of animals.

Since a considerably large area of natural grassland for feeding stretches across the southern part of the island, the area is expected to have a high potential for successful development of animal husbandry. The feedable grasses in the island are very low in yield and the improvement of the grass species will be indispensable for securing the necessary feeds.

Increase in number of animals and their generic improvement will require the practise of encouraging the artificial insemination by animal husbandry breeding station of DA.

5.1.5. Proposed Farming Pattern

The farming pattern has been formulated taking into consideration the fundamental agricultural conditions of soil, climate, the slope of the land, other factors such as market demand for the crop, available supply of local labor, farmers' requirements and needs, etc. the proposed farming patterns are presented below: (refer to Figure 5.1.2)

<u>Farming Pattern</u>	<u>Slope</u>	<u>Proposed Crops</u>
- Pattern w/ paddy/ diversified crops as core	Flat/gentle slope land	Paddy + Upland Crops (vegetables and/or fodder crops for livestock) + Industrial crops (coconut)
- Pattern w/ fruits crops as core	Hilly and slope land	Fruits crops + Upland crops (cereals and/or fodder crops for livestock) + Industrial crops (coconut)
- Pattern w/ fodder crops for livestock as core	Hilly and slope land	Fodder crops for livestock + Upland crops (cereals) + Industrial crops (coconut)

For the above-mentioned farming patterns to succeed, it is necessary to conduct continuous experiments and research on farming techniques and dissemination of information on results of experiments and research. Farmers' organizations are also important to improve and provide a systematic marketing system. In addition to the above, there is also the need to provide and develop infrastructure facilities like irrigation and drainage, rural water supply, farm-to-market roads, etc. and land consolidation system.

5.1.6. Agricultural Support Scheme

a) Research and Experiments

1) Strengthening of Research Activities

Under this program, continuous research on the proper cultivation and management of different crops proposed for development would be undertaken. Specifically, crops/activities such as vegetables, fruit crops, industrial crops, soil/fertilizers, insects/diseases, marketing/processing, farm management/economy with an increase in the number of specialists, food crops, and farm mechanization would be undertaken.

2) Marinduque Agricultural Development and Promotion Farm (MADPF)

The latest farming technology developed through continuous research and experiments would be presented to the extension workers and farmers at the MADPF. The proposed site is at the existing Provincial Training Center at Tamayo, Sta. Cruz. For training purposes, qualified experts on diversified crops, fruit trees and industrial crops, soil/fertilizer, irrigation, farm machinery, water and farm management are required. The major research work to be undertaken includes adaptability testing of new kinds/varieties of crops, preparation of guidelines on cultivation of each crop, establishment of rotational cropping systems, and further research into income and expenditures on farm activities.

3) Seed and Nursery Bank

A seed and nursery bank should be established to supply quality and low cost seeds and nursery. These seeds and nurseries would be distributed to the farmers through the proposed multi-purpose agricultural cooperatives. The Bank would be located in a secluded area to ensure the quality of seeds/nurseries produced.

b) Extension Scheme

An Agricultural Production Technologist (APT), would be responsible for the transfer of knowledge and technology to the farmers. The APTs will provide sufficient knowledge and expertise in the fields of vegetable/fruit/industrial crops production, animal husbandry, soil/fertilization techniques, farm management, etc. An expert in each field would be deployed in each municipality and would provide extension services and guidance to all farmers.

c) Farmers' Organization Plan

The Medium Term Philippines Development Plan (1987 - 1992) involves establishment of an integrated farmers cooperative association (PMAKB), which will convert, merge and absorb the existing Samahan Nayan. The establishment of PMAKB will encourage the practise of collective marketing of produce and purchase of farm inputs, collective use of common farm machines, soil improvement work, extensive farmland consolidation and labor saving in marketing and farming works so as to ensure more effective and profitable farmers' organization activities. The activities will be one of the most important agricultural supporting works with increase in agro-production and marketing.

5.1.7. Agricultural Development Projects

Agricultural development in Marinduque requires the introduction and demonstration of new farming techniques, the improvement of post-harvest facilities, the provision of a stable supply of farm inputs, livestock breeding, improvement of the marketing, organization and registration systems, etc. (refer to Figure 5.1.3 and Appendix E-3)

a) Introduction of Technology for Research, Experiment and Extension Works

Agricultural development aims not only to improve paddy cultivation techniques but also to introduce and develop farming techniques for new crops such as vegetables, fruits, industrial crops, etc.

(1) Strengthening of Research Staff

To develop farming techniques of new crops to be introduced and to evaluate local suitability of new crops, the number of staff in various fields such as vegetable, fruits, industrial crops, and forage crops cultivations, soil/fertilization, water management, farm management/farm economy should be increased.

(2) Strengthening of the Marinduque Agricultural Development and Promotion Farm (MADPF)

The application tests of new farming techniques developed by DA, would be undertaken at the Farm. Results of tests should be analyzed by farm management experts, after which, the techniques would then be systemized. Transfer of new farming techniques to the agricultural production technicians, the farmer leaders and others, would be carried out through demonstration and practice at the experimental farm in MADPF.

(3) Strengthening of the Agricultural Extension Workers

The number of APTs would be increased to 72 (one person for every three Barangays). The APTs would be assigned to the Municipal office. The technical knowledge transfer would be carried out based on the farming technique guidelines of DA. The APT's would visit farmers' houses, demonstration farms, multi-purpose agricultural cooperative (MPAC), etc.

(4) Pest/Diseases Observatory

Two experts would be employed to collect insect pests and pathogenic data on a daily basis. As a consequence, outbreak of pests/diseases could be forecasted. Warning of impending pests and diseases would be carried out by the Municipal Agriculturist.

b) Seeds/Seedlings Production and Preservation

Agricultural inputs such as fertilizers and farm chemicals would also be provided through the proposed MPAC at lower prices. Manure to improve soil conditions by utilizing various materials such as agricultural by-products, coconut timber or leaves, would be disseminated by the APT to the farmers. For these objectives, (5) Seed Bank and (6) DA Municipal Nurseries are proposed.

c) Demonstration of Rice-based Farming Improvement Technology

The techniques improved and developed by DA would be demonstrated and extended to the farmers. For these purposes, (7) Irrigated paddy cultivation demonstration farm, (8) Rainfed paddy/diversified crops cultivation demonstration farm would be established.

d) Demonstration of Diversified Crop Based Farming Improvement Technology

The following demonstration farms would be set up for the propagation of new farming techniques for newly introduced crops such as vegetables, fruits and industrial crops on the flatland, the coconut area, and sloping land. For achievement of this purpose, (9) vegetable cultivation demonstration farm, (10) coconut intercropping demonstration farm, (11) hillside farming demonstration farm for coconut areas and (12) agro-forest demonstration farm would be proposed in the area.

e) Improvement of Post-harvest Facilities and Technology

This scheme aims to maintain quality of farm products such as rice and corn, to save losses during processing farm products and to increase workability of farming through the introductions of farm machines and facilities such as drying places, rice mills and warehouses for rice and corn. For achievement of the above, (13) Post-harvest facilities for rice and (14) Post-harvest facilities for corn would be proposed.

f) Post-harvest of Coconut Fruits and Effective Utilization of Coconut Timber

The nurseries and fertilizers for new coconut varieties were provided by PCA from 1989. To encourage the introduction of post-harvest facilities and to upgrade the technology of copra processing and for effective utilization of coconut timber, (15) Post-harvest facilities for coconut and (16) Coconut timber utilization would be proposed.

- g) Increase of Animal/Poultry, their Healthcare/Sanitation, Improvement of Registration System of Animals and Introduction of Insurance System for Animals

The Marinduque Livestock Breeding Station will be improved and enhanced in staff and facilities for successful artificial insemination of large animals, improvement of raising methods of livestock, hygiene and check up of animals and improvement of grazing land. The number of small and large animals is expected to increase. And also, the farmers shall be insured against damage/death of animal from unpredictable diseases and the illegal slaughter should be prevented. For these purposes, (17) Rehabilitation of Marinduque Livestock Breeding Station, (18) Cattle dispersal, (19) Carabao dispersal, (20) Goat stock farm, (21) Goat dispersal, (22) Backyard poultry demonstration farm, (23) Grazing field demonstration farm, (24) Remodelling of slaughter house, (27) Strengthening of registration system of livestock and (29) Public animals auction market would be introduced.

- h) Marketing and Organization Improvement Scheme

It is necessary to increase productivity and to sell agricultural produce with high farm gate prices in order to increase farm incomes. To achieve this purposes, the farmers would organize farmer's cooperatives and also, provincial and national governments would establish a trading center. To assist this scheme, (25) Integrated agriculture trading center and (26) Multi-purpose agricultural cooperative would be proposed.

FIGURE 5.1.1 PROPOSED CROPPING PATTERN

AREA	MAY	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.
Paddy Field 5,650ha (2670)	Irrigated Paddy Rice (LP, B, N, T, H)											
	Rainfed Paddy Rice (LP, S, H) Diversified Crops (S) Paddy Rice (S)											
Upland Field 4,300ha	Crop Rotation Area Vegetable Pulse Crops Upland Rice (LP, S)						Crop Rotation Area Gramineae Vegetable Pulse Crops (LP, S)					
Tree growing site 2,100ha	Perennial Crops (Fruit and Industrial Crop) (O)											
Grassland 4,000ha	Meadow and Pasture Grass											
Coconut Site (1650)	Irrigated Paddy Rice (T)											
	Upland Crops (T)											
29,550ha (1700)	Irrigated Paddy Rice (T)											
Inter Cropped 8,650ha (5300)	Irrigated Paddy Rice (T, O)											
	Upland Crops (T)											
Single Cropping 20,900ha	Coconut (T)											
	Coconut (T)											
	Coconut (T)											

Remarks :

- T Coconut
- O Perennial Crops (fruit, coffee, cacao, etc)
- Lp Land preparation
- N Nursery
- S Sowing
- T Transplanting
- H Harvesting

FIGURE 5. 1. 2. PROPOSED FARMING AREA

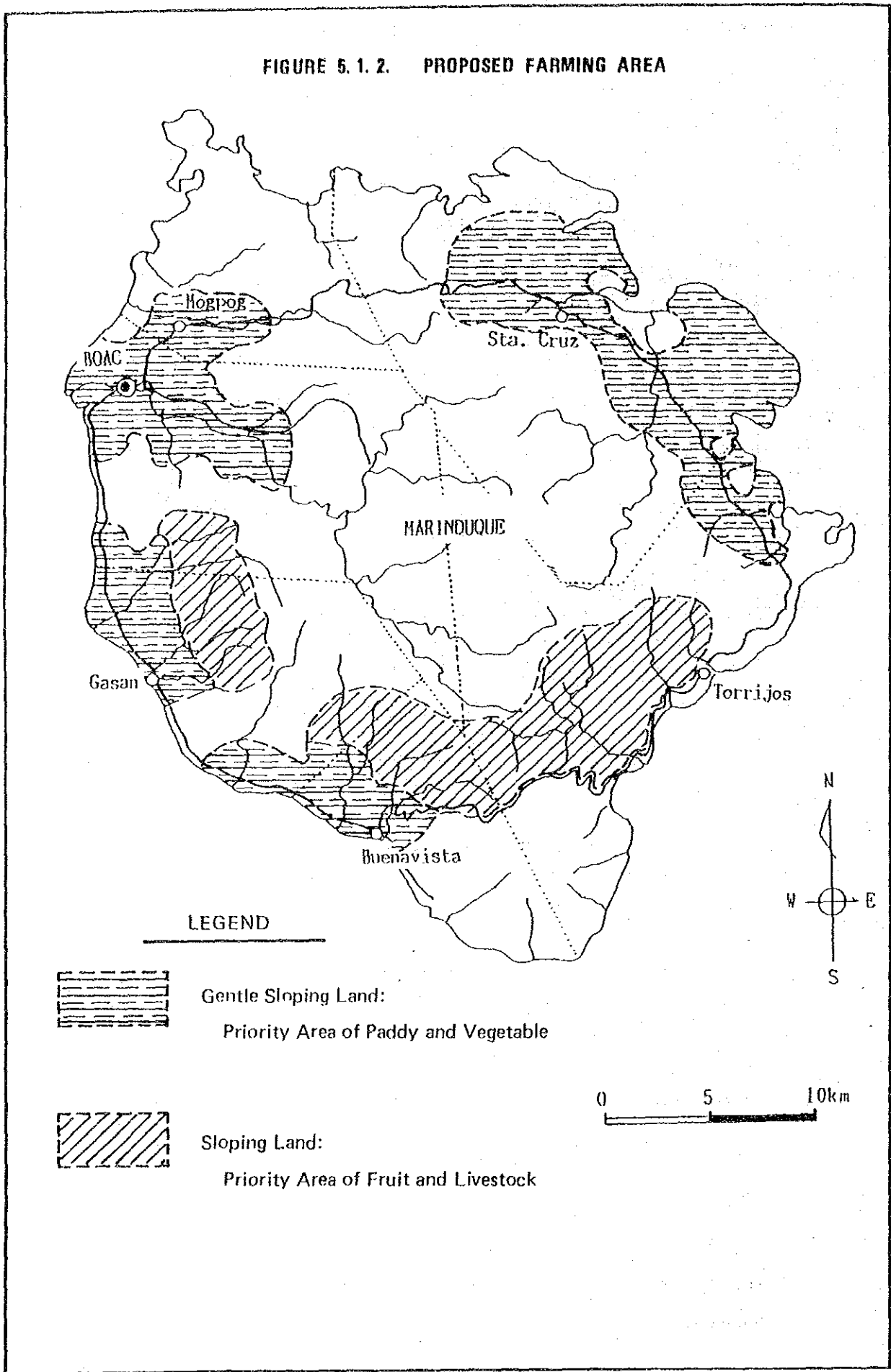
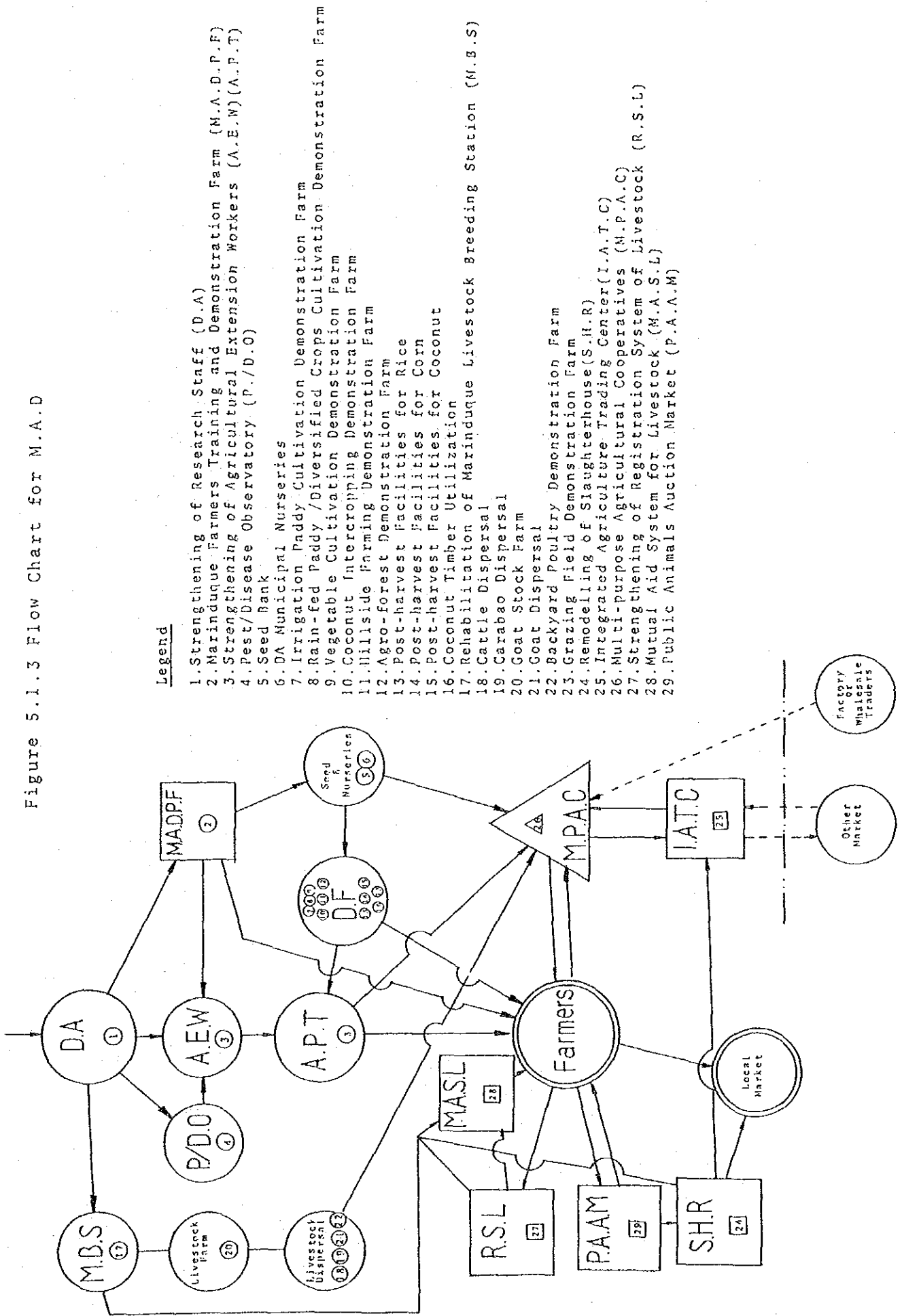


Figure 5.1.3 Flow Chart for M.A.D



Legend

1. Strengthening of Research Staff (D.A)
2. Marinduque Farmers Training and Demonstration Farm (M.A.D.P.F)
3. Strengthening of Agricultural Extension Workers (A.E.W)(A.P.T)
4. Pest/Disease Observatory (P./D.O)
5. Seed Bank
6. DA Municipal Nurseries
7. Irrigation Paddy Cultivation Demonstration Farm
8. Rain-fed Paddy /Diversified Crops Cultivation Demonstration Farm
9. Vegetable Cultivation Demonstration Farm
10. Coconut Intercropping Demonstration Farm
11. Hillside Farming Demonstration Farm
12. Agro-forest Demonstration Farm
13. Post-harvest Facilities for Rice
14. Post-harvest Facilities for Corn
15. Post-harvest Facilities for Coconut
16. Coconut Timber Utilization
17. Rehabilitation of Marinduque Livestock Breeding Station (M.B.S)
18. Cattle Dispersal
19. Carabao Dispersal
20. Goat Stock Farm
21. Goat Dispersal
22. Backyard Poultry Demonstration Farm
23. Grazing Field Demonstration Farm
24. Remodelling of Slaughterhouse(S.H.R)
25. Integrated Agriculture Trading Center(I.A.T.C)
26. Multi-purpose Agricultural Cooperatives (M.P.A.C)
27. Strengthening of Registration System of Livestock (R.S.L)
28. Mutual Aid System for Livestock (M.A.S.L)
29. Public Animals Auction Market (P.A.A.M)

5.2. Small-Scale and Cottage Industries

Promotion of small-scale and cottage industries is one of the important components in regional development planning in terms of generation of employment opportunities, income generation and prevention of out-migration. The DTI in Marinduque is in charge of fostering the activities of small scale and cottage industries in Marinduque, giving technical guidance on existing industries and providing guidelines for establishing new industries.

For the establishment of new industries, careful examination on the supply of raw materials, technical aspects and marketing shall be made. One of the major problems of the existing wood handicraft industry is a stable supply of raw materials. Some manufacturers have started to plant the trees required for the industry.

In connection with the implementation of the agricultural development plan facilities for rice milling, agro-processing and storage of agricultural produce are expected to be increased in the future. A part of this requirement will be met by the facilities and services provided by MPAC and the remainder will be met by the facilities and services to be provided by the private sector.

5.3. Agricultural Infrastructure Development

5.3.1. Irrigation Plan

a) Irrigation Planning

To attain self-sufficiency of rice in Marinduque, double crop farming system of paddy is recommended in the proposed irrigation area taking into consideration topographical, meteorological and hydrological conditions. Paddy seedlings in the first and second croppings are transplanted in June and November, respectively, and harvested in October and March, respectively.

The water resources for the proposed irrigation area are springs or the surface water of rivers. The critical months of low discharge are the four months from February to May. The amount of discharge, however, fluctuates year by year. The drought discharge on the probability of 1/10 is estimated at 0.87 cu.m/sec/100 sq.km in the Boac river basin.

The monthly evapotranspiration rates are calculated by using the modified Penman method. The maximum rate of 5.8 mm/day and the minimum rate of 3.1 mm/day of evapotranspiration can be obtained for May and January, respectively. The crop coefficient ratio fluctuates from 0.95 to 1.1. Monthly ET crop rate, therefore, varies from 3.3 to 5.1 mm/day. The percolation rate of 1.5 mm/day can be used by considering the silty loam or clay soil of any paddy field. The amount of water for land preparation on the first and second croppings are 210 and 190 mm, respectively. The irrigation efficiency of 0.5 can be applied in designing the facilities. Consequently, the maximum water requirement of 1.6 lit/sec/ha is calculated and a cropping intensity of 175% by considering the climatic and agricultural conditions. (refer to Appendix F-1-3.)

b) Proposed Irrigation System

For the irrigation project, first priority is to be given to the rehabilitation of existing irrigation systems because of the low investment and quick yield. A total of 27 existing systems would be rehabilitated. After completion of this rehabilitation work, construction of 27 irrigation systems is proposed. After completion of all the proposed projects, the irrigation acreage will expand to 3,910 ha. The rehabilitation projects include 18 intake facilities to be improved and 45 km of irrigation canals to be rehabilitated. The intake gates should be attached to the intake facilities to protect intrusion of flood water on farmland and to make effective use of water resources. In the newly proposed irrigation projects, one turn-out facility irrigation per 10 to 15 ha of the beneficial area and a canal density of 50 m/ha of farm ditches as an on-farm facility are proposed.

The proposed Tagum-Angas irrigation project aims to provide irrigation throughout the year and to supply water for village use and also to generate hydropower supply. The total irrigable area of 630 ha, which is comprised of 480 ha of paddy fields and 150 ha of diversified crop fields, will be proposed.

The Binunga multi-purpose project is proposed, which has four purposes; namely, irrigation, water supply, hydropower and flood control.

The potential area of this project covers 920 ha extending along the Boac and Mogpog rivers, including the existing CIS of 210 ha. (refer to Appendix F-1-4.)

5.3.2. Drainage and Flood Protection

a) Drainage Planning

As there are no drainage facilities in the 760 ha of existing irrigation area, the necessary facilities are proposed for construction together with the rehabilitation work of irrigation facilities. It is also proposed in the new project areas of 2,910 ha that irrigation facilities are introduced, which will consist of 2,760 ha of paddy fields and 150 ha of diversified cropping areas. (refer to Appendix F-2-2.)

For the design of drainage facilities, the drainage module of 6 lit/sec/ha can be applied based on the design rainfall of 66.5 mm/day on the probability of 1/2 and run-off coefficient of 0.8.

b) Flood Protection

In order to protect the 365 ha of farmland which consist of 100 and 150 ha in the downstream areas of the Mogpog and Boac rivers, respectively, 100 ha in the Mansabang area and 15 ha in the Bagtingon area, flood protection dikes are proposed.

The proposed runoff discharge can be calculated using the discharge - frequency - drainage area - relationship. The proposed runoff discharge using a return period of one to ten years is applied as follows:

	<u>Proposed runoff discharge</u>				(W = 1/10 years)
Drainage Area (sq.km)	10	50	100	200	
Specific Discharge (cu.m/sec/sq.km)	16	10	8.5	7.0	

The total length of the proposed flood protection dikes which are constructed of reinforced concrete, cobblestone masonry and/or earth fill, are planned. During the periods of short, medium and long term development, 12.4, 11.1 and 20.1 km of the flood protection dikes are proposed.

5.3.3. Rural Roads

a) Basic Concept

Rural roads are vital elements not only in upgrading the standards of living but also in the development of agricultural and relevant industries in the rural areas. Rural roads are classified as follows:

<u>Road Classification</u>	<u>Administrative Classification</u>	<u>Function</u>
- Primary Road	National Road	Inter-region, Major Farm-to-Market Road
- Secondary Road	Provincial Road	Inter-region, Farm-to-Market Road
- Feeder Road	Barangay Road	Inter-village, Farm-to-Market Road
- Farm Road	Other Roads	Trunk Farm Road

The most essential function of rural roads to be considered in this Master Plan is the farm-to-market road which is particularly utilized for transportation and distribution of agricultural products and input such as fertilizers and farming materials.

Direct effects/merits of rural road development are the savings in transportation costs and time, increase of agricultural produce, and promotion of agro-industries. Farm road development is also necessary to support the irrigation and agriculture development programs.

b) Development Objectives

Objectives of the rural road development are to improve accessibility between Barangays and towns so as to vitalize the agricultural production, and to stimulate and support agricultural development as well as other infrastructure programs.

Targets and the framework of rural road development program were established based on the problems of the present road network and following aims.

- To provide adequate road protection structures and drainage facilities taking into consideration the frequent typhoons and heavy rains.
- To reinforce the motor pool of PEO of the Provincial Government to encourage road operation and maintenance activities.
- To provide concrete pavement roads in Barangay centers for multi-purpose use such as dry pavement for agricultural produce, market area, meeting place, recreation area, playground, etc.

c) Targets and Programs

Overall targets of the Road Development Programs by the end of the year 2010 are as follows:

- All Barangays are to be accessible by all-weather roads with at least gravel surface.
- National roads which function as major farm-to-market roads shall be paved with asphalt or concrete.
- Farm-to-market roads which are to be provided for agricultural areas, shall be all-weather roads.
- Farm roads shall be adequately provided to the farming areas according to the existing and proposed irrigation and agriculture development programs.
- All existing temporary bridges such as timber and bailey bridges are to be replaced by permanent bridges.
- Multi-purpose pavements shall be provided not only to Barangay centers but also to remote villages.

Based on the targets described above, individual road development programs are formulated by category and by development stages. The total length of rural roads (farm-to-market roads) for new construction and improvement/upgrading by the end of the long-term development plan period is 330 km and 300 km,

respectively. The total length of farm roads to be constructed is 300 km while the proposed multi-purpose pavement is scattered in 400 places including some areas in the remote Barangays. As to bridge development, 370 l.m are for replacement and 500 l.m are for new construction. (refer to Appendix G-1-2.)

d) Operation and Maintenance

The maintenance operations are broken down into regular (routine) and periodic maintenance. If, for some reasons, road maintenance is neglected for some years, the road conditions may become so bad that heavy operations are required with more funds to restore the road to its original standards. Thus, it is important to perform steady and efficient maintenance operations on schedule.

DPWH shall undertake such maintenance operations for national roads and Barangay roads, and PEO shall be responsible for all provincial roads and part of the Barangay roads. Reinforcement of Motor Pool of PEO should also be programmed in the short-term development plan period. (refer to Appendix G-1-2.)

5.3.4. Village Water Supply

This program aims to supply water for agriculture and for the inhabitants. Water for agriculture includes irrigation, drinking water for animals and also water for farm produce and farm machines. The proposed system is on Level II. The design capacity should meet future water demands.

a) Bagtingon Area (Buenavista)

The village water supply system, with a capacity of 2,190 cu.m/day is composed of 1,250 cu.m farming water which includes irrigation water for a proposed 2.0 ha seed farm, farming water for livestock (1,600 head of cattle, 5,000 head of carabao, 1,200 head

of horses), and for washing farm produce and machines, and 940 cu.m of drinking water for 15,650 inhabitants. The water source is a spring located at Yook Barangay 7.5 km away from the poblacion of Buenavista. The facilities consist of a diversion dam, a main pipeline of 7.5 km, distribution pipelines of 16 km, a break-pressure chamber, a regulating tank ($V = 950$ cu.m), and 133 communal faucets. The reservoir would be located at the site with an elevation of about 30 to 40 m above MSL and near the service area. (refer to Appendix F-3-2.)

b) Tagum-Angas Area (Sta. Cruz)

This program is for 350 cu.m of farming water supply for livestock (1,300 cattle, 2,700 carabao, 130 horses) and for washing farm machine, and 340 cu.m of drinking water for 5,600 inhabitants. The water source for this area depends on the proposed Tagum-Angas reservoir. The facilities consist of a main pipeline of 6 km, distribution pipelines of 19 km, a reservoir tank ($V = 300$ cu.m) and communal faucets. (refer to Appendix F-3-2.)

5.4. Rural Infrastructure Development

5.4.1. Rural Water Supply

To improve the rural living conditions, it is necessary to improve the existing water supply system. It is, therefore, necessary to meet the inhabitants' needs.

a) Development Strategy

The development of the rural water supply system will be projected as follows:

- i) Short-term Development : 24 hour-water supply for the urban areas.
- ii) Medium-term Development: Repair of non-functioning wells, provision of stable water supply and rehabilitation of old pipes.
- iii) Long-term Development: Promote the Level-II system of water development to 100% of inhabitants in the urban areas and around 70% of inhabitants in the rural areas.

b) Selection of Project

Based on the development strategy, the following rural water supply plans were selected: (refer to Appendix I-2-2.)

i) Short-Term Development Plan

Sta. Cruz water resources development plan on water supply would be proposed in Sta. Cruz, which faces serious problems at present. This program aims to solve water shortages for the urban area and to stably provide water. A target population of 56,400, an

average daily demand of 3,380 cu.m/day, and a maximum daily demand of 4,400 cu.m/day are envisaged. The source of water is a spring located at Tanbangan Barangay, 20 km away from the poblacion of Sta. Cruz, which supplies the stable water by a gravity system even in the dry season. The major facilities are a diversion dam, a reservoir (V = 1,500 cu.m), main pipe lines (ϕ 6" to 8", L = 20 km), distribution pipe lines (ϕ 2" to 4", L = 40 km) and communal faucets (150 units). Operation and maintenance of the facilities would be charged by Rural Water Supply Association organized by beneficiaries. The association would collect water charge from beneficiaries as expenses for operation/maintenance.

ii) Medium-Term Development Plan

A rehabilitation plan of the Boac, Mogpog, Sta. Cruz and Torrijos water supply systems is proposed. This program aims to stably supply water of good quality.

- Boac Water Supply System Rehabilitation Plan

The target population is 5,400 by the year 2010. The main work is to replace main and distribution pipelines to GI pipes (3 to 8" in diameter) with a total length of 17 km. The Boac rural water supply association would collect the water charge from beneficiaries, and assume management, operation and maintenance.

- Mogpog Water Supply Rehabilitation Plan

The target population is 4,000 in the year 2010. The main works is rehabilitation of a deep well discharging 1,600 cu.m/day and exchange of pipelines with the total length of 8.5 km with 1.0 to 6" in diameter of GIP respectively. Operation and maintenance is carried out by the existing Mogpog rural water supply association.

- Sta. Cruz Water Supply Rehabilitation Plan

For the target population of 10,000 in the year 2010, the rehabilitation works which includes replacement of pipelines of 6.5 km with a diameter of 4" would be proposed. Operation and maintenance of the system would be carried out by the existing association.

- Torrijos Water Supply Rehabilitation Plan

For the target population of 2,200 in the year 2010, the existing system would be rehabilitated by replacement of a pipeline of 6" in diameter with a length of 10 km. Operation and maintenance is carried out by the existing associations.

iii) Long-Term Development Plan

For solving water shortages in the urban and rural areas of Gasan and Boac and stably providing water, the following projects are proposed.

- Gasan Water Supply Rehabilitation Plan

The plan aims to improve the existing water supply system to meet the future demand for the population of 29,700 in the year 2010. The capacities, on an average daily demand of 1,790 cu.m/day and/or the maximum daily demand of 2,200 cu.m/day are applied. The major facilities compose of an intake box, a reservoir with a capacity of 880 cu.m, a main pipe line of 8 km with 6" in diameter, distribution pipe lines of 29 km length with a diameter of 2 to 4", and 133 sets of communal faucets.

5.4.2. Mini-hydropower Development

a) Demand

In the future, the electricity demand would be increased up to 29.5 GWH based on the per capita electricity of 30 kwh/month/household and 57,000 households at the target year in accordance with increase of income and stable supply of electricity.

b) Supply

NPC began a field investigation to install four sets of new generators with a capacity of 2.25 MW by 1992. The plan includes 57 km of transmission line 69 KV and distribution lines of 475 km, 4.16 to 13.2 KV. In this plan, Marinduque would gain sufficient electricity to the future demand of 29.5 GWH. The generating cost and O & M cost by a generator are higher than that of hydropower

generator. Therefore, it is necessary that a study of the marine cable to connect to the Luzon Grid and/or of other new hydropower stations taking into consideration economic conditions. Since the Marinduque Island is placed on the advantageous condition with enough amount of rainfall, there are several sites to generate small scale of hydropower. The plan would propose two hydropower generations, the Tagum-Angus station with 1.4 GWH and the Binunga station with 3.0 GWH. The amount of this hydropower is to about 15% of the future demand. These stations will be used for the firm power generation and will be able to reduce load of the generator.

5.4.3. Rural Electrification

Rural electrification is very important in improving the standards of living of the Area. Since a large proportion of the Study Area is not yet energized, the program aims to provide electrification in the area. Marinduque has an average diffusion rate of only 25%. It is therefore necessary to raise the diffusion rate of electricity by extending the transmission lines in high density population areas.

To increase the future diffusion rate by 75% in the year 2010, the following targets are set up. During the short-term development, the number of house connection of 8,700 would be increased by expansion of the transmission line of 69 KV with the length of 57 km and the secondary line of 4.16 to 13.2 KV with the length of 475 km. In the medium-term development the energized area would be expanded by the construction of distribution lines of 30 km and secondary lines of 120 km. The energized house connection would be 7,600. In the long-term development, the diffusion rate of 75% would be proposed by the distribution lines of 40 km and secondary lines of 170 km. Consequently, the energized number of house connection will be increased to 17,200. (refer to Appendix I-3-2)

5.4.4. Traffic System

Traffic in Marinduque is by land or sea. The problem of land routes could be solved with the development of rural and farm roads. However, being an island province, Marinduque relies more on water transport. Considering the on-going and proposed development projects for the province, the number and quantity of passengers and cargo to be handled by the ports is expected to increase, therefore, improvement and development of port facilities are necessary.

During the short-term development period, the development purposes are to support domestic trade and marketing organization such as the improvement of the existing ports and to improve the traffic system in Marinduque. A passenger's waiting shelter of 400 sq.m, a cargo shed of 1,000 sq.m and two sets of forklifts with a capacity of 5 tons is proposed to promote effective loading and unloading work. For the inhabitants, a 239 waiting shelters are proposed along the national roads to protect them from strong sunshine and rainfall.

In the medium-term development period, in order to promote the targets of the short-term development, the waiting sheds of 223 along the provincial roads, two passenger's waiting sheds of each 400 sq.m at the Balanacan port and two cargo sheds of 1,000 sq.m with two sets of forklifts of 5 tons capacity.

In the long-term development, 330 waiting sheds along the municipal roads and 70 waiting sheds along the provincial roads. At the Buyabod port, the same facilities of the Balanacan port would be proposed. (refer to Appendix G-2-2.)

5.4.5. Health and Medical System

The health and medical facilities in Marinduque are within the levels set by the Government. However these facilities are concentrated in the town, hence, the people living in the remote

Barangays are not serviced. The health manpower to population ratio is almost within the levels set by the Government, but the number of physicians and dentists is still below that of the national levels.

During the short-term development period, construction of eight BHSs and one health center, rehabilitation of two BHSs and one RHU, expansion of the hospital and introduction of two clinic cars are proposed to improve the present situation of medical facilities.

In the medium-term development period, 3 RHUs and 7 BHUs will be constructed to conduct additional health and/or medical facilities. In the long-term development period, four physicians and three dentists would be increased to strengthen the health manpower capabilities.

5.4.6. Education and Welfare

a) Education

Elementary education is vital to the population which is the responsibility of DECS. Majority of the educational facilities are concentrated in the poblacion or towns, hence, students coming from the remote Barangays have no access to these facilities. It is therefore very important that rural/farm roads be developed. With the construction of roads, education, welfare and also health facilities become accessible to the majority of the population.

To improve education facilities, 245 classrooms to be rehabilitated, 40 classrooms to be replaced, 20 classrooms to be constructed and 9 school toilets to be constructed are proposed during the short-term development. In the medium-term development, construction of 56 units of school toilets at primary school would be proposed for practice of basic training on sanitation. In the long-term development, 110 school toilets in the elementary schools will be constructed.

b) Welfare

For improvement of welfare, the following development plans are proposed. (refer to Appendix I-8-2)

- i) For assistance to socially disadvantages family, self employment assistance, marriage counselling service and social service for solo parent are proposed.
- ii) For women's welfare, social community skills development and maternal and child care should be proposed.
- iii) For disability prevention and rehabilitation of disabled person, disability prevention, vocational skills development and self employment assistance should be proposed.
- iv) For emergency assistance, integrated disaster preparedness should be proposed.
- v) For child and youth welfare, day care services, supplemental feeding and skills for livelihood development should be proposed.

5.4.7. Communication System

The communication system in Marinduque is generally poor. It is therefore necessary to develop the communication system which would help improve economic conditions. With all the other development efforts being proposed, the demand for a better and improved communication systems is expected to increase. Hence for this program, the telephone system would be proposed to be improved by installing telephone system not only in private homes but in all public buildings and at least in every Barangay.

During the short-term development plan, 60 telephones in public buildings and 80 telephones in private houses at Boac, Buenavista, Mogpog, Gasan and Sta. Cruz should be set up. The total length of the telephone line is about 40 km. During the medium-term development period, a telephone exchange system should be installed at Torrijos. And 50 more telephones should be set up in public buildings and 250 in private houses. During the long-term development plan, 100 km of telephone line should be constructed, to fill up the telephone network gap in Marinduque. (refer to Appendix I-7-2.)

5.5. Aquaculture Development

5.5.1. Development Plan

The improvement of inland fisheries, including brackish water pond culture has the possibility of increasing employment opportunities and income earning potential and hence could improve the socio-economic conditions of the island. The development of 1,500 ha of swamp area including existing brackish water ponds which can produce 3,500 to 4,000 MT of black tiger shrimp would have a value of about 740 million pesos even with a decrease in market prices in the consumer market. Recent fish culture technology developed and used in the Philippines can also produce 3,000 MT of Bangus and increase per capita consumption by at least 18 kg/year. (refer to Appendix H-3-1)

5.5.2. Basic Measure for Aquaculture Development

For the development of the aquaculture industry in Marinduque, it is necessary that the following measures be taken by the Provincial Government before improvement of the Brackishwater Fish Culture Demonstration Farms; namely: 1) Provide regulatory measures for the aquaculture industry; 2) Identify existing and potential areas for fishpond development; and 3) Monitor environmental conditions of swamp and mangrove areas. (refer to Appendix H-3-2)

5.5.3. Improvement of Brackishwater Fish Culture Demonstration Farm (BFCDF)

The technology to be used for aquaculture should be based on the technology developed by the institutional organization and on studies to be made on production, developing suitable feeds for every stage of growth, feeding, and measure taken on possible diseases of the shrimp and fish based on local conditions.

a) Rehabilitation of Fish and Shrimp Culture Ponds in BFCDF

For the year-round shrimp culture experiment, at least 12 ponds with an area of about 0.5 ha are required. For fish cultures, an additional six ponds with 0.5 ha (except for nursing ponds) is required. The banks of the culture ponds are reinforced and the ponds should be deepened to maintain suitable water temperature for fish culture. The farming ponds should, therefore, be reconstructed and the area extended to about 10 ha with reinforced banks and proper depth. (refer to Appendix H-3-3.)

b) Introduction of Hatchery Tanks and Laboratory

To provide a stable supply of shrimp post larva (PLs), small scale shrimp hatchery equipment is required with production capacity between one and two million PLs per month. Feed processing equipment for the post hatches of shrimp should also be provided. Bio-chemical and chemical testing apparatus are also required. (refer to Appendix H-3-5.)

c) Proposed Feed Processing Plant

It is essential to study proper feed ingredient combinations for the shrimp nursing stage and the stage of shrimp-raising ponds. For semi-intensive and/or intensive shrimp culturing method, the cost of feed plays an important role in the production costs together with the cost of PLs. Fresh and properly composed ratio of combination with the right ingredients would be very appetizing to the shrimps and with this, rapid growth with low mortality rate and perhaps feeding ratio of one to 1.5 kg for one kilogram of production would be enough. A study of composition and materials available from local sources to be used as raw material for shrimp feed, such as rice bran, meal of shrimp heads and trash fish would reduce costs of feed. (refer to Appendix H-3-5 and H-3-6.)

d) Laboratory for Ecology and Pathology

An intensive culture method has affected the ecology of the animals. Also, unusual animal diseases occur with change of the environmental conditions and provision of high nutritional feeds. Therefore, it is essential to study and collect basic information on this particular field in the laboratory at the demonstration farm site. (refer to Appendix H-3-4.)

e) Proposed Pilot Processing Plant with Ice-Making Plant and Cold Storage

Needless to say, the final purpose of fish and shrimp culture should be high prices and good quality. For the development of the BFCDF, a method of handling the produce from the post-harvest to the final product would play an important role. Hence, recovery rate from processing, temperature of the produce during post-harvest to processing, temperature of freezing and storage and decomposition and oxidation of the product in different storage temperature, etc. should be taken into consideration in the development of the aquaculture. (refer to Appendix H-3-7.)

5.5.4. Other Facilities Related to Aquaculture

Marinduque has similar conditions to other provinces, namely, the nonavailability of facilities such as ice-making plants and cold storage, etc. An increase in production of fish and shrimp culture without such facilities would affect the increase in production from fish and shrimp culture ponds in the future and so to a great extent affect the economic prospects of the province. The site of the ice making plant should be close to the center of the fish culture ponds, in two places at Mogpog and Sta. Cruz areas with a recommended capacity of seven and five MT, respectively. (refer to Appendix H-3-8.)

5.5.5. Development of Freshwater Fish Culture

It is rather difficult to expect an increase in fish catch from the seas surrounding the island. Attention must therefore be focused on the poly-culture of carp in the paddy field and/or the reservoir for irrigation. The species recommended to be cultured are carp, grass carp and other freshwater fishes.

The proposed reservoirs for irrigation with a total capacity of 15.5 MCM would be able to produce about 470 MT of freshwater fish. (refer to Appendix H-4)

5.5.6. Culture Program for Coconut Crabs

Data reveals that coconut crabs are no longer available in Marinduque. However, as part of the activities of BFCDF, it is recommended that species would be preserved and studied.

A preservation area of about 1 to 2 ha along a coconut plantation area near the laboratory could be used for artificial hatchery and breeding methods for crab species.

5.6. Development Costs

5.6.1. Basic Conditions

a) Unit Cost

The unit cost was determined based on the unit cost of similar work items used in recent projects in Marinduque Province and Region IV. All unit costs were then updated to the price levels of June 1989 using the price index category of construction in the industry sector, issued by NEDA.

b) Exchange Rate

The exchange rate between Philippine peso and US dollar was determined at 21.80 pesos (US\$1.00 = 21.80 Philippine pesos)

c) Engineering, Administration Costs, and Contingency

20% of construction costs as engineering and administration cost, and 15% as physical contingency were added to the development cost.

5.6.2. Development Costs

The development costs which are estimated at current prices on a contract basis, are composed of 11 items according to the sectoral development program. The total development cost is 3,800 million pesos, 1,502.7 million pesos of which is allocated for the short-term development, 879.4 million pesos for the medium-term development, and 1,417.9 million pesos for the long-term development. (refer to Table 5.6.1.)

5.6.3. Operation and Maintenance Costs

The annual operation and maintenance costs are composed of salaries and wages for operation and maintenance staff, administration and general expenditures, equipment depreciation and repair costs, fuel and oil costs, maintenance cost of the facilities, special expenditure for training/seminar/demonstration programs, and 10% of the total O & M costs as a physical contingency.

The annual operation and maintenance costs amounted to 53.2 million pesos for the short-term period, 71.4 million pesos for the medium-term period, and 103.2 million pesos for the long-term period. (refer to Table 5.6.2.)

Table 5.6.1 Summary of Development Cost (As of June 1989)

(Unit: 1,000 ₪)

Description	Total	Short-Term (1991-1995)	Medium-Term (1996-2000)	Long-Term (2001-2010)
1. Agricultural Development	<u>166,000</u>	<u>74,800</u>	<u>66,700</u>	<u>24,500</u>
2. Agricultural Infrastructure Development				
1) Irrigation Development	814,000	78,400	181,800	553,800
2) Drainage Development	483,000	162,000	160,500	160,500
3) Rural Road Development	1,204,000	401,300	290,700	512,000
4) Village Water Supply Development	40,000	40,000	-	-
Sub-total of 2	<u>2,541,000</u>	<u>681,700</u>	<u>633,000</u>	<u>1,226,300</u>
3. Rural Infrastructure Development				
1) Rural Water Supply Development	244,000	97,000	78,500	68,500
2) Hydro-Power & Rural Electrification Development	254,000	190,500	26,000	37,500
3) Traffic System Development	65,500	16,800	20,000	28,700
4) Social Services Development	133,500	65,900	35,200	32,400
Sub-total of 3	<u>697,000</u>	<u>370,200</u>	<u>159,700</u>	<u>167,100</u>
4. Aquaculture Development	<u>20,000</u>	-	<u>20,000</u>	-
5. MADPP	<u>376,000</u>	<u>376,000</u>	-	-
Total (1-5)	<u>3,800,000</u> (100%)	<u>1,502,700</u> (40%)	<u>879,400</u> (23%)	<u>1,417,900</u> (37%)

Table 5.6.2 Summary of Annual Operation and Maintenance Cost

(Unit: 1,000 P)

Description	Short-Term (1991-1995)	Medium-Term (1996-2000)	Long-Term (2001-2010)
1. Agricultural Development	<u>8,860</u>	<u>12,790</u>	<u>13,430</u>
2. Agricultural Infrastructure Development			
1) Irrigation Development	440	1,180	3,470
2) Drainage Development	130	230	330
3) Rural Road Development	8,165	12,955	20,595
4) Village Water Supply Development	435	435	435
<u>Sub-total of 2</u>	<u>9,170</u>	<u>14,800</u>	<u>24,830</u>
3. Rural Infrastructure Development			
1) Rural Water Supply Development	660	1,330	1,960
2) Hydro-Power & Rural Electrification Development	23,400	29,500	48,500
3) Traffic System Development	270	620	1,080
4) Social Services Development	1,840	2,660	3,700
<u>Sub-total of 3</u>	<u>26,170</u>	<u>34,110</u>	<u>55,240</u>
4. Aquaculture Development	-	<u>700</u>	<u>700</u>
5. MADPP	<u>9,000</u>	<u>9,000</u>	<u>9,000</u>
<u>Total (1-5)</u>	<u>53,200</u>	<u>71,400</u>	<u>103,200</u>

5.7. Implementation Plan

5.7.1. Implementing Agency

Basic national policy of the government of the Philippines for implementation of integrated area development (IAD) projects is to promote and accelerate administrative decentralization. According to NEDA implementing guidelines (No. 68, 1988) for IAD projects, coordination and management of implementation of single-province IAD projects are to be the responsibility of the provincial government.

Based on the above state policy, it is recommended that the implementing agency be the Provincial Government of Marinduque which has a sufficient number of staff and adequate experience. The Project Board, with the Provincial Governor as chairman, shall be established to act as the overall manager and coordinator. A Project Management Unit (PMU) shall be created under the Project Board to execute general implementation activities.

Since the development projects formulated in this Master Plan cover several sectors, all line agencies concerned shall participate in the implementation of the project. PMU as the key coordinating body shall be responsible for general project management and coordination among the sectoral line agencies such as PEO, DA, NFA, PCA, NIA, DPWH, NPC and others. These line agencies shall undertake the actual implementation of the project in the field. In an integrated development project such as this, close cooperation between the coordinating body and participating line agencies is important for the smooth implementation of the project to attain the overall development goals. (refer to Figure 5.7.1.)

5.7.2. Implementation Plan

Implementation of the 20-year development project is divided into three stages, namely short-term (1991-1995), medium-term (1996-2000) and long-term period (2001-2010).

In order to implement the development projects, financial and technical assistance by foreign governments and/or international development organizations shall be rendered to the government of the Philippines. Particularly, since the total development cost has reached a great amount, intense efforts for fund procurement should be made by the government to achieve the development targets without delay.

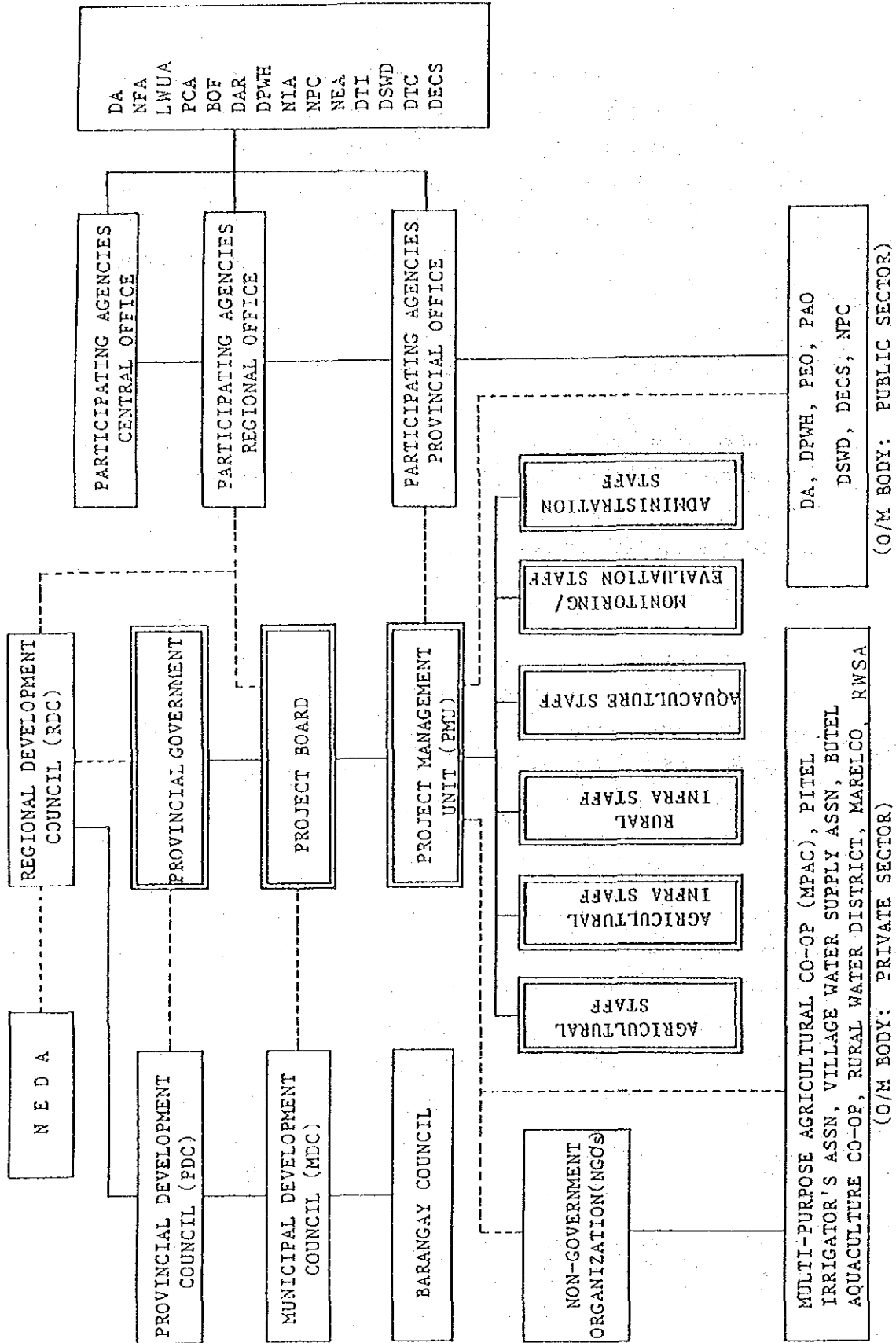
5.7.3. Operation and Maintenance Body

Executing agencies for the operation and maintenance of facilities and equipment constructed/purchased under each development project would be divided into two categories, i.e. public sector and private sector, depending on the characteristics of the projects.

The operation and maintenance of the irrigation, village water supply, rural water supply and rural electrification development projects would be turned over to the private sector. O/M body of these projects shall be the cooperatives/associations which are to be organized by the beneficiaries and formed by project/sector and/or by area.

On the other hand, facilities and equipment provided by the project such as agriculture, drainage, rural roads, traffic system, social services and aquaculture shall be managed and maintained by the relevant government agencies.

Figure 5.7.1 Proposed Organizational Chart for Implementation



5.8. Justification of the Master Plan

5.8.1. Overall Benefits

The proposed Master Plan aims to: (i) attain food self-sufficiency; (ii) enhance farmers' income; (iii) increase agro-based employment opportunities; and (iv) improve social welfare conditions. In order to achieve these objectives, the Master Plan, consisting of various development schemes, has been formulated through a broad-based integrated development approach.

The Master Plan will increase agricultural production, raise incomes and improve living standards of the people residing in Marinduque. The Plan will also enable higher productivity in existing agricultural land, aquaculture development areas, and under-utilized livestock resources. Agricultural and rural infrastructures would not only improve the production base but also enhance the social welfare of the people in terms of transportation, water supply, education, communication, etc. Benefits can be expected to emerge almost immediately after investments made during the initial stage of the Plan. The majority of the rural population would benefit directly through improvement of transportation, electricity services, agricultural extension services, marketing, and other social services and facilities.

5.8.2. Economic Rate of Return of the Master Plan

Project costs of the Master Plan are assumed to include 50% of non-traded goods and services which are converted into border prices based on the financial projects costs multiplied by a Standard Conversion Factor (SCF) of 0.86. Transfer payments such as taxes and subsidies are excluded in the economic costs.

Major direct benefits arising from the Master Plan include: (i) increased agricultural production, particularly rice and vegetables; (ii) prevention of future flood damages; (iii) improved transportation system; (iv) improved water supply system; and (v) improved rural electrification. Benefits to be derived from drainage improvement are reflected in the increased agricultural production.

Based on the economic costs and benefits as described above, the Economic Rate of Return (EIRR) of the Master Plan is estimated at 26%. Basic assumptions underlying the calculation of the EIRR are detailed in Appendix K. The economic rate of return calculation excludes the benefits arising from improvement of social services and facilities as they are primarily for improvements in the quality of life which are difficult to quantify.

5.8.3. Farm Income and Rural Employment

The majority of families in Marinduque will enjoy higher levels of income and other benefits. The net annual farm income of a typical farm holding of 2.0 ha (1.0 ha of rice and 1.0 ha of coconut land) is estimated to increase from 9,255 pesos to 21,702 pesos as a result of improved agricultural services and irrigation facilities.

The labor force which is required for integrated agricultural development will be estimated at 8.7 million man-days, and about 44,000 laborers will be necessary according to the assumption of 200 work days per year.

The Master Plan will increase the utilization of the surplus rural labor force and it is estimated that about 7.9 million man-days of labor will be required during the implementation of the Master Plan. The Plan would generate about 0.2 million man-days of employment per year at full development for operation and maintenance of the project facilities.

5.8.4. Improvement of Agricultural and Rural Infrastructures

Many Barangays in Marinduque have very poor accessibility, particularly in the interior areas of the province. The construction and improvement of roads will remove this constraint and will bring these Barangays into the mainstream of the regional economy. As a result, mobility of goods and services will be improved and economic activities will be expanded.

Agricultural productivity will directly or indirectly be upgraded through improvements in the input supply system, marketing and storage and processing facilities.

The development of rural infrastructure facilities and social services will contribute substantially towards reducing the incidence of disease, improving health standards and raising the general quality of life in the province.

5.9. Selection of Priority Development Area

5.9.1. Criteria for Selection

The criteria for the selection of priority areas for integrated agricultural development of Marinduque would take into account the agricultural and socio-economic conditions. The agricultural factors would consider soil, geographic and water resources condition, present land use, present investment presence of basic agricultural and infrastructure facilities. The socio-economic factors considered were the demographic conditions, social infrastructures and farm household economy.

5.9.2. Selection of Priority Development Area

The following seven sub-areas totalling an area of 68 sq.km were selected as priority development areas based on the aforementioned criteria for selection. These areas are located on the flat alluvial plains with a slope of less than 3%, with available water resources for irrigation, densely populated and with the existing main road constructed as a farm-to-market road. Low investment costs and early returns will be expected from the development of these areas. (refer to Figure 5.9.1)

Summary of Area

Gross area of Province	952.9 sq.km
Study Area	805.0 sq.km
- Priority Development Area	68.0 sq.km
- Other Development Area	737.0 sq.km

<u>Proposed Area</u>	<u>Municipality</u>	<u>Acreage</u> (sq.km)	<u>Remarks</u>
1. Bagtingon	Buenavista	7.4	Based on the detailed topographic map with a scale of 1:10,000.
2. Gasan	Gasan	9.2	
3. Boac	Boac	16.4	
4. Mogpog	Mogpog	8.4	
5. Sta. Cruz	Sta. Cruz	5.2	
6. Tagum-Angas	Sta. Cruz	14.7	
7. Matuyatuya	Torrijos	6.7	
<u>Total</u>		<u>68.0</u>	

5.9.3. Priority Ranking of Priority Development Areas

The priority development areas selected in the preceding section have further been assessed from the viewpoint of development needs as well as development potential/incentives in order to identify the priority development area(s) which should have higher priority in the implementation stage. Priority ranking of the development areas has been attempted using several indicators showing development needs and potential/incentives. The indicators such as income level, power availability, road pavement ratio, water supply ratio, and irrigation ratio have been used for the development needs category. The indicators such as labor availability, landholding size, land tenure status, sharing arrangement, and agricultural land availability have been used for the development potential/incentives category.

The Tagum-Angas area is ranked first in the development need category, followed by Bagtingon and Matuyatuya areas. In development potential/incentives category, the Sta. Cruz area is ranked first, followed by Tagum-Angas and Bagtingon areas. Average rank of each category has been calculated and converted into weight points according to a points system.

As a result of the computation, the Tagum-Angas area with a points total of 66 has been ranked first followed by the Bagtingon area with a points total 63. The Mogpog, Sta. Cruz and Matuyatuya areas have been ranked third with the same points total of 62 each. (refer to Table 5.9.1)

5.9.4. Priority Development Plan Project

- Marinduque Agricultural Development and Promotion Project
(MADPP)

The MADPP plan shall be drawn up with consideration for not only the inhabitants of the MADPP Area but all the people of Marinduque Island. Besides the above evaluation of the Area, the

Project Area will play a vitally important role as a keystone of the agricultural development of the whole of Marinduque with various major facilities provided. MADPP with its various facilities is considered to be a pioneer project of the development of the six priority projects and remote islands in other provinces.

a) Agricultural Development Plan

The local farmers of Marinduque Island as well as those of the priority project area will have to improve their technology for farm management and crop cultivation. At present, however, budget shortages for this purpose have hampered the extension workers and farmers, preventing them from receiving sufficient practical education and the training regarding essential farming techniques. The existing facilities cannot adequately serve the educational purposes due to shortage in equipment and materials, although currently used during educational gatherings seminars, training for farm housewives, youths and extension workers. The introduction of audio-visual equipment, the system of inviting guest lecturers, etc. will enhance the education and training more effectively and efficiently.

Animal husbandry will be encouraged as a profitable side business of farmers in the island with limited farmland and steep topography, so as to increase farm income. The existing Marinduque Animal Propagation Station is not adequately equipped with artificial insemination tools and instruments for large-size animals, although available for small-size animals. Improvement and upgrading of these facilities and equipment will enable the number of animals to be increased as well as to improve the quality of the species by crossing with frozen semen.

The upgrading of farming technology of the local farmers will require not only the upgrading of the extension workers' technology but also provide the farmers with practical training in the fields and show the actual results through demonstration farming. When

demonstration projects for irrigated and rainfed paddy cropping are successfully finished, the demonstration will be carried out in other locations to transfer the necessary technology to the other farmers in the locality. In general, one demonstration farm should be able to show new farming technology for two to three years, and after withdrawal, the local farmers will have to try their utmost to adequately maintain and further develop the acquired technology through self-help effort.

Quality of farm produce after harvesting will be a major factor to give serious effect to price-decision of farm products. And an increase in the manpower required for post-harvesting work has served to lower the labour productivity of the farms in this Area.

Improvement in labour-productivity will be made through improvement of post-harvesting techniques. Since the necessary post-harvesting equipment/machines are nonexistent throughout the Area, introduction of these machines and equipment for paddy and corn is essential to raise the prices of the farm products and the labour productivity.

The major dimensions of MADPP are as follows.

Gross area	:	1,470 ha
Population (1989 estimated)	:	5,400
Number of farm household	:	804 (100%)
Landowner	:	409 (58)
Tenants	:	335 (42)

Major project components of MADPP are as follows:

- Agricultural development

- . Strengthening of the Marinduque Agricultural Development Promotion Farm 1
- . Rehabilitation of Marinduque Breeding Station 1
- . DA Municipal Nursery 1

. Irrigated Paddy Cultivation Demonstration Farm	1
. Rainfed Paddy/Diversified Crop Cultivation	1
. Post-harvest Programs for Rice	1
. Post-harvest Programs for Corn	1
. Multi-purpose Agricultural Cooperative	1
- Agricultural infrastructure development	
. Irrigation (480 ha paddy; 150 ha diversified crop)	630 ha
. Farm-to-Market Road (Rehabilitation)	10 km
(New construction)	15 km
(Multi-purpose pavement)	20 pls
. Village water supply	
(Main pipeline)	6 km
(Distribution pipeline)	19 km
(Public faucets)	70 pls
- Rural infrastructure development	
. Rural electrification	
(Transmission line 69 KV)	8 km
(Distribution line 1 ϕ)	3 km
(Secondary line)	1.5 km
. Waiting shed	17 pls
. Education	
(Rehabilitation of Tagum E/S)	6 classes
(Rehabilitation of Napo E/S)	3 classes
(Construction of school toilet)	2 pls
- Aquaculture development	
(Improvement of BFCDF)	1 pls
(Hatchery of shrimp)	1 pls
(Fish/shrimp processing plant)	1 pls

Table 5.9.1 Priority Ranking of Priority Development Area

Parameters	Priority Development Areas						
	Bagtingon (Buenavista)	Gasán	Boac	Mogpog	Sta. Cruz	Tagum-Angas (Sta. Cruz)	Matuyatuya (Torrijos)
1. Development Need							
a. Income Level	1	6	3	4	2	2	5
b. Power Availability	2	5	6	4	3	3	1
c. Road Pavement Ratio	3	4	5	6	7	1	2
d. Water Supply	3	4	6	1	2	2	5
e. Irrigation Facility	6	2	5	2	7	1	4
f. Average Rank	3.0	4.2	5.0	3.4	4.2	1.8	3.4
g. Weight	31	29	27	31	29	34	31
2. Potential/Incentives							
a. Labor Availability	6	5	2	4	1	1	3
b. Land Holding	2	4	6	3	5	5	1
c. Land Tenure	2	7	4	3	1	4	6
d. Sharing Arrangement	1	4	6	4	1	1	1
e. Agricultural Land Availability	2	5	6	1	3	3	4
f. Average Rank	2.6	5.0	4.8	3.0	2.2	2.8	3.0
f. Weight	32	27	28	31	33	32	31
3. Total Weight	63	56	55	62	62	66	62
4. Overall Rank	2	6	7	3	3	1	3

Notes: Point System Used:

Average Rank	Weight
1.00 - 1.49	35
1.50 - 1.99	34
2.00 - 2.49	33
2.50 - 2.99	32
3.00 - 3.49	31
3.50 - 3.99	30

Table 5-9-2 Annual Family Income

<u>Development Area (Municipality)</u>	<u>Sample Barangays</u>	<u>Annual Income (P)</u>	<u>Rank</u>
Bagtingon (Buenavista)	3	7,500	1
Gasán	3	18,600	6
Boac	4	15,700	3
Mogpog	3	16,700	4
Sta. Cruz	4	12,250	2
Tagum-Angas (Sta. Cruz)	(4)	12,250	2
Matuyatuya (Torrijos)	3	18,300	5

Source: 20 Barangays Sample Survey conducted by the Study Team

Note : The lower the income, the higher the rank

Table 5-9-3 Power Availability

<u>Municipality</u>	<u>Ratio of Electrification</u>	<u>Rank</u>
Buenavista	18.5%	2
Gasán	29.5%	5
Boac	35.5%	6
Mogpog	26.2%	4
Sta. Cruz	21.2%	3
Torrijos	14.9%	1

Source: MARELCO, Marinduque

Note : The lower the ratio, the higher the rank.

Table 5-9-4 Road Pavement Ratio

<u>Development Area</u>	<u>Road Pavement Ratio</u>	<u>Rank</u>
Bagtison	92.9%	3
Gasán	95.2%	4
Boac	99.1%	5
Mogpog	99.3%	6
Sta. Cruz	100.0%	7
Tagum-Angas	86.0%	1
Matuyatuya	90.0%	2

Source: DPWH, Marinduque

- Note : 1) Pavement ratio including asphalt, concrete and gravel pavement
 2) The lower the ratio, the higher the rank

Table 5-9-5 Water Supply

<u>Municipality</u>	<u>Water Supply Ratio</u>	<u>Rank</u>
Buenavista	42%	3
Gasán	64%	4
Boac	89%	6
Mogpog	31%	1
Sta. Cruz	38%	2
Torrijos	68%	5

Source: DPWH, Marinduque

- Note : The lower the ratio, the higher the rank

Table 5-9-6 Irrigation Facility

<u>Development Area</u>	<u>Irrigation Ratio</u>	<u>Rank</u>
Bagtingon	86.2%	6
Gasán	50.0%	2
Boac	81.4%	5
Mogpog	50.0%	2
Sta. Cruz	92.8%	7
Tagum-Angas	0	1
Matuyatuya	36.1%	4

Source: NIA, Marinduque

Note : The lower the ratio, the higher the rank

Table 5-9-7 Labor Availability

<u>Municipality</u>	<u>No. of Farm Household</u>	<u>Rank</u>
Buenavista	1,200	6
Gasán	2,100	5
Boac	3,500	2
Mogpog	2,200	4
Sta. Cruz	4,700	1
Torrijos	3,000	3

Source: 1980 Census of Agriculture

Note : The higher the number, the higher the rank

Table 5-9-8 Land Holding

<u>Municipality</u>	<u>Average Land Holding</u>	<u>Rank</u>
Buenavista	3.10 ha	2
Gasán	2.59 ha	4
Boac	2.45 ha	6
Mogpog	2.62 ha	3
Sta. Cruz	2.47 ha	5
Torrijos	3.27 ha	1

Source: 1980 Census of Agriculture

Note : The higher the size, the higher the rank

Table 5-9-9 Land Tenure

<u>Development Area</u>	<u>Percentage of Landowner</u>	<u>Rank</u>
Bagtingon	60.6%	2
Gasán	40.3%	7
Boac	56.8%	5
Mogpog	58.4%	3
Sta. Cruz	62.6%	1
Tagum-Angas	57.9%	4
Matuyatuya	53.8%	6

Source: 95 Barangays Land Tenure Survey conducted by the Study Team

Note : The higher the ratio, the higher the rank

Table 5-9-10 Sharing Arrangement (Paddy)

<u>Municipality</u>	<u>Ratio of Sharing Arrangement (Tenant vs Landowner)</u>	<u>Rank</u>
Buenavista	75%	1
Gasán	66%	4
Boac	61%	6
Mogpog	66%	4
Sta. Cruz	75%	1
Torrijos	75%	1

Source: 20 Barangays Sample Survey conducted by the Study Team

Note : The higher the percentage, the higher the rank

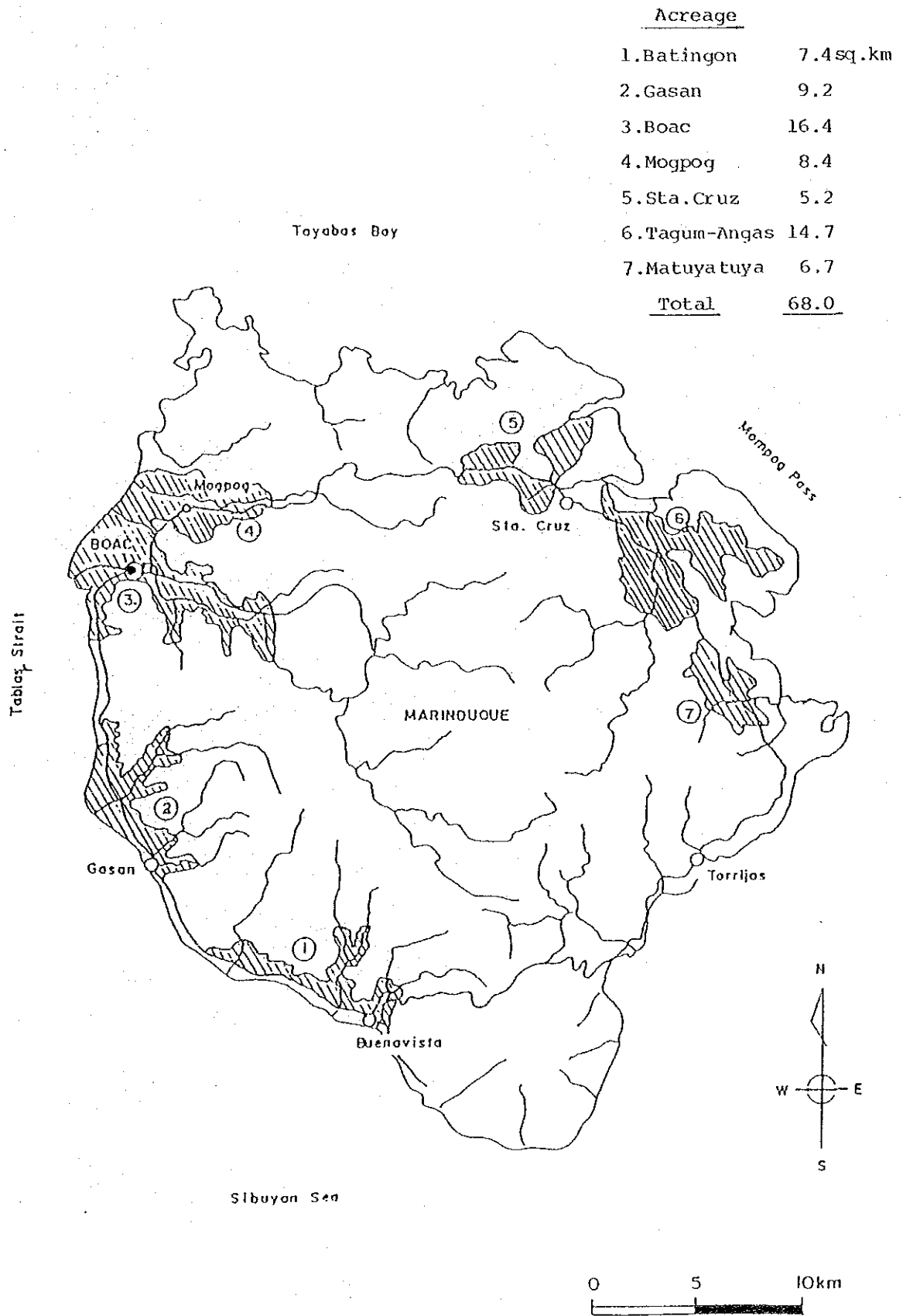
Table 5-9-11 Agricultural Land Availability

<u>Municipality</u>	<u>Percentage of Agricultural Land</u>	<u>Rank</u>
Buenavista	48.8%	2
Gasán	45.1%	5
Boac	40.5%	6
Mogpog	64.8%	1
Sta. Cruz	46.6%	3
Torrijos	45.9%	4

Source: 1980 Census of Agriculture

Note : The higher the rate, the higher the rank

Figure 5.9.1 Location Map of Priority Development Area



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