

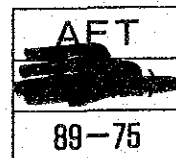
REPUBLIC OF THE PHILIPPINES

**MASTER PLAN STUDY
ON
THE INTEGRATED AGRICULTURAL DEVELOPMENT PROJECT
IN MARINDUQUE**

MAIN REPORT

JANUARY 1990

JAPAN INTERNATIONAL COOPERATION AGENCY



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国際協力事業団

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PREFACE

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct a Master Plan Study on the Integrated Agricultural Development Project in Marinduque and has entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a survey team headed by Mr. Masahiro Iida, Sanyu Consultants Inc., three times from November, 1988 to August, 1989.

The team held discussions with the officials concerned of the Government of the Republic of the Philippines and conducted a field survey. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of the Philippines for their close cooperation extended to the team.

January, 1990.

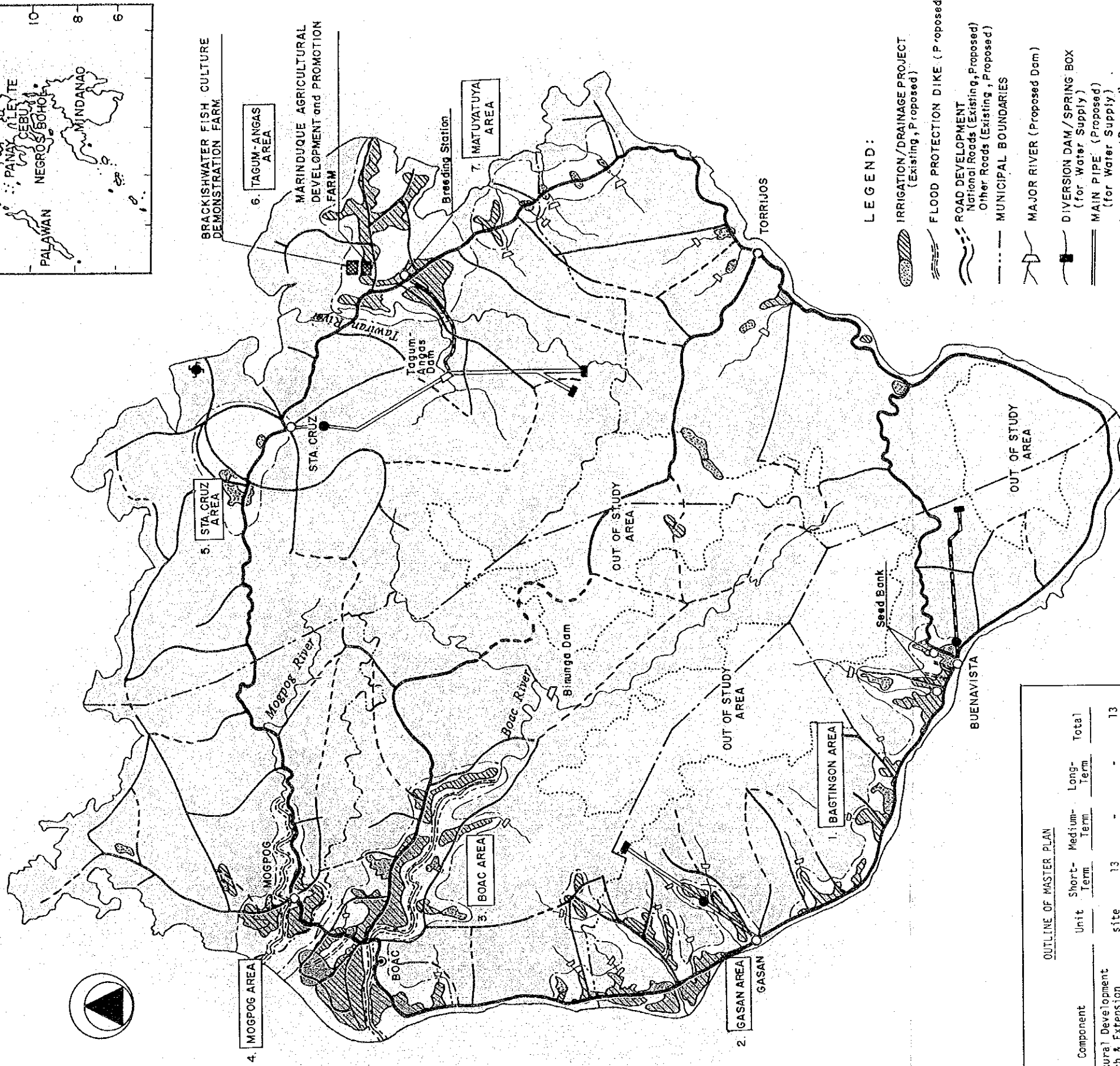
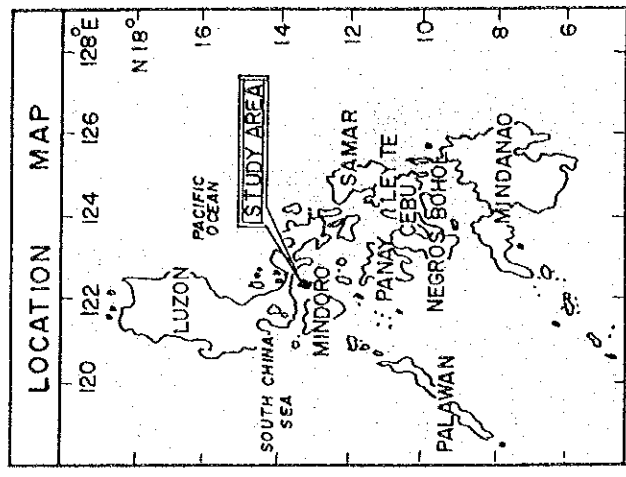


KENSUKE YANAGIYA

President

Japan International Cooperation Agency

GENERAL PLAN THE INTEGRATED AGRICULTURAL DEVELOPMENT PROJECT IN MARINDUQUE



- LEGEND:**
- IRRIGATION/ DRAINAGE PROJECT (Existing, Proposed)
 - FLOOD PROTECTION DIKE (Proposed)
 - ROAD DEVELOPMENT
National Roads (Existing, Proposed)
Other Roads (Existing, Proposed)
 - MUNICIPAL BOUNDARIES
 - MAJOR RIVER (Proposed Dam)
 - DIVERSION DAM/ SPRING BOX (for Water Supply)
 - MAIN PIPE (Proposed) (for Water Supply)
 - PIPE LINE (Proposed) (for Village Water Supply)
 - GENERATOR (Proposed)
 - PRIORITY DEVELOPMENT AREA

	Present (ha)	Proposed (ha)
I. Agricultural Area		
Agricultural Area	5,400	5,650
Paddy Rice	4,020	4,300
Diversified Crops	32,470	29,550
Coconut Trees	2,810	4,000
Meadows and Others	-	2,100
Fruit	-	-
II. Forest Area		
Shrub/Grasses	24,370	7,300
Forest	5,530	21,500
III. Wetland and Others		
	5,990	6,100
Total	80,500	80,500

Component	Unit	Term			Total
		Short-Term	Medium-Term	Long-Term	
1. Agricultural Development					
1) Research & Extension	site	13	2	-	13
2) Nurseries & Seed Bank	"	11	12	6	29
3) Demonstration Farm	"	8	11	9	28
4) Post-Harvest	"	15	11	3	29
5) Livestock Development	"	7	16	17	40
6) Farmer's Organization	"	3	4	-	7
7) Marketing & Trading	"	-	-	-	-
2. Agricultural Infrastructure Development					
1) Irrigation/Drainage	ha	1,650	680	1,340	3,670
2) Flood Protection	km	12	11	20	43
3) Rural Road	km	290	240	400	930
4) Village Water Supply	m ³ /d	2,870	-	-	2,870
3. Rural Infrastructure Development					
1) Rural Water Supply	m ³ /d	3,380	1,500	2,030	6,910
2) Hydro-Power & Generator	KN	9,000	300	600	9,900
3) Rural Electrification	km	490	150	210	850
4) Traffic System	place	245	215	400	860
5) Health & Medical Service	"	20	10	-	30
6) Education & Welfare	"	300	-	100	400
7) Communication	km	40	-	-	40
4. Aquaculture					
	place	1	-	-	1
5. MWDPP					

SUMMARY

(General)

1.01 This report contains the findings of the field surveys which were carried out on three occasions during the period from November 14, 1988 to August 26, 1989, and results of the analysis of data and information, based on the Implementing Arrangement agreed between the Government of the Philippines and Japan International Cooperation Agency (JICA) on July 15, 1988.

(National and Regional Socio-Economic Conditions)

2.01 Economic performance of the Philippines has shown favorable trends during the last two years. With the resumption of economic growth, the emphasis in policy is also shifting from short-term concerns of stability and crisis management to long-term objectives of sustained growth and improvement in socio-economic equity. The agricultural sector continues to be the mainstay of the Philippine economy, accounting for about 50% of total employment, and 30% of Gross Domestic Product (GDP) in 1986. The low growth in 1987 was mainly due to the generally poor harvests of both cash and food crops due to adverse weather conditions and contraction in forestry value-added.

2.02 The Medium-Term Philippine Development Plan (MTPDP), although the original one was updated by NEDA in July 1988, seeks to shift the focus of the development strategy from growth maximization to rural development, poverty alleviation, and reduction in social inequity.

2.03 The Southern Tagalog Region, surrounding the capital of the Philippines, Manila, is composed of eleven provinces. The region has a total estimated population of about 7.9 million in 1989. The region accounts for large agricultural and fishery resources having a total farm area of 1.15 million ha or 13% of the total national farm area.

2.04 The Medium-Term Southern Tagalog Region Development Plan, 1987-1992 has been prepared to try and achieve economic recovery in the short-run and sustainable growth in the long-run in line with the MTPDP. The plan projects that for the region, population will reach 8.5 million by 1992, gross regional domestic product (GRDP) will increase to about 18,800 million pesos with an annual rate of increase of 6.74% and the employment rate will expand to 3.3 million with an annual-growth rate of 6.32%.

(Location and Area)

3.01 The province of Marinduque is about 170 km from Manila, and belongs to the Southern Tagalog Region (Region IV). The province consists of the Marinduque Island and 17 islets. The round-shaped main island which is about 35 km in diameter is located at 122°32' E and 13°20' N. The province consists of six municipalities; namely, Boac, Buenavista, Gasan, Mogpog, Torrijos, and Sta. Cruz with a physical land area of 959.2 sq.km. The municipality is composed of 218 Barangays, as of 1989. The provincial capital is Boac.

3.02 The total area of the Study Area is 805 sq.km excluding the outlying islets, forest areas and non-cultivable lands.

(Natural Conditions)

3.03 The climate of the province can be categorized as Type IV according to the Corouas Climate classification, having no clear boundary between dry and wet seasons. An annual mean rainfall of about 2,030 mm was recorded at Boac, 73% of which occurs during the wet season from June to December. Marinduque has an annual mean temperature of 27.0°C, annual mean humidity of 83% and mean wind velocity of 2.4 m/sec. Total cyclones affects the province once a year.

- 3.04 The island consists of about ten percent of alluvial plains and 90% of rolling hilly areas. A dormant volcano, Mt. Malindig which is 1,157 m high is located at the southernmost part of the Island. Mangrove and nipa are mainly grown in the tidal swampy areas of about 6,000 ha located in the northern part of the Island.
- 3.05 The rivers have small drainage areas of about 20 sq.km on average, and river beds have steep slopes of more than 1/100, except in the Boac, Mogpog, and Tawiran rivers. These three rivers have swampy tidal areas downstream from the river basin. River discharges are observed on the western side of the Island throughout the year due to good vegetation of the river basin. The rivers on the eastern part have no water during the less rain season or dry season due to poor vegetation of the drainage areas.
- 3.06 A drought discharge of 1.76 cu.m/sec/100 sq.km usually occurs in April. The estimated flood peak discharge is 6.0 cu.m/sec/sq.km based on the flood mark at the Boac river. The maximum discharge of 8.3 cu.m/sec/sq.km is usually observed during the wet season.
- 3.07 The geology of Marinduque consists of serpentinites and volcanics as basement rocks overlain by volcanic and sedimentary rocks of Eocene to Miocene in age which were intruded by diorite. Overlying these rocks are younger pyroclastic and clastic rocks. Marinduque has low seismic profile as no earthquake with magnitude greater than 5 has been recorded within its vicinity.
- 3.08 The Island is divided into shallow well, deep well and difficult zones which occupy about 10%, 50% and 40% of the area, respectively. Safe yield is about 43,000 lpd from shallow wells and 320,000 lpd from deep wells.

3.09 The alluvial soils representative of San Miguel sandy soil located mainly at the alluvial plain covers an area of about 6,800 ha with deep, fertile, well drained and suitable soil for cultivation of various crops. The soils in the hilly and mountainous areas of about 68,500 ha in total are generally classified as clay and clay loam. The soils are mainly divided into Maranlig clay (about 17,100 ha), Banto clay loam (about 15,500 ha) and Banhigan clay loam (about 11,500 ha). The Maranlig clay soil has low fertility due to erosion and other soils have different soil characters to fit crop cultivation.

(Socio-Economic conditions)

3.10 The estimated population of the province was about 206,000 in 1989, and the future estimated population will reach about 305,540 in 2010 with an annual growth rate of 1.9%. The population density is 212 persons per sq.km in 1989.

3.11 Working age population of more than 15 years of age was estimated at 123,000 in 1987, about 76,000 of which was labour force. Of total labor force, 65,000 are employed and about 11,000 are unemployed with an unemployment rate of 14.5% which is the highest in Region IV.

3.12 The main economic activity in Marinduque is agriculture, the main crop of which is coconut, followed by rice and corn. Fishery is the dominant source of livelihood in the province. The main industry is mining, producing about 13% of the nation's copper. Commerce and trade in the province is facilitated through neighboring trade centers such as Lucena city in Quezon.

3.13 The 1985 Family Income and Expenditures Survey reported that the estimated total income of Marinduque was 671 million pesos for 36,608 families. The average annual household income is calculated at 18,330 pesos in 1985 which is the second lowest share among the eleven provinces in Region IV.

3.14 The provincial government is responsible for overall planning and development to improve the present socio-economic conditions in close collaboration with the line agencies and other institutions.

(Present Conditions of Agriculture)

3.15 The estimated numbers of households, farm households, and total economically active population are 38,220 households (100%), 19,420 households (51%) and 31,910, respectively.

3.16 Land with a slope of less than 18% is already fully utilized as agricultural land. The land with a slope of more than 18%, which is suitable for forest areas is partially used as coconut land and "kaingin" farming land. The agricultural land accounts for 44,700 ha (equivalent to 55% of the Study Area). The remaining land of about 29,900 ha (or 37%) is used as forest and grassland (cogon), of which about 5,530 ha is reserved forest. The swampy area is 4,910 ha (or 6%) and the remaining area of about 990 ha (or 1%) is composed of roads and rivers.

3.17 The most dominant crop is coconut with an area of 32,470 ha, which is planted on some parts of steeply sloped areas having a slope of more than 18% and also on flat areas. Palay is cultivated in paddy fields of about 5,400 ha, about 900 ha of which is irrigated, while the remaining area is rainfed. The area of about 4,020 ha is utilized for diversified crops such as corn, cassava, sweet corn, etc., of which about 3,500 ha is planted with upland rice.

3.18 The average farm size is 2.3 ha in 1989, which is lower than the national average of 2.84 ha. Farm households typically have a cultivated area of 0.5 ha. The rate of landowner including partial owner, was 74% in 1980.

3.19 The progress of land reform during the period from 1972 to August 1988 was too slow as only 27 ha of corn and paddy field were reformed to farmer beneficiaries. Afterwards, for only nine (9) months from August 1988 to April 1989, the areas of 120 ha of corn and paddy field were released to the 321 farmer beneficiaries. The accomplishment rate is 52% of the targeted area of 283 ha. The area offered voluntarily by landowners reached 835 ha in April 1989, however, delay of land survey due to the budget shortage of the Department of Land is one of the constraints. Leaseholds contracts between 1,840 landowners and 2,320 farmers have been made. The objective area is 1,023 ha.

3.20 The present farming system is based on the coconut. The typical system is coconut with paddy and diversified crops such as sweet potato, cassava, etc. Other farming systems such as animal husbandry and fruit cultivation can be observed.

3.21 In the irrigation area, farmers can cultivate a double crop of paddy each year. The first paddy is planted from May to September, and the second from November to March. On the upland fields, paddy is planted from July to November depending on rainfall. Recently, under the DA guidance, coconut areas located near the backyard farm were intercropped with vegetables which provided high profits to the farmers.

3.22 Farmers use draft animals such as carabaos or cattle for plowing, harrowing, and land leveling. The cultivated depth is shallow, usually less than 10 cm. HYVs of palay are commonly planted at the irrigated and rainfed paddy fields. The HYVs are transplanted at intervals of 12 to 15 cm two weeks after germinating. After transplanting, fertilizers, and insecticides are not usually applied because of high prices of input materials. Hence, after transplanting, only weed control is carried out by the farmers. On the upland areas the

improved local variety is planted by the broadcasting method without fertilizer.

3.23 The yield of coconut has shown a tendency to decrease in recent years, since the age of the trees is more than 50 years. A total production of 32,200 metric tons was recorded in 1988 which is equivalent to nearly one ton per ha. Although coconut trees came to be replanting time, farmers can not afford to shoulder the investment necessary for replanting and can not supplement the decrease in income for seven to eight years after replanting.

3.24 The average production of palay for over the past five years is only 16,600 ton from 10,900 ha of planted area. The yield of palay of 1.5 ton/ha is lower than 2.4 ton/ha which is the national average. The traditional farming practice with no chemicals and dense transplanting of mixed seeds causes poor tillering, small number of grains and low maturity. The production of corn is 640 ton from the 1,020 ha field which is equivalent to 60% of the national average yield.

3.25 The fact that palay production is 16,600 tons whereas the demand is 35,500 tons show a self-sufficient ratio of 47% within the Island in 1988. The supply of 900 tons of vegetables covers only 40% of the total demand of 1,700 tons. These shortages are imported from neighbouring provinces.

(Animal Husbandry)

3.26 The number of livestock increased between 1980 and 1987, from 6,540 to 8,080 head for cattle, 20,262 to 25,262 head for carabao and 43,220 to 55,568 head for swine, because of the provincial government ban on animal exportation. Artificial insemination is conducted for swine at the Marinduque Livestock Breeding Station of DA. Since the facilities and technicians

of the Station are poor and inadequate, artificial insemination is done only on a limited basis. Foot and mouth disease and sepsis is almost entirely controlled by vaccine. Most livestock are bred in backyards.

(Post-harvest and Agro-processing)

3.27 Because of poor or no facilities and equipment, post-harvest activities such as threshing, drying, etc. of rice and corn are conducted manually, hence, the quality of farm products is poor. Most farm products are stored at the farmer's house. NFA warehouses store only imported rice. There exist 76 rice mills in the province, most of which are small-scale mills called "kiskisan" type.

3.28 Shortage of staple food such as rice and vegetables are made up by imports from neighboring provinces by NFA and the private merchants. About 95% of the coconut crop in Marinduque is exported to Lucena as copra. A public market is operated by each municipality where goods and food are sold. Some Barangays have their own markets which operate once a week.

(Agro-processing)

3.29 Due to the absence of agro-processing activities, most farm products are exported without undergoing any processing. Some wood resources are processed in sawmills into timber, however, no further processing is conducted on the timber.

(Agricultural Credit)

3.30 Agricultural credit services are provided through PNB and five branch offices of the Rural Bank. The PNB can offer loans to aquaculture, livestock, and main farm production activities, on the other hand, only the Sta. Cruz branch office can offer loans. Aside from these formal lending institutions, there are also informal lenders such as traders, landowners, relatives and other types of private financing arrangement.

(Farmer's Organization, Research and Extension)

3.31 There were 67 farming groups, 21 Irrigator's Associations, 62 Samahang Nayons, some small coconut farmer's organizations, etc. as of 1988. Most of them, however, are now inactive in their works due to shortage of staff to manage the organizations.

3.32 There are 41 extension technicians for paddy cultivation under the DA and 13 extension workers under the provincial government. The total number of these technicians is nearly equal to the national average. The training facilities for re-education of the extension technicians and for knowledge transfer of new techniques are not yet constructed. Especially, there is no extension technician for vegetable cultivation. Furthermore, the farmers could not receive the services due to the low road density in the interior and poor transport facilities.

3.33 The local manufacturing sector is closely linked with the agricultural sector which consists mainly of grain milling, food preservation, woodcraft, weaving, etc. As the major industry on Marinduque, woodcraft is faced with the problem of decreasing logs, which are suitable for handicraft.

(Present Conditions of Agricultural Infrastructure)

3.34 The existing irrigation systems cover 1,240 ha of potential areas including about 900 ha of the actual service areas (equivalent to 73% of irrigation ratio), are divided into five categories. Of the total system, 21 existing CISs with 650 ha of the potential area, can irrigate an area of 450 ha out of 650 ha (69% of irrigation ratio). About half of the CISs are not operational due to delays in repair work of the facilities damaged by typhoons, etc. The Irrigators' Associations (IA) have been established. However, about 80% are not properly managed due to a low rate of collection of water charges for

operation and maintenance of the facilities and repayment of the amortization of the construction costs. The water charge is 1.5 cavan/ha/year in standard.

3.35 There are no drainage facilities on farmland due to the steep slope of the land. About 20 flood protection dikes were constructed along the rivers and streams, but the quantity and quality of dikes was inadequate in preventing floods in the area. The operation and maintenance work is carried out by DPWH; however, a new project to construct dikes cannot be implemented due to the budget shortage of the DPWH.

3.36 The total road length amounts to 666 km, equivalent to a road density of 0.69 km/sq.km and 3.36 km/1,000 persons. Both exceed the national average. Farm-to-market roads are mainly provincial and Barangay roads. About 90% of the farm-to-market roads have either gravel or earth surface. Many roads are impassable during the wet season. Problems on the present road network are lack of farm-to-market roads, absence of farm roads, lack of road maintenance, and lack of road protection structures.

(Present Conditions of Rural Infrastructures)

3.37 The sources of water supply are wells and springs usually managed by the municipal government except those in Buenavista. The present water supply systems are inadequate. Most of the distribution pipelines are old and leaking. About 75% of the urban population avail of these water services. On the other hand, the rural population gets its water from both deep and shallow wells. About 55% of the rural population avail of these sources. All deep wells and about 90% of shallow wells can obtain water throughout the year.

- 3.38 All municipalities of Marinduque are served by the Marinduque Electric Cooperative, Inc. (MARELCO), the electric power of which is generated by Marcopper Mining Corporation in Sta. Cruz. MARELCO can supply power 24 hours a day except in strong wind or heavy rainfall conditions. The average diffusion rate is only 25%. Total power consumption is 2.9 MWH which is equivalent to seven kwh per month per household.
- 3.39 The internal transportation system in Marinduque consists of trucks, jeepneys, or tricycles. The main transportation measure is the jeepney which occupies 49% of the total number of vehicles in the province. However, the inhabitants in the interior area have to use horses or hike because of lack of roads. Ferry boats from Cawit, Balanacan and Buyabud are available to carry passengers to other provinces and daily morning flights between Gasan and Manila and an additional afternoon flight three times a week are operated by Philippine Airlines (PAL).
- 3.40 There are two public hospitals, eight rural health units, and 41 Barangay health stations with a total bed capacity of 125. The medical services of these public health institutions are operated by 220 staff including 31 doctors. However, the medical facilities, medical instruments and medical supplies of these health facilities are all insufficient. The most prevalent disease is diarrhea due to poor quality of drinking water.
- 3.41 Formal education system consists of elementary, secondary, and tertiary levels. Elementary education is being provided in 166 schools. There are 41 secondary schools and four colleges. The school attendance ratio is low due to poverty. Fully-equipped schoolhouses are rare. Almost all schoolhouses have been damaged by typhoon. The rehabilitation work has not been completed yet due to budget shortages.

3.42 There are about 33,200 dwelling units in Marinduque. The occupancy rate is about 97%. Almost all houses are built from wood and bamboo. They are frequently damaged by typhoons.

3.43 The province has postal, telephone and telegraph services and radio communication. There is no public telephone services in Marinduque, but there exist commercial telephone services in Boac and Mogpog. Long-distance calls outside the province are available only from Boac.

(Social Welfare)

3.44 Welfare in Marinduque is classified into family and community welfare, child and youth welfare, women's welfare, and disabled person's welfare. Welfare activities cannot be adequately implemented because of insufficient budget.

(Aquaculture)

3.45 Recently, fishing for marine products in the Philippines has declined considerably due primarily to the over-exploitation of traditional fishing grounds. The importance of aquaculture has to be seen from the point of view of source of animal protein, foreign exchange earnings from fish exports, shrimps and related products. The share of aquaculture production in fish supply grew to 21% in 1985. The Philippines has developed and gained high aquacultural techniques, especially in shrimp and Bangus culture.

3.46 Per capita consumption of fish products in Marinduque is only 5.6 kg/year, which is lower than the national average. Fish culture ponds are rapidly expanding up to 700 ha (about 600 ha of Bangus and about 100 ha of shrimp) operated by 55 private owners. These ponds have a scale of 6 to 16 ha and are located in the northern parts of the Island, or in the swampy areas of Mogpog and Sta. Cruz. The yield is only about 1.0 ton/ha. The culture technology should be improved.

3.47 The Brackishwater Fish Culture Demonstration Farm is equipped with a building and 8 fish ponds totaling 4.7 ha. However, the facilities of these fish ponds are vulnerable to typhoons and heavy rains due to poor construction. The laboratory has only simple instruments such as thermometers, a PH meter and a salinity meter.

(Forestry)

3.48 As of 1988, the total forest land which belongs to the government is approximately 21,600 ha. The province of Marinduque however, has no existing watershed projects to prevent the forest from denudation. Therefore the forest protection area has to be identified in order to set up rehabilitation projects for watershed purposes and preservation of the ecological balance.

(Inquiry Survey)

3.49 The inquiry survey was carried out at 50 selected Barangays in the Study Area in order to understand the felt needs of the inhabitants. The inhabitants' priority is the development of a water supply system followed by rural electrification, roads and upgrading of the standard of living. The problems of farming tools for agricultural production still exist, although they were only considered sixth in priority by the respondents.

(Development Target)

- 4.01 (1) The target year is 2010. This development period of 20 years is divided into three stages; namely, Short-Term Development (5 years), Medium-Term Development (10 years) and Long-Term Development (20 years).
- (2) The attainment of food self-sufficiency within the province is most urgent and important.
- (3) In the target year, the estimated population will be 305,000, the estimated number of households will be 56,700, the estimated number of farm households will be 28,800 with a farm household population of 47,400.

- (4) The targets on Phase I, II and III of Land Reform should be accomplished as soon as possible.
- (5) The numbers of labor force population in 1995, in 2000 and in 2010 are estimated at 90,000, 117,000 and 141,000, respectively. The estimated numbers of employed population are 80,000 in 1995, 117,000 in 2000 and 135,000 in 2010, respectively.
- (6) As the target of economic growth, the family income will be improved to 21,875 pesos in 1995, 29,985 pesos in 2000 and 46,137 pesos in 2010.

(Area Development Plan)

4.02 A development plan by zone would be proposed for the promotion of the agricultural development plan. Based on the natural and socio-economic conditions, the province would be divided into the following three zones:

- (1) Northern Zone : The development of paddy and vegetable cultivation would be proposed in addition to aquaculture development. This zone would become the nucleus of agriculture development in Marinduque.
- (2) Southern Zone : The development mainly of animal husbandry and vegetable cultivation would be proposed.
- (3) Western Zone : The emphasis of development is placed on paddy and vegetable cultivation. Specifically, coconut flatland areas would be intensively utilized to produce increased farm output.

(Proposed Land Use Plan)

4.03 With the present soil, water resources, slope and geological conditions, the following five land use plans would be proposed.

- (1) Flatland (land slope of 0 to 8%)
 Land slope of 0 to 3% : Intensive use of the present cultivated areas and the idle areas in coconut plantations
 Land slope of 3 to 8% : Vegetable and corn cultivations in the idle areas of coconut plantations.
- (2) Hilly land (land slope of 8 to 15%)
 The grasslands (cogon) will be converted to pasture for animal husbandry development and the idle areas in the coconut plantations would be used as vegetable plantation areas and orchards.
- (3) Hillsides (land slope of 15 to 18%)
 Considering soil conservation measures, orchards and pastures would be recommended.
- (4) Forest (land slope of more than 18%)
 The lands in this category will be used as forest reserves to maintain water resource.
- (5) Swampy area
 These areas would be used for aquaculture development, taking into consideration environmental and ecological measures of mangrove and nipa palm areas.

4.04 The summary of the proposed land use is presented as follows:

	<u>Present</u> (ha)	<u>Proposed</u> (ha)	<u>Remarks</u>
Agricultural land			
Paddy field	5,400	5,650	
Upland field	4,020	4,300	
Coconut	32,470	29,550	
Other crops	2,810	4,000	
Orchards	-	2,100	
<u>Sub-total</u>	<u>44,700</u>	<u>45,600</u>	
Forest area	29,900	28,800	
Swampy area	4,910	4,900	Fish pond: present 700 ha, proposed 1,500 ha
Others	990	1,200	
<u>Total</u>	<u>80,500</u>	<u>80,500</u>	

The net intercropped areas of coconut plantation are as follows:

Irrigated paddy field	: 1,240 ha
Diversified crop field	: 1,350 ha (inclusive 600 ha of irrigation field)
Fruit field	: 1,700 ha
Industrial crop field	: 1,500 ha
Fodder crop field	: 4,000 ha
<u>Total</u>	<u>: 9,790 ha</u>

(Soil Conservation)

4.05 For soil conservation of sloped cogon grassland and idle land, vegetation by ipil-ipil or napier grass would be introduced in order to reduce the velocity of surface runoff water, increase percolation rate of soil and also to reduce the shock of raindrops on the surface.

(Water Resources Development Plan)

4.06 The total amount of water resources in the Marinduque Island is estimated at 1,330 MCM per annum. At present, about 99% of the water resources are not being used and drained into the sea. The water utilization rate would be increased to 8% with the introduction of various irrigation projects.

(Agricultural Development Scheme)

5.01 To promote the agricultural development program, it is necessary to improve the existing agricultural infrastructural facilities and provide new farming technology.

The government agencies involved in agricultural supporting services would be responsible for the introduction of new techniques, such as improved seeds, sanitation program for animals, etc. The farmer's cooperatives, on the other hand,

would help in the operation and maintenance of agricultural infrastructure, distribution of farm inputs, storage and marketing of farm inputs/outputs and the management of agricultural machines. And also, the provincial government will provide opportunities for technicians to attend training courses and will request some specialists to provide lectures and training in the province, if necessary.

(Farming Technology Development)

5.02 Crops which are easy to cultivate would be recommended at the initial stage, while highly profitable cash crops needing higher technology would be introduced at the later stage. The major farming technique such as development and introduction of improved seeds, soil layer improvement by deep plowing, fertilization and water management, pest and disease controls, introduction of rotation cropping, application of organic matter, establishment of pruning techniques, and introduction of grafting would be developed and introduced. Considering the distant location of the island from the big markets, the crops which can easily be stored and transported would be selected and recommended.

(Farming System Development)

5.03 Taking into consideration soil and climate conditions, supply and demand of farm products in the market, availability of labor force in the productive areas, willingness of farmers, etc., the following three patterns of crop production are proposed.

- (1) Paddy with vegetable cultivation : Flat and gradient areas
- (2) Fruits with other crops : Hilly and sloping areas
- (3) Animal husbandry with other crops: - do -

(Crop Production Plan)

5.04 The rice production is the top priority in attaining food self-sufficiency. Double cropping of paddy would be recommended for irrigated farms. Improved farming techniques would be introduced for both the rainfed and irrigated farms. The acreage of paddy field is expected to increase from 5,400 ha to 5,650 ha in the future, as the land utilization rate is increased. The yield of palay from irrigated fields would be increased from 2.5 ton/ha at present to 4.0 ton/ha in the future. As a result, the production of palay would increase from 16,600 to 38,700 tons. On the other hand, demand of paddy is expected to increase from 35,500 to 45,900 tons including losses and seed requirements. Consequently, the self-sufficiency ratio of 47% at present would be increased to 84% by the target year. Based on the assumption of per capita annual consumption of 20 kg of vegetables, the amount of 6,100 tons of vegetables to be produced from about 600 ha of upland fields, would be necessary in the future.

(Livestock Development Scheme)

5.05 The present grasslands in the southern zone are proposed to be used for livestock development. The number of livestock is expected to increase by using agricultural by-products and concentrated feeds and by increasing the number of animal husbandry technicians. It is also expected that introduction of technologies and facilities for artificial insemination would further help increase the number of livestock.

(Agricultural Supporting Services Scheme)

5.06 In addition to paddy cultivation research activities, research on other crops would also be undertaken. Personnel requirement would also be planned. The existing provincial training center at Tamayo would be strengthened by introducing field application of newly developed farming techniques, and by

providing demonstration farms for training extension workers and farmers. A seed farm for vegetable cultivations would be proposed to ensure a stable supply of HYV seeds at lower prices. The seed farm would be located in a selected area to ensure the quality of seeds/nursery produced.

- 5.07 Existing extension workers, well versed on paddy cultivation techniques would be trained on diversified crop cultivation techniques. They can, in turn, infuse newly acquired techniques to the farmers. Farmers, on the other hand, would be encouraged to join multi-purpose agricultural cooperatives (MPAC). The proposed MPAC has functions of cooperative bargaining for farm inputs and outputs and cooperative use of farming machines. The MPAC will play a very important role for agricultural development.

(Agricultural Development Projects)

- 5.08 To promote the agricultural development of Marinduque, introduction and demonstration of new farming techniques, improvement of post-harvest facilities, stable supply of farm inputs, breeding and raising of livestock, improvement of marketing system, and farmer's organization are necessary. Vitalization of manpower resources through education and training of extension workers and farmers for propagation of new farming techniques is important. In order to accomplish these objectives, strengthening of DA's research staff, improvement of Marinduque Agricultural Development and Promotion Farm, strengthening of agricultural extension workers, pest/disease observatory, stable supply of seed/nursery, demonstration farms of various farming techniques, improvement of post-harvest facilities, effective use of coconut resources, increase of animals and improvement of registration system of livestock, introduction of integrated agricultural trading center, multi-purpose agricultural cooperative, etc. are proposed.

(Small-Scale and Cottage Industries)

5.09 Promotion of small-scale and cottage industries is one of the important sectors in regional development planning in terms of generating employment opportunities and income as well as preventing out-migration. The DTI Marinduque Office will be in charge of fostering the activities of small-scale and cottage industries, giving technical guidance on the existing industries and providing guidelines for establishing new industries.

(Agricultural Infrastructure Development)

5.10 The rehabilitation of the existing irrigation systems is accorded high priority, and the development of new irrigation systems will be carried out. During the short-term development, the rehabilitation work on 21 existing CISOs and five CIPs in totaling 1,500 ha of paddy fields would be proposed. Paddy fields of 680 ha on the medium-term development and 1,340 ha on the long-term development will be irrigated. The intercropped irrigation area is 1,240 ha. Consequently, the total irrigation paddy field will be 3,910 ha including 390 ha of the private irrigated paddy fields.

5.11 The drainage module of 6 lit/sec/ha and drainage canal density of 30 m per ha is proposed for farm drainage facilities. Flood protection dikes of 13.5 km are proposed for the Mogpog river, 26.5 km for the Boac river, 1.6 km for Patat in Bagtingon, and 2.0 km for Cabuyao in Mansabang. Farmland of 365 ha will thus be protected from further inundation.

5.12 Objectives of the rural road development are to improve accessibility between Barangays and towns so as to increase agricultural production, and to stimulate and support agriculture development as well as other infrastructure development plans. Overall targets by the end of the target year are summarized as follows:

- All Barangays shall be accessible by an all-weather road.
- National roads which function as farm-to-market roads shall be paved with asphalt or concrete.
- Farm roads shall be provided to the farming areas according to the irrigation and agriculture development plans.
- All existing temporary bridges are to be replaced by permanent bridges.
- Multi-purpose pavements shall be provided to every Barangay.

The total length of the proposed farm-to-market roads is 330 km while about 300 km are programmed for improvement/upgrading. 300 km for farm road construction, 400 places for multi-purpose pavement, 870 liner meter for bridge development, and reinforcement of Motor Pool of PEO are also programmed for development.

5.13 Water supply for irrigation, animals, washing farm outputs and tools/instruments, and daily consumption of the local people, water supply systems are proposed at Bagtingon in Buenavista and at Tagum-Angas in Sta. Cruz. The estimated daily water demand of 690 cu.m, agricultural water of 350 cu.m, the service population of 5,600 in 2010 and its water of 340 cu.m would be proposed for Tagum-Angas area. The major facilities of 25 km of pipelines, a delivery tank and communal faucets would be planned. For the Bagtingon area, the design discharge of 2,190 cu.m is applied with an intake facility, 23.5 km of pipelines, a delivery tanks and communal faucets.

(Rural Infrastructure Development)

5.14 The main objective of the rural water supply development is to expand and improve the existing systems. For the short-term development, a 24-hour water supply will be achieved. The water resources development for the Sta. Cruz water supply system would be implemented. For the medium-term development plan, quality and quantity problems of water would be improved

for the existing Boac, Mogpog, Sta. Cruz and Torrijos rural water supply systems, while for the long-term development plan, the water supply systems would be extended to 100% of the population in the urban areas and around 70% of the population in the rural areas. In Gasan and Boac, rural water supply systems would be improved and rehabilitated.

5.15 On the assumption of a future monthly power demand of 30 kwh per household and the estimated number of households of 57,100, the total electricity demand will reach 29.5 GWH per year. The provincial government has a plan to install a thermal power plant with a capacity of 9 MW in total by 1992. Considering cheaper power generation cost, the hydropower plant or a marine cable to connect the Luzon Grid to Marinduque should be studied. There are two hydropower generation stations with a capacity of 1.4 GWH at the Tagum-Angas dam and of 3.0 GWH at the Binunga dam.

5.16 It is necessary to increase the diffusion rate of electrification. To attain this target, the five-year extension program of MARELCO will be given top priority. The main objective is to promote electrification in the province. For short-term development, extension of transmission lines for stable supply of electric power while for the medium- and long-term development, the distribution and secondary lines would be extended into the interior areas to raise the living standards of the inhabitants. The diffusion rate will be improved from 65% to 75%.

5.17 Considering the on-going and proposed traffic system development plans, it is expected that the number of passengers and the quantity of cargo to be handled at the ports will increase tremendously. It is therefore necessary to improve the existing Balanacan, Buyabad, and Cawit ports. This scheme would consist of construction of waiting houses for passengers

and warehouses for cargoes, and construction of waiting sheds along the main road.

5.18 The existing health and medical facilities are concentrated in the towns. However, even these facilities are not adequate to serve the existing population. Inhabitants in the remote Barangays, therefore, cannot avail themselves of medical services. To maintain their health and prevent diseases, they only receive periodical medical check-ups. For this program, hospitals and health centers would be upgraded and provided the necessary facilities. For the Barangays, a mobile car with the necessary personnel and facilities would be recommended.

5.19 In line with the education and welfare program, Barangay roads would be improved and constructed by the Provincial Government. Improved roads would make educational facilities more accessible to pupils and/or students. The educational plan would consist of rehabilitation, replacement and construction of educational facilities (elementary) and construction of school toilets.

5.20 Quick and accurate socio-economic information is of great importance, which bring much benefit to the farmers. In this regard, an adequate and efficient telephone system is proposed for the whole province. Telephone lines are also proposed to be set-up in public buildings and utilities.

5.21 By developing the swampy area of about 1,500 ha including the existing fish ponds of about 700 ha, the estimated production for black tiger shrimp is about 3,500 ton and about 3,000 ton of Bangus. For the development, the improvement of the existing Brackishwater Fish Culture Demonstration Farm, introduction of a small-scale fish-meal and feed processing plant, cold storage are necessary. The proposed facilities

for irrigation would be used for freshwater fish culture. Per capita consumption of 5.6 kg per annum of fish will be increased to 18 kg.

(Development Cost)

5.22 The estimated development cost at the June 1989 price levels is 3,800 million pesos. The total development cost is further divided into three stages, namely, 1,502.7 million pesos for the short-term development (1991-1995), 879.4 million pesos for the medium-term development (1996-2000) and 1,417.9 million pesos for the long-term development (2001-2010). The annual operation and maintenance cost amounts to 53.2 million pesos for the short-term development, 71.4 million pesos for the medium-term development, and 103.2 million pesos for the long-term development.

(Implementation Plan)

5.23 Executing agency for the implementation of the project shall be the Provincial Government of Marinduque. A Project Board headed by the Provincial Governor, and a Project Management Unit (PMU) under the Project Board shall be established. Sectoral line agencies shall also participate in the actual implementation of the projects under the general management of PMU. Facilities and equipment constructed/purchased under the irrigation, village water supply, rural water supply and rural electrification projects will be turned over to the cooperatives/associations to be organized by the beneficiaries. On the other hand, facilities under the agriculture, drainage, rural roads, traffic system, social services and aquaculture projects shall be maintained by the relevant government agencies.

(Project Evaluation)

5.24 The Master Plan would increase agricultural production, raise income and improve living standards of the people residing in Marinduque. The project costs for the Master Plan have been estimated and the benefits have been quantified. As a result of benefit-cost analysis, the EIRR is calculated at 26% which exceeds the opportunity cost of capital of 15% in the Philippines. Therefore, the proposed Master Plan is considered economically feasible.

(Selection of Priority Development Areas)

5.25 The following seven priority areas are selected based on the results of the field investigation and the collected data such as the natural conditions of soil, land use, water resources, etc., socio-economic conditions, farm economy, and social infrastructure. The selected areas mainly consist of cultivated land of paddy, diversified crop fields, coconut plantations, etc. with a slope of less than 3%, excepting mangrove and nipa areas. The total acreage of the priority areas is 68 sq.km.

<u>Area</u>	<u>Municipality</u>	<u>Area</u> (sq.km)
1. Bagtington	Buenavista	7.4
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>

(Priority Ranking)

5.26 In order to identify priority development area(s) which will have higher priority in the implementation stage, priority ranking of the development areas has been attempted using several indicators such as income level, power availability, road pavement ratio, water supply ratio, and irrigation

facility ratio (showing necessity for development), labor availability, land holding size, land tenure status, sharing arrangement, and agricultural land availability (showing development potential/incentives). By the result of the evaluation, Tagum-Angas was selected as the first ranked area for development.

(Priority Development Project - Marinduque Agricultural Development and Promotion Project - MADPP)

5.27 The aforementioned priority development project has the purposes of effective utilization of the limited land resources, assistance of marketing of farm inputs and outputs, improvement and extension of the technology of agriculture and fish culture and improvement of living standards of the farmers. The following components and dimensions would be proposed for Integrated Agricultural Development.

5.28 The Marinduque Agricultural Development Promotion Farm is proposed for raising farming technique of farmers and extension workers. The Marinduque Livestock Breeding Station is strengthened for increasing the number of animals by artificial insemination. The Brackishwater Fish Culture Demonstration Farm is planned for research and supply of fish culture techniques and fingerings. The abovementioned facilities are the core bases for Integrated Agricultural Development. The improvement and strengthening of the facilities will play a pilot role not only for the other six priority development areas in Marinduque but also other remote islands.

5.29 The major components are as follows:

- (1) Agricultural Development
 - Strengthening of the Marinduque Agricultural Development Promotion Farm
 - Rehabilitation of Marinduque Breeding Station

- DA Municipal Nursery
 - Irrigated Paddy Cultivation Demonstration Farm
 - Rainfed Paddy/diversified crop cultivation
 - Post-harvest Programs for Rice
 - Post-harvest Programs for Corn
- (2) Agricultural Infrastructure Development
- Rehabilitation and improvement of irrigation facilities
 - Rehabilitation and improvement of rural roads
 - Introduction of village water supply system
- (3) Rural Infrastructure Development
- Expansion of rural electrification
 - Rehabilitation of education facilities
- (4) Aquaculture Development

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ABBREVIATION/CONVERSION TABLE/GLOSSARY

ABBREVIATION

BAEcon	Bureau of Agricultural Economics
BAPA	Bureau of Power Association
BAS	Bureau of Agricultural Statistics
BAEx	Bureau of Agricultural Extension
BAT	Bureau of Air Transportation
BCGS	Bureau of Coast and Geodetic Survey
BDT	Bureau of Domestic Trade
BFT	Bureau of Foreign Trade
BIR	Bureau of Internal Revenue
BL	Bureau of Lands
BMG	Bureau of Mines and Geo-Sciences
BOI	Board of Investment
BOP	Bureau of Posts
BOS	Bureau of Soils
BSMI	Bureau of Small- and Medium-Scale Industries
BUTEL	Bureau of Telecommunications
CB/CBP	Central Bank of the Philippines
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DBM	Department of Budget and Management
DECS	Department of Education, Culture and Sports
DENR	Department of Environment and Natural Resources
DFA	Department of Foreign Affairs
DLG	Department of Local Government
DOF	Department of Finance
DOH	Department of Health
DOLE	Department of Labor and Employment
DOTC	Department of Transportation and Communication
DPWH	Department of Public Works and Highways
DSWD	Department of Social Welfare Development
DTI	Department of Trade and Industry
IBRD	International Bank for Reconstruction and Development
IRRI	International Rice Research Institute
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
JSPS	Japan Society for the Promotion of Science
LBP	Land Bank of the Philippines
LWUA	Local Water Utilities Administration
MWSS	Metropolitan Waterworks and Sewerage System
NACIAD	National Council on Integrated Area Development

NACIDA	National Cottage Industries Development Authority
NDC	National Development Corporation
NCSO	National Census and Statistics Office
NEA	National Electrification Administration
NEDA	National Economic and Development Authority
NEPC	National Environmental Protection Council
NFA	National Food Authority
NHA	National Housing Authority
NIA	National Irrigation Administration
NIST	National Institute of Science and Technology
NLUC	National Land Use Committee
NMYC	National Manpower and Youth Council
NNC	National Nutrition Council
NPC	National Power Corporation
NPCC	National Pollution Control Commission
NRCP	National Research Council of the Philippines
NWRB	National Water Resources Board
OEA	Office of Energy Affairs
OECF	Overseas Economic Cooperation Fund
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PCA	Philippine Coconut Authority
PCARRD	Philippine Council for Agricultural Resources Research and Development
PCCI	Philippine Chamber of Commerce and Industry
PCIERD	Philippine Council for Industry and Energy Research Development
PCGG	Presidential Commission on Good Government
PCGR	Presidential Commission on Government Reorganization
PEO	Provincial Engineering Office
PNB	Philippine National Bank
PNOC	Philippine National Oil Corporation
PPA	Philippine Ports Authority
RDC	Regional Development Council
RWDC	Rural Waterworks Development Corporation
SSS	Social Security System
TBAC	Technical Board for Agricultural Credit
UN	United Nations
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
UP	University of the Philippines

CONVERSION TABLE

LENGTH

mm : millimeter(s)
cm : centimeter(s)
m : meter(s)
km : kilometer(s)
inch : inch(s) = 2.54 cm
mile : mile(s) = 1.6093 km

AREA

sq.mm : square millimeter(s)
sq.cm : square centimeter(s)
sq.m : square meter(s)
sq.km : square kilometer(s)
ha : hectare

WEIGHT

mm.gr: milli-gram(s)
gr : gram(s)
kg : kilo-gram(s)
ton : ton(s)
once : once(s) = 28.350 gr

CAPACITY

lit : liter(s)
cu.m : cubic meter(s)
gallon : gallon(s) = 3.785 lit
MCM : million cubic meter(s)
cavan : cavan(s) = 50 kg of palay

DISCHARGE

lps : liter(s) per second
cms : cubic meter(s) per second
(or m³/sec, cu.m/sec)
cusec: cubic foot per second
lpd : liter(s) per day

VELOCITY

mm/sec : millimeter(s) per second
cm/sec : centimeter(s) per second
m/sec : meter(s) per second
km/hr : kilometer(s) per hour
knot : knot(s) = 1.86 km/hr

sec : second(s)
min : minute(s)
hr : hour(s)
Max. or max. : maximum
Min. or min. : minimum

% : percent(s)
No. : number
°C : degree(s) centigrade
Hp : horse power
W : watt(s)

KW : kilowatt(s)
MW : megawatt(s)
WH : watt(s) hour
KWH : kilowatt(s) hour
MWH : megawatt(s) hour

EL : elevation
MSL : mean sea level
FWL : full water level
HWL : high water level
LWL : low water level

ET	:	evapotranspiration
ETcrop	:	evapotranspiration of crop
N	:	nitrogen
P	:	phosphorus
K	:	potassium
LV	:	local variety
LIV	:	local improved variety
HYV	:	high yielding variety
O & M	:	operation and maintenance cost
EIRR	:	economic internal rate of return
MT	:	metric ton(s)
B/C	:	benefit cost ratio
FY	:	fiscal year (1st of January to 31st of December)
peso	:	peso(s) - US\$0.4587 (as of June, 1989)
\$:	dollar(s) 21.80 pesos (as of June, 1989)

GLOSSARY

Study Area	:	Area of 805 sq.km covered by the Master Plan of the Integrated Agricultural Development Project in Marinduque
province	:	A political subdivision of a country comprising municipalities
Barangay	:	A political subdivision of province comprising Barangays
poblacion	:	A political subdivision of a municipality comprising villages
Monsoon	:	A political center of a town
Trade wind	:	Predict wind that blows from the sea to the continent and oppositely in Winter
Tropical cyclone	:	One of three Philippines air currents, comprising from a generally easternly direction reaching the island during the period from February to April PAGASA classifies the tropical cyclone by the wind speed in center as follows: - Tropical depression; up to 17.1 m/sec (33 knot) - Tropical storm ; 17.2 (34 knot) to 32.6 m/sec (63 knot) - Typhoon ; over 32.7 m/sec (64 knot)
IR	:	High yielding variety of rice which bears varieties from IRRI
Cogon	:	A coarse grass which usually covers idle land or abandoned clearing (<i>Imperata cylindrica</i>)
Ganta	:	A common unit of volume for rice equivalent to 2.24 kg of milled rice
Nipa	:	Heavy-leafed type of palm used in hatching huts
Share tenancy	:	A practice where operators rent the land they work and pay as rent a share of the cash or crops grown
Carabao	:	The animal that most farmers used for plowing and other farming works. It is about the size of an ox and is similar to the water buffalo in other countries.
Fiesta	:	Spanish term for feast, celebrated pompously once a year to honor the patron saint.
Kaingin	:	Deforestation by shifting cultivation with slashing and burning forest/brush
Survival rate	:	The number who graduate/the number who enroll

CHAPTER 1. GENERAL

CHAPTER 1. GENERAL

In response to the request of the Government of the Republic of the Philippines, the Government of Japan through the Japan International Cooperation Agency (JICA) dispatched a Preliminary Study Team to the Philippines in March, 1987. The Implementing Arrangement (I/A) of the Technical Cooperation between the Japan International Cooperation Agency and National Council on Integrated Area Development (NACIAD) on the Integrated Agricultural Development Project in Marinduque in the Republic of the Philippines was agreed upon between JICA and NACIAD on July 15, 1988.

Due to the abolition of NACIAD in March, 1989, the office of the Provincial Governor of Marinduque shall take an active role in the overall coordination of the study in cooperation with the National Economic and Development Authority (NEDA) regional office.

In accordance with the I/A, JICA dispatched the Study Team composed of ten members to the Philippines for the first field survey during the periods from November 14 to December 28, 1988, the second field survey from January 16 to March 16, 1989, and the third field survey from June 28 to August 26, 1989.

The Report consists of four volumes, Main Report, Appendix I, Appendix II and Data Base, which was provided based upon the study on the findings and observations of the field survey conducted in the Philippines by the Study Team in cooperation with the office of the provincial government, the NEDA regional office and other government agencies concerned and others.

Appendix I compiles data, information and the result of the study for supporting the Master Plan while Appendix II compiles the results of the study on the priority project and the Data Base shows various results of the present conditions of the Study Area.

The objective of the Study is to formulate the Master Plan for the integrated agricultural development of the Marinduque Province. The Study Area covers the Marinduque Island except mountainous land and small islands.

The Study Team would like to take this opportunity to express their sincere appreciation to the Director of the NEDA regional office and to the Governor of Marinduque Province and other officials concerned for assistance and generosity offered to the Study Team during the field survey period which enabled the smooth undertaking of the field survey.

Appreciation is also given to the Directors and the chiefs concerned of NEDA and to the Directors and Heads of sections concerned of various governmental line agencies for their kind assistance and convenience given to the Study Team in providing the necessary data and information as well as in conducting the field trips for the field survey. The list of personnel conducted by the Study Team is attached in Appendix A for their heartfelt thanks.

CHAPTER 2. SOCIO-ECONOMIC CONDITIONS

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2.1. National Level

2.1.1. Philippine Economy

Although the Philippines experienced the worst economic and financial crisis in its postwar history starting in late 1983, the economic performance of the Philippines has shown favorable trends in the last two years and there are a number of positive indications that the process of recovery has commenced. Such indications can be seen from several socio-economic indicators such as the growth rate of Gross Domestic Product (GDP), decreased rate of consumer price indexes, and favorable trends in the balance of payments situation. (refer to Table 2.1.1)

With the resumption of economic growth, the emphasis in policy is also shifting from short-term concerns of stability and crisis management to long-term objectives of sustained growth and improvement in socio-economic equity.

Although industrialization has been the main focus of the Philippine Government's economic policy, the agricultural sector continues to be the mainstay of the economy, accounting for about 50% of total employment, 28% of GDP, and 31% of export earnings in 1987. The growth of the agriculture sector in real terms decelerated from 3.7% in 1986 to 0.4% in 1987. The low growth in 1987 was mainly due to the generally poor harvests of both cash and foodcrops due to adverse weather conditions and contraction in forestry value-added. In crop subsectors, almost all crops, except corn, experienced negative growth rates in 1987. There was a physical decline in the outputs of rice, coconuts, sugarcane, bananas, coffee, and abaca in 1987 compared with 1986. Some gains were however registered in the outputs of corn, peanuts, and pineapples.

In the fisheries subsector, fish products in 1987 increased by 5.9% over 1986. This growth was mainly due to the growth of 8.2% in fishery output from commercial fishing and growth of 19% from aquaculture. Aquaculture has been the fastest growing field in the fisheries sector. The output of aquaculture increased by 6.2% in 1987 and contributed to more than 30% in the value-added by fisheries.

2.1.2. Medium-Term Philippine Development Plan (MTPDP)

The MTPDP which was proclaimed in December 1986 (the original MTPDP) was updated by NEDA in July 1988, mainly to revise growth projections, in order to reflect the economic experience of 1987 and to address more comprehensively the priorities of the Government. The MTPDP which outlines the development strategy of the Philippine Government during 1987-1992, both in the original and updated versions, seeks to shift the focus of the development strategy from growth maximization to rural development, poverty alleviation and reduction in social inequity. (refer to Table 2.1.2)

Table 2.1.1 Economic Indicators of the Philippines

		1983	1984	1985	1986	1987
Gross Domestic Product (GDP)	GDP at Current Market Prices (mp)	384.1	540.5	612.2	632.2	711.5
(Bn Pesos)	GDP at Constant 1972 mp	99.9	93.9	89.9	91.3	95.9
	Growth Rate (%)	0.9	-6.0	-4.3	1.5	5.1
Price Indexes	Consumer (Metro Manila 1980 = 100)	195.3	291.5	351.9	370.5	395.5
	Annual Change (%)	10.8	49.3	20.7	5.3	6.7
Balance of Payments (Million US\$)	Exports (fob)	5,005	5,391	4,629	4,842	5,720
	Imports (fob)	-7,487	-6,070	-5,111	-5,044	-6,737
	Services (net)	-740	-823	-	757	-76
	Transfer (net)	472	386	379	441	554
	Current Balance	-2,750	-1,116	-103	996	-539
Labor Force ('000)	Total	21,130	20,756	21,252	21,993	22,568
	Employed	18,543	18,550	18,675	19,455	20,050
	Unemployed	1,587	2,206	2,577	2,538	2,518
	Unemployment Rate (%)	7.9	10.6	12.1	11.5	11.2

Source: National Census and Statistics Office, Manila

Table 2.1.2 Major Targets under MTPDP, 1988 - 1992

Target Items	1987 (Actual)	Original Plan	Updated Plan
1. Growth rate in real GNP (%)	5.7	6.8	6.5
2. Growth rate in real per capita GNP (%)	3.2	4.4	4.1
3. Growth of real exports (%)	-1.1	10.2	9.0
4. Growth of real imports (%)	25.2	9.4	9.5
5. Share of agriculture in GDP (%)	28.7	27.2	26.0
6. Share of manufacturing in GDP (%)	23.9	24.2	29.3
7. Growth of population	2.4	2.3	2.3
8. Unemployment rate (%)	11.2	6.7	7.3
9. Incidence of poverty (%)	58.9	45.4	45.2
10. Life expectancy (years)	63.7	64.6	64.6
11. Literacy rate (%)	88.0	89.0	89.0
12. Total school enrollment ratio (%)	62.3	66.0	66.7

Source: National Economic and Development Authority

2.2. Regional Level

2.2.1. Southern Tagalog (Region IV)

The Southern Tagalog Region is considered the largest and prime region in the country. It is composed of eleven provinces, of which six are the mainland provinces of Aurora, Batangas, Cavite, Laguna, Quezon and Rizal while five are island provinces; namely, Marinduque, Occidental Mindoro, Oriental Mindoro, Palawan and Romblon. It includes four cities, 213 municipalities, and 5,249 Barangays. The Region had a total population of about 6.1 million in 1980, which was estimated to reach about 7.9 million in 1989. The Region accounts for large agricultural and fishery resources having a total farm area of 1.15 million ha or 13% of the total national farm area.

2.2.2. Medium-Term Regional Development Plan, 1987 - 1992

The Medium-Term Development Plan of Region IV has been prepared to try and achieve economic recovery in the short-run and sustainable growth in the long-run in line with the basic strategy formulated in the Medium-Term Development Plan of the Republic of the Philippines. The Plan's major projections and targets are described in the following:

- (1) The regional population is expected to grow at an average annual rate of 2.64% to reach 8.5 million by 1992.
- (2) The Gross Regional Domestic Product (GRDP) will increase from an estimated 13,570 million pesos at constant 1972 prices in 1987 to around 18,801 million by 1992, posting an average annual growth rate of 6.74%. Per capita GRDP will increase by an annual average rate of 3.62% as against the population annual growth rate of 2.64%.
- (3) Regional employment is projected to reach, from a total of 2.4 million in 1987, around 3.3 million in 1992 at an average annual growth rate of 6.32%.
- (4) Structure of regional economy, in terms of share in GRDP, will be estimated as follows: i) agriculture sector with the share of 32.8%; ii) industry sector, 34.4% and iii) services sector, 32.8%. Unemployment is expected to be reduced to 4.08% in 1992 from 10.33% in 1987.

CHAPTER 3. PRESENT CONDITIONS OF THE STUDY AREA

CHAPTER 3. PRESENT CONDITIONS OF THE STUDY AREA

3.1. Natural Conditions

3.1.1. Location and Area

The island province of Marinduque with a physical land area of 959.2 sq.km is located about 170 km southeast of Manila, the capital of the Philippines. The island is bordered in the north by Tayabas Bay, in the northeast by Mompog Pass, in the west by Tablas Strait, and in the south by the Sibuyan Sea. It has 17 outlying islets, major ones of which are the Tres Reyes, Polo, Maniways, Mongpong, and Salomague. Marinduque lies at longitude 121°45' and 122°15' east, and latitude 13°10' and 13°35' north. The Marinduque Island has width and length of about 35 km by east-west and by north-south. It consists of six municipalities; Boac, Buenavista, Gasan, Mogpog, Torrijos and Sta. Cruz. The Provincial capital is Boac.

The Study Area covered by the Master Plan for the Integrated Agricultural Development Project in Marinduque is 805 sq.km excluding the outlying islets, forest areas, and non-cultivable land. (refer to General Plan.)

3.1.2. Climatic Condition

a) Climate Type

The climate in Marinduque can be categorized as Type IV, according to the Coronas Climate classification by PAGASA. The IV climate has a rainfall more or less evenly distributed throughout the year with no clear boundary between dry and wet seasons. (refer to Table 3.1.1 and Appendix C-1-1.)

b) Rainfall

Annual mean rainfall at the Boac station, PAGASA is recorded at 2,034.6 mm on average for the 17 years from 1970 to 1986. From January to May there is less rainfall with a monthly record of less than 150 mm. The total amount of rainfall during the wet season represents 73% of the annual rainfall. During this period paddy cultivation is carried out. On the other hand, in the irrigated paddy field with available water even in dry season, two crops of paddy in one year or five crops of paddy in two years are carried out. The minimum monthly rainfall was recorded at 80 mm in February, while the maximum monthly rainfall was recorded at 273.6 mm in October. The number of rainy days, on a monthly basis, averages more than ten during the period from June to November. The annual mean number of rainy days is recorded at 80 days. (refer to Appendix C-1-2.)

c) Temperature and Humidity

The annual mean temperature is 27.0°C, and the mean maximum and minimum temperatures are 32.9°C and 22.3°C, respectively. The monthly mean temperatures in May are a maximum of 28.6°C and a minimum of 25.3°C in January. The difference between the monthly mean maximum and minimum temperatures is between six to eight centigrade degrees through the year while the difference on the annual mean temperature is only 3.3°C. However, temperatures in highland areas with an elevation of about 400 to 700 m (in the center and southern parts of Marinduque) are lower by two to four degrees centigrade than those of the lower areas near the coast. The annual mean relative humidity is recorded at 83%, with a minimum of 78% in April and a maximum of 86% from September to November. (refer to Appendix C-1-3 and C-1-4.)

d) Wind Direction and Velocity

The mean wind velocity is 2.4 m/sec (8.64 km/hr) and is almost constant throughout the year. The main wind direction during the less rainy season is southwest while during the wet season, it is northwest to northeast. (refer to Appendix C-1-5.)

e) Cloudiness

The recorded annual mean cloudiness is 5.1 with the minimum and maximum cloudiness recorded at 3.4 Okta in April and 6.0 Okta in August, respectively. It is said that the weather of Marinduque is mainly cloudy. (refer to Appendix C-1-6)

f) Evaporation

Based on the data available at the Los Banos Evaporation station (there is no station in Marinduque), the total amount of evaporation is 1,604.4 mm. Conversion factor of 0.7 is being used to determine the actual amount of evaporation which is 1,120 mm per annum. While the estimated evapotranspiration by the Penman method shows the values of 1,566.4 mm per annum, 5 to 6 mm from February to May and 3 to 4 mm during the wet season.

3.1.3. Geographic Conditions

Except for scattered low-lying areas located on the western and eastern seacoasts, the island of Marinduque consists of rolling areas of hilly and mountainous areas. The slope of the alluvial plain is between 0 and 3%, less than 10 m above mean sea level (MSL). The elevation of the hills and mountainous areas is more than 400 to 700 m and the slope of these areas is steeper than 18%.

The coastal plains consist of alluvial plains. The coastal plains are formed by sediment from rivers and tides. The plains are mostly found in the western part of the island. Each area is small, only about 100 to 200 ha are existing along the seacoast in the shape of a belt. The geological landscape of the alluvial plain includes alluvial fans, river terraces, lower physiograph units/land facets which are developed from deposition and sedimentation to the level of slightly undulating terrain. The alluvial plain areas in the Mogpog, Boac and Gasan municipalities belong to this category. The maximum scale of this landscape in the island is observed in the lower reaches of the Boac river with an area of about 1,000 ha. In the northern part of the island, the alluvial plains are found downstream from the Tawiran river and other small rivers; however, the scale is smaller, about 100 to 200 ha.

The hilly areas are formed by ridges with elevation of less than 500 m above MSL and a V-shaped valley extending towards the sea. This landscape is vicinal to the coastal plain or the alluvial plain. The inclined landscape consists of steeply sloped land which continues down to gently sloping areas. It is observed that the hilly area is formed by sediment rocks in the western part of the island. In the eastern part of the island, the plutonic hilly areas extend to the Torrijos municipality and a limestone hilly areas is observed in the northern part of the island. In the eastern region around Balanacan port and a part of the northern and eastern areas of the Sta. Cruz municipality, hilly areas are scattered. The total area of this hilly region is about 740 sq.km, equivalent to 77% of the total area of the province. The mountainous area is formed by two continuous mountain ranges (the Boac river basin) which are located along the Boac river. At the southern end of the island, the dormant volcano, Mt. Malindig with the highest elevation of 1,157 m above MSL covers parts of the Torrijos and Buenavista municipalities. The total area is about 50 sq.km or 5% of the total area of the province.

3.1.4. Hydrological Condition

a) Observatories and Periods

For a period of ten years before 1970, run-off data from three stations at Boac, Mogpog and Tawiran rivers were available. However, at present, all stations are non-operational. In August 1988, NIA established five gauging stations at Boac, Bagtingon, Buangan and Tawiran rivers. In order to collect more accurate hydrological data, the JICA Study Team established two self-recording water level gauging stations on the Boac and Tawiran rivers considering the conditions of rainfall and topography. The Boac station is representative for the western part of Marinduque, and Tawiran for eastern part. The station at Boac has been in operation since December 22, 1988 while the Tawiran station since January 20, 1980. (refer to Appendix C-2-3.)

b) Rivers

Generally, the bed slope of rivers in Marinduque is steep. Only Boac, Mogpog and Tawiran rivers have gentle gradient slopes in the lower reaches of the rivers in their tidal sections. In these rivers, revetment works are not carried out except in small portions. Many calamities such as slope-sliding in the meandering sections and erosion of roads along the rivers are caused by severe flooding during the heavy rainy periods (typhoons and the monsoon).

Examining the mean monthly discharge, a large difference ranging between 1.76 cu.m/sec/100 sq.km in March and 18.18 cu.m/sec/100 sq.km in November has been observed. According to the flood marks in the rivers in Marinduque, the maximum flood specific discharge of the Boac river is estimated at 6.0 cu.m/sec/sq.km. The annual run-off of 260 MCM with a run-off coefficient of 0.5 is calculated for the Boac river. The small rivers having about 20 sq.km of the drainage area show 20 MCM per annum with a peak discharge of 8.3 cu.m/sec/sq.km. (refer to Appendix C-2-4.)

Discharge of rivers with comparatively small drainage areas located on the west side of Marinduque can be observed even during the less rainy season due to heavy vegetation in the drainage area. While in the eastern parts, vegetation is poor due to the "kaingin" system (shifting cultivations); hence, discharge cannot be observed during the same period.

3.1.5. Geology and Seismicity

a) Geology

The general geological setting of Marinduque is fairly complex with serpentines and altered volcanics as the basement rocks. These older rocks are overlain in unconformable strata with a thick sequence of pyroclastic rock, intercalated clastic rock, volcanic flow and limestone ranging in age from Eocene to Miocene, which are, in turn, overlain unconformably by younger pyroclastics and tuffaceous sedimentary rocks. Middle Tertiary adjustments accompanied by the intrusion of diorite caused the block movements, folding and faulting. Geologically, Marinduque is divided into two blocks by the Boac river fault which traverses the island from the northeastern slopes of Mt. Malindig in Torrijos to Mogpog. The northeastern block is underlain mostly by diorite and pre-Miocene rock, while the southwestern block consists mainly of Pliocene and younger formations. (refer to Figure 3.1.1 and Appendix D-1-1.)

b) Geological Structures

The regional structural features of Marinduque are dominated by the northwest-trending Boac river fault which is clearly expressed by its topography. The fault dips steeply to the southwest and appears to have controlled the course of the middle to upper reaches of the Boac river. West of the Boac river fault is another similarly northwest-trending fault that marks the western edge of the wedge-shaped horst block near the center of the island. These

two faults are apparently deep-seated and could have probably influenced the emplacement of the intrusive rocks contributing towards appreciable copper sulphide and gold metalization. Another regional structure of importance is the thrust fault along the western flank where small bodies of serpentine are thrust into the Gasan Formation. (refer to Appendix D-1-2.)

c) Seismicity

Historical seismic data of Southern Luzon indicate that Marinduque is located within an area of low-level of seismic activities. No significant earthquake with a magnitude greater than five has been recorded within a 50 km radius area from the island.

3.1.6. Hydrogeology

The groundwater map made from a rapid assessment of the groundwater resources of Marinduque shows shallow wells, deep wells and difficult areas based on the depth of aquifer and geology in each category. In general, aquifers in the shallow and deep well areas have more pervious elements of the sedimentary and alluvial deposits, while in the difficult areas, groundwater comes up only within the fractured zone of igneous rocks which mainly underlie these areas. Rough estimates on the groundwater potential in the study area are based on a groundwater recharge rate of 10% of the annual rainfall and averaged specific capacities of existing wells and the maximum drawdown of five meters. The results indicate a safe yield of 40,000 lit/day (lpd) from shallow wells and 320,000 lpd from deep wells. (refer to Appendix D-3.)

3.1.7. Soil and Land Classification

a) Land Slope

The land slope of the Marinduque Island is classified into the following six categories; zero percent, 0 to 3%, 3 to 8%, 8 to 15%,

15 to 18%, 18 to 30%, and more than 30%. Land with a slope of less than 8% accounts for about 25% of the whole Study Area, about six percent of which is tidal marsh. Land suitable for paddy cultivation with a slope of less than 3% occupies about ten percent of the total. On the other hand, topographically steep land with slope of more than 8% accounts for 38%.

b) Vegetation

Most of the hilly and mountainous land located in the central part of the interior is covered with forest, dominated by dipterocarp species. Coconut trees are planted even in proximity to the reserved forest with land slope of more than 18%. Some Kaingin farmers (shifting cultivators) are cultivating the steep land with a slope of more than 18% and therefore, such land has become degraded due to soil erosion. The middle to upper hillside of the Malindig mountain is covered with primeval forest. Most parts of hilly areas with slopes of 8 to 18% are planted with coconut trees. The land areas planted with coconut trees are intercropped with several fruits such as banana, pineapple, coffee, corn, root-crops, and vegetables. In the alluvial plains and ravines, rice and coconuts are planted. Coconuts are also intercropped with several fruits, and the aforesaid vegetables. The tidal marsh is covered with mangrove and nipa.

c) Soils

Most of the soils in the study area are composed of weathered deposits developed from igneous rocks like diorite and andesite, sedimentary rocks like shale, sandstones, limestones, and fluvial deposits. These soils are divided into 26 soil types. (refer to Figure 3.1.2)

Hydrosol derived from marine alluvium is largely distributed in the tidal marsh area along the inlets of the east coast. Some hydrosol soils are also found on the west coast. Such areas constitute brackish water marsh with mangroves and nipa. The coverage of this soil is 1,775 ha (2.2% of the total), of which some parts are utilized for fish culture ponds.

The soils in the coastal alluvial plains and ravines are derived from fluvial deposits. The major soil types are: (1) San Manuel sandy loam and Laylay sandy loam in the Boac river basin, (2) Mogpog clay loam in the Mogpog river basin, (3) Mogpog silty loam in the Libtagin river basin, (4) San Manuel sandy loam in the Tawiran river basin, and (5) Gasan loamy sand along the coastal areas extending from Gasan to Buenavista. The soils are well-drained and suitable for cultivation of rice, corn, peanut, mungbean, coconut and various kinds of vegetables.

Coverage of San Manuel sandy loam is 2,469 ha (3.1% of the total). The soil layer is thick and fertile with soil color of yellowish-brown to pale brown. Laylay sandy loam, accounting for 669 ha (0.8%), is also fertile with a soil color of grayish-brown. Gasan loamy sand occupies 993 ha (1.2% of the total), with soil color of grayish-brown to pale brown. This soil is well-drained and suitable for vegetable cultivation as far as irrigation water is available, despite its slightly poor water holding capacity.

Coverage of Mogpog clay loam is 2,014 ha (21%). The soil is fertile with soil color of brown to reddish brown. Mogpog silty loam covers 1,063 ha (1.0%) and is fertile. The soil is well-drained as sandy clay loam is distributed one meter underneath these two soils. In addition to these soils, Cabahuan clay and Matuyatuya clay loam occupy 847 ha (1.1%) and 399 ha (0.5%), respectively.

The major soil types in the hilly and mountainous areas are Maranlig clay, Banto clay loam and Banhigan clay loam. Maranlig clay is the soil developed from andesite and diorite rocks originating from igneous rocks and covering 17,065 ha (21.2%) with brown to yellowish-brown soil color. The soil is not fertile and prone to erosion, constituting a major constraint for cultivation. The soil is distributed in Sta. Cruz and Torrijos and constitutes a large part of the secondary forests and cogon grassland. In some areas under these soils, coconut, banana, upland rice, corn, cassava, sweet potato, and peanut are planted.

Banto clay loam is the soil developed from igneous rocks such as andesite and diorite, with reddish brown color, and accounts for 15,490 ha (19.2%). The soil is deep and fertile, and therefore is suited for growing coconut, upland rice, cassava, and sweet potato. The soil is distributed in the municipalities of Mogpog, Boac, Sta. Cruz and Torrijos.

Banhigan clay loam is the soil developed from weathered deposits like shale and sandstones, with pale yellow brown to dark yellow brown color, and accounts for 11,536 ha (14.3%). The soil is found slightly shallow with a higher fertility than Banto clay loam. Crops' productivity is considered comparatively high. Coconut, upland rice, corn, cassava, sweet potato, pechay, and mustard are grown in this soil. These soil types are distributed in the municipalities of Boac, Gasan and Buenavista.

Balanacan clay is the soil developed from igneous rocks such as andesite and basalt (brown color), and accounts for 6,228 ha (7.7%). The soil is distributed in the northern part of the island. In addition to rice, several kinds of vegetables (okra, mustard, asparagus bean, tomato, egg plant, bottle gourd, sponge gourd, pechay etc.) are grown in this soil.

Timbo clay loam evolved from volcanic rocks is distributed around the Malindig volcano. The soil covers 2,559 ha (3.2%), with soil color of brown to dark reddish brown. The soil is found deep and well drained. Coconut, cassava, banana, coffee, and abaca are grown in this soil. The soil property is suited for growing vegetables.

d) Land Classification

This land classification has been made in taking into consideration such limiting factors as soil fertility, erosion or flood vulnerability, etc. Land is classified into agricultural land (Class A to D), grass or forestland (Class M and N), and fish culture ponds or wild animal reserves (Class X and Y).

Class A and B, these lands which are suitable for cultivation, account for about 8,670 ha (or 10.8% of the total land area). The land classified into class C, D, M and N, which is not suitable for cultivation due to steep slopes, accounts for 38% of the total land area. Such land should be used for grassland or kept as reserved forest. Swamp areas (Class X), suitable for pisciculture ponds, are distributed along the inlets, accounting for 1,775 ha or 2.2% of the total. The land with exposure of rocks and coarse fragments (Class Y) which is unsuitable for cultivation, is distributed around Malindig volcano, accounting for about 986 ha or 1.2% of the total land area. This land should remain a preserved area for wild animals.

The alluvial land, Umingan and San Manuel soils are classified as Class A, which are most suitable for cultivation. The other soils, however, are classified as class B due to low fertility caused by poor drainage or excessive permeability. Alluvial land in hilly areas is usually classified as Class C or Class D in consideration of soil erosion. Grass and forest lands fall under Class M classification. (refer to Appendix E-1.)

Table 3.1.1. Summary of Climatological Conditions of Marinduque

Item	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Monthly Rainfall ^{1/}													
Mean (mm)	136.2	80.0	70.9	73.8	128.2	226.8	222.6	155.5	201.3	273.6	247.0	218.8	2,034.6
Max. (mm)	298.2	262.7	129.9	227.8	283.9	323.9	315.1	458.6	352.5	621.0	433.9	538.3	-
Min. (mm)	36.6	10.4	19.3	0.0	19.6	116.1	70.1	35.6	37.4	104.0	119.2	56.8	-
Daily Rainfall													
Max. (mm)	50.5	37.8	43.0	67.0	40.3	52.5	55.6	43.7	51.0	61.2	52.8	52.8	
Number of Rainy Days	6	4	4	4	5	8	9	6	8	10	9	6	80
Temperature ^{2/}													
Max. (°C)	28.3	29.1	30.5	31.8	32.9	32.2	31.6	31.6	31.3	30.7	30.0	28.6	
Min. (°C)	22.3	22.7	23.4	24.3	24.4	24.1	23.9	23.9	23.8	23.7	23.6	22.6	
Mean (°C)	25.3	25.8	26.7	28.0	28.6	28.2	27.7	27.1	27.1	27.5	27.2	26.9	27.0
Relative Humidity ^{3/} (%)	84	82	79	78	79	82	85	84	86	86	86	84	83
Cloudiness ^{4/} (okta)	5.7	4.5	3.7	3.4	4.4	5.6	5.6	6.0	5.9	5.7	5.5	4.9	5.1
Prevailing Wind													
Direction ^{5/}	NE	NE	E	SE	SE	SE	NW	NW	NE	NE	NE	NE	
Velocity (m/s)	2	2	3	3	2	3	2	2	2	2	2	3	2.4
Open Pan Evap. ^{6/} mm/day	3.2	4.7	6.1	6.6	5.6	4.7	4.1	4.0	3.7	3.5	3.3	3.3	1604.4
Number of Typhoons ^{7/}	1	1	1	2	5	8	4	1	1	10	10	8	1.4

Note: Period of Record and Source

1/ 1970 - 1986, (at Boac, PAGASA)

2/ 1977 - 1986, (at Calapan, PAGASA)

3/ - do -

4/ - do -

5/ 1970 - 1986, (at Calapan, PAGASA)

6/ 1977 - 1986, (at Los Banos, PAGASA)

7/ 1951 - 1987, (in Marinduque, PAGASA)

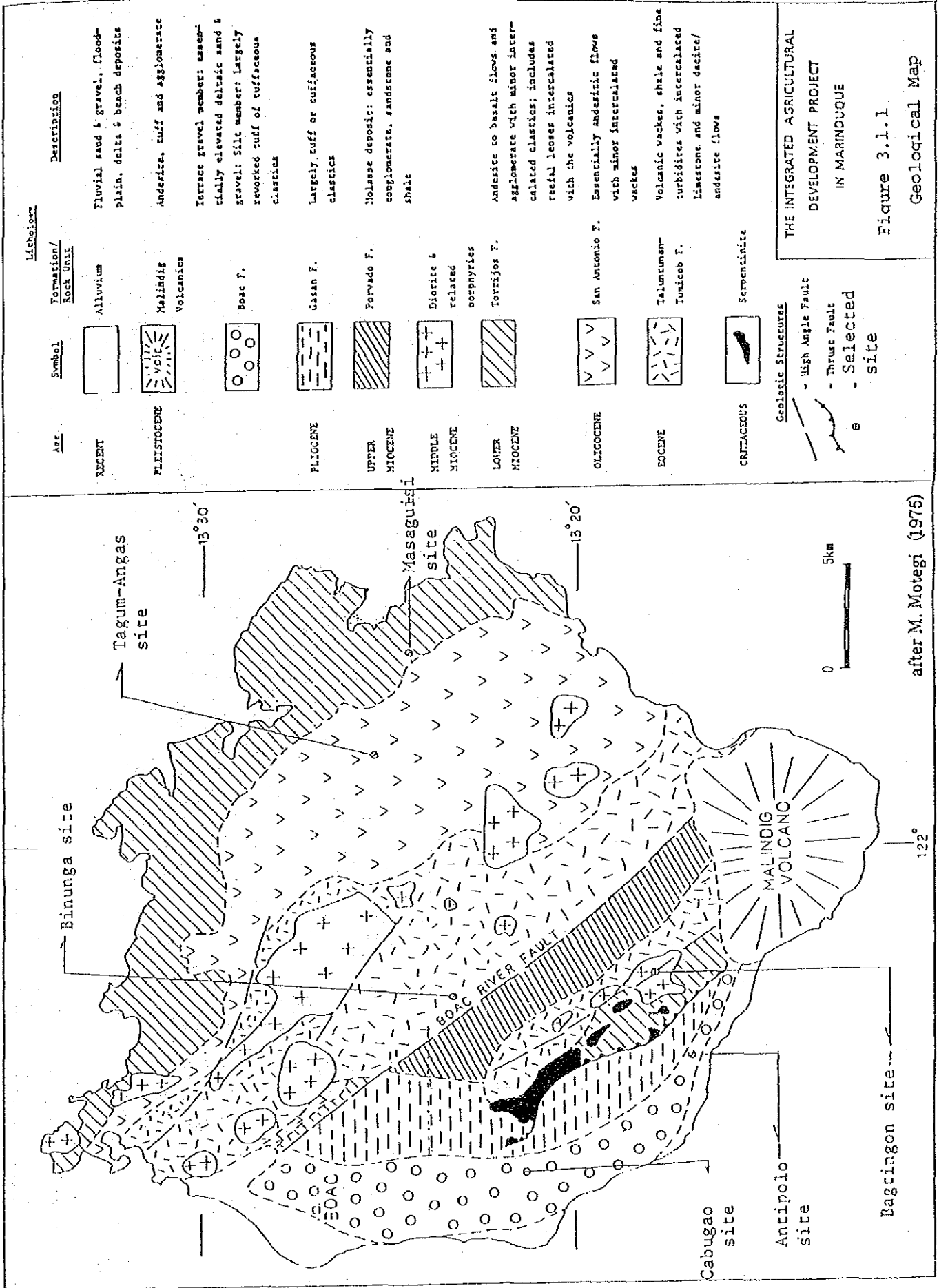
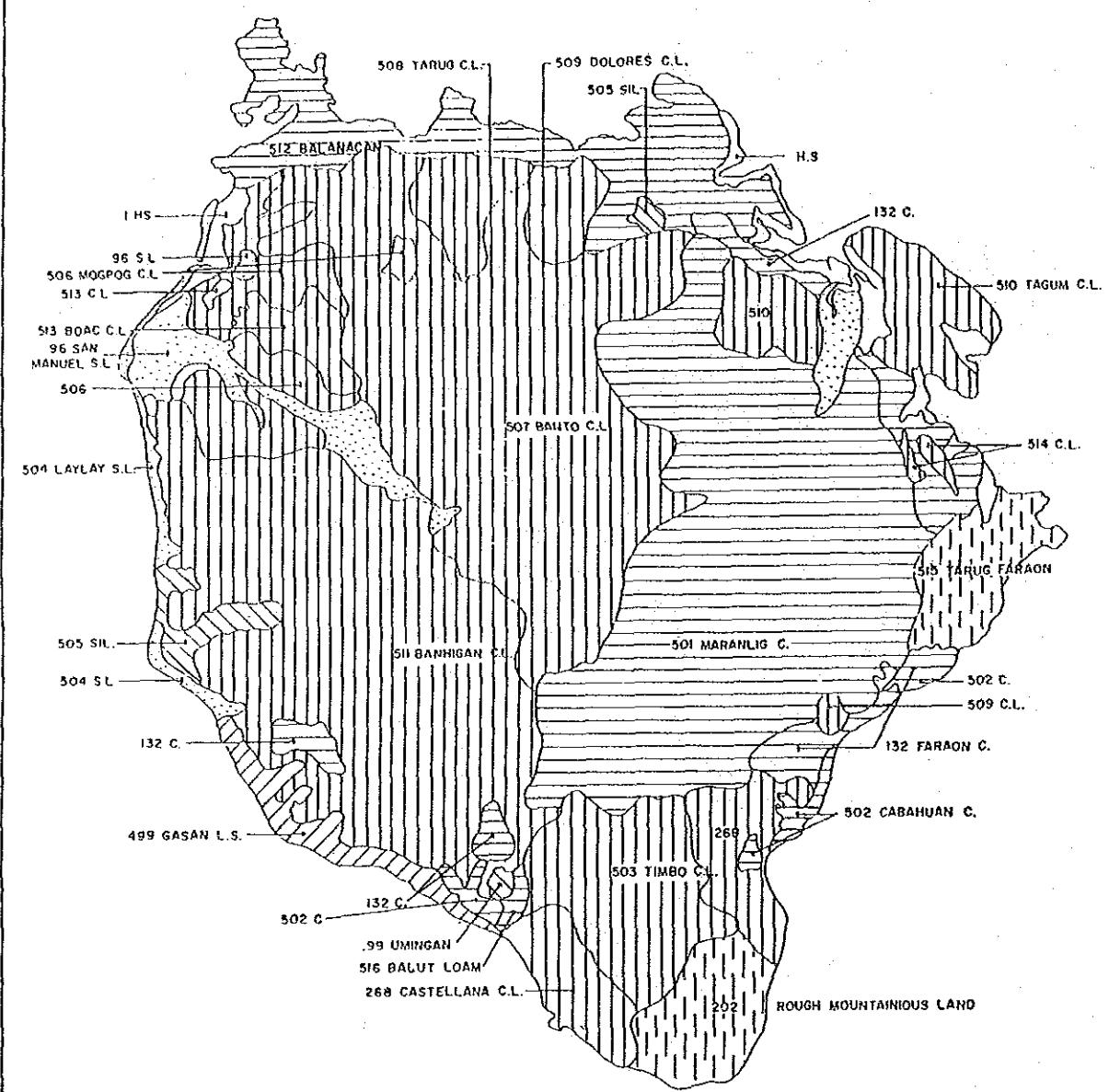






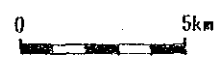


Figure 3.1.2 Soil Map



LEGEND :

-  H.S. HYDROSOL
-  S.L. SANDY LOAM
-  L.S. LOAMY SAND
-  SIL. SILT LOAM
-  C.L. CLAY LOAM
-  C. CLAY



3.2. Socio-Economic Conditions

3.2.1. Population

In 1980, Marinduque had a population of 173,715 which showed an average yearly growth rate of 1.3% between 1975 and 1980. Based on the assumption of annual growth rate of 1.9% during 1980 and 2010, it is estimated that the population of Marinduque reached 205,780 in 1989 and will increase to 305,536 by 2010. (refer to Figure 3.2.1)

Average population density per sq. km in Marinduque was 181 persons in 1980. Among six (6) municipalities, population density was highest in Mogpog with 301 persons per sq. km and lowest in Torrijos with 104 persons per sq. km. It is estimated that the average population density of Marinduque increased to 214 persons per sq. km in 1989.

3.2.2. Employment

The working age population (15 years old and over) in Marinduque was enumerated at 123,000 in 1987, of which the labor force population was estimated at 76,000 with a labor force participation rate of 61.8%. Employed persons in the labor force population was enumerated at 65,000 and the unemployed 11,000 with unemployment rate of 14.5%, which is the highest rate among eleven (11) provinces in the Region IV. It is estimated that this high rate of unemployment is due partly to adverse effects caused by the typhoons in 1987. (refer to Table 3.2.1.)

3.2.3. Economic Conditions

The main economic activity in the province is agriculture, with coconut as the primary crop, followed by palay and corn. Copra is the main source of income for most farmers and more than 50 copra buyers are engaged in the purchase and sale of copra. However, the

province experienced a sharp decline in the production of coconut in 1988 owing to damage caused by two typhoons in 1987. As the damaged coconut trees will take several years to recover, a normal harvest is not expected before 1992.

Fishery is a dominant source of livelihood in the province. Municipal fishing contributes about 77% of the total fish production. Commercial fishing production shared 21% of the total production while inland fishery and aquaculture had aggregate share of 2%.

The main industry is mining, producing about 13% of the nation's copper, 2% of its gold and 10% of its silver. Marcopper Mining Corporation operates, producing copper, while another mining firm extracts lime.

The manufacturing operations in the province have been closely linked with the agriculture sector, consisting of grain milling, food preservation, woodcraft, etc. Commerce and trade in the province is facilitated through two major trade centers in the neighboring provinces, namely, Lucena City in Quezon and Pinamalayan in Oriental Mindoro.

3.2.4. Family Income

The estimated total income of Marinduque was 671 million pesos for 36,608 families with an average household income of 18,330 pesos in 1985. Marinduque contributed only about 1.7% to the total regional income and had the second lowest share among the eleven (11) provinces of Region IV. Income level of the province seems to have worsened after 1987 when two big typhoons, Herming in August and Sisang in November, hit the island and caused considerable damage to agricultural production. (refer to Table 3.2.2.)

3.2.5. Administration

The provincial government of Marinduque is responsible for overall planning and development of Marinduque to improve socio-economic conditions in close collaboration with national line agencies and other institutions. Organizationally, the provincial government is composed of the office of the Provincial Governor, Vice Governor, Sangguniang Panlalawigan (Board Members), and the offices of various divisions such as Civil Security Unit, Provincial Budget, Provincial Planning and Development, Provincial Treasurer, Provincial Engineer, Provincial Assessor, Provincial Agriculturist, and National Offices. (refer to Figure 3.2.2)

The province of Marinduque is divided into six (6) municipalities, namely; Boac, Buenavista, Gasan, Mogpog, Santa Cruz, and Torrijos.

Each municipality in Marinduque is further subdivided into Barangays. The municipality of Boac, the capital town, ranks third in land area, but ranks first in terms of the number of Barangays with 61, followed by Sta. Cruz with 55, Mogpog with 37, Gasan and Torrijos with 25 each, and Buenavista with 15. The total number of Barangays is 213.

Table 3.2.1 Employment Status (1987), Region IV

Province	15 years old & Over (1,000)	LFPR	Employment Rate	Unemployment Rate
Philippines	35,865	65.4	91.7	8.3
Region IV	4,690	64.6	91.6	8.4
Batangas	858	69.8	88.6	11.4
Cavite	651	55.8	94.2	5.8
Laguna	773	66.5	87.2	12.8
Marinduque	123	61.0	86.7	14.7
Occ. Mindoro	159	71.7	100.0	-
Oriental Mindoro	324	56.2	92.3	7.7
Palawan	291	70.1	98.0	2.0
Quezon	820	61.1	92.6	7.2
Rizal	475	66.1	92.7	7.3
Romblon	132	81.1	94.4	5.6
Aurora	86	64.0	92.7	5.5

Source: Integrated Survey of Households, NCSO, Oct. 1988

Note : LFPR - Labor Force Participation Rate

Table 3.2.2 Family Income Data for Southern Tagalog Provinces (1985)

Province	Family Income (million pesos)	No. of Families (.000)	Average Family Income (Pesos)	Ranking
Batangas	7,127.1	237.4	30,020	5
Cavite	6,681.1	168.0	39,759	2
Laguna	8,452.8	204.9	41,249	1
Marinduque	671.0	36.6	18,330	10
Occ. Mindoro	1,773.8	49.8	35,638	4
Oriental Mindoro	2,100.0	95.5	21,979	6
Palawan	1,711.9	82.5	20,746	7
Quezon	4,842.8	245.3	19,741	8
Rizal	4,694.1	121.8	38,547	3
Romblon	636.2	40.1	15,856	11
Aurora	401.0	21.7	18,479	9
Southern Tagalog	39,091.7	1,303.7	29,985	-

Source: 1985 Family Income and Expenditures Survey

Figure 3.2.1 Population Trend in Marinduque

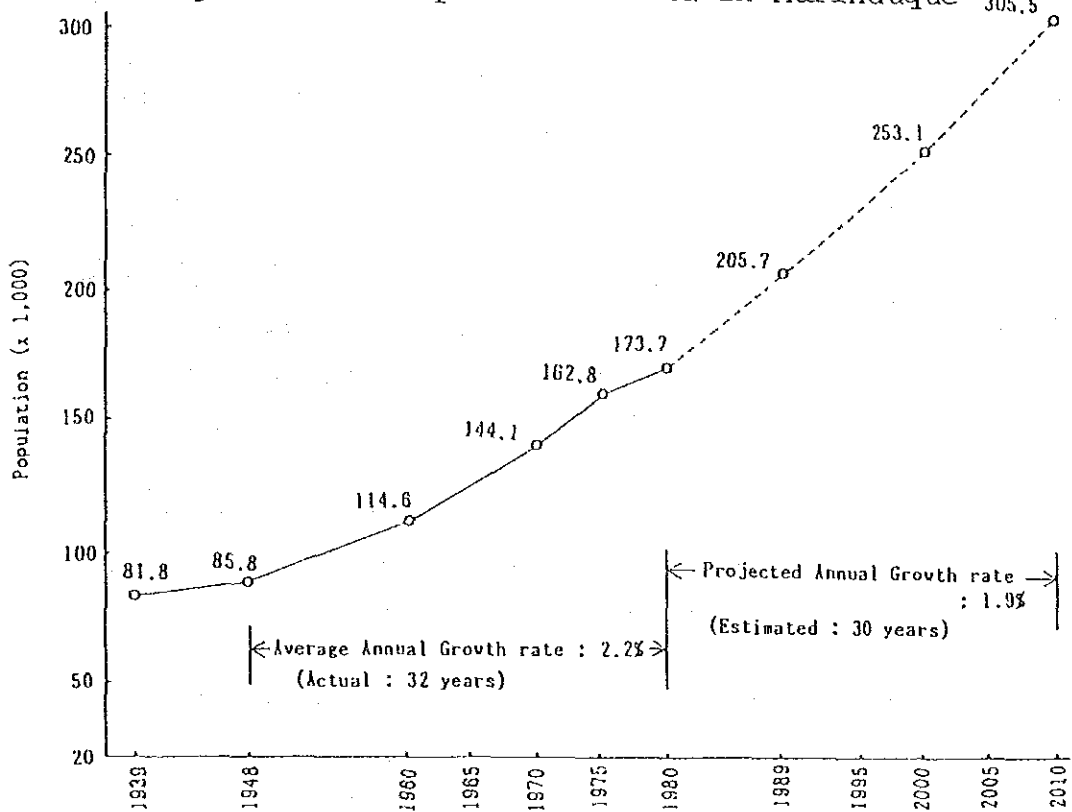
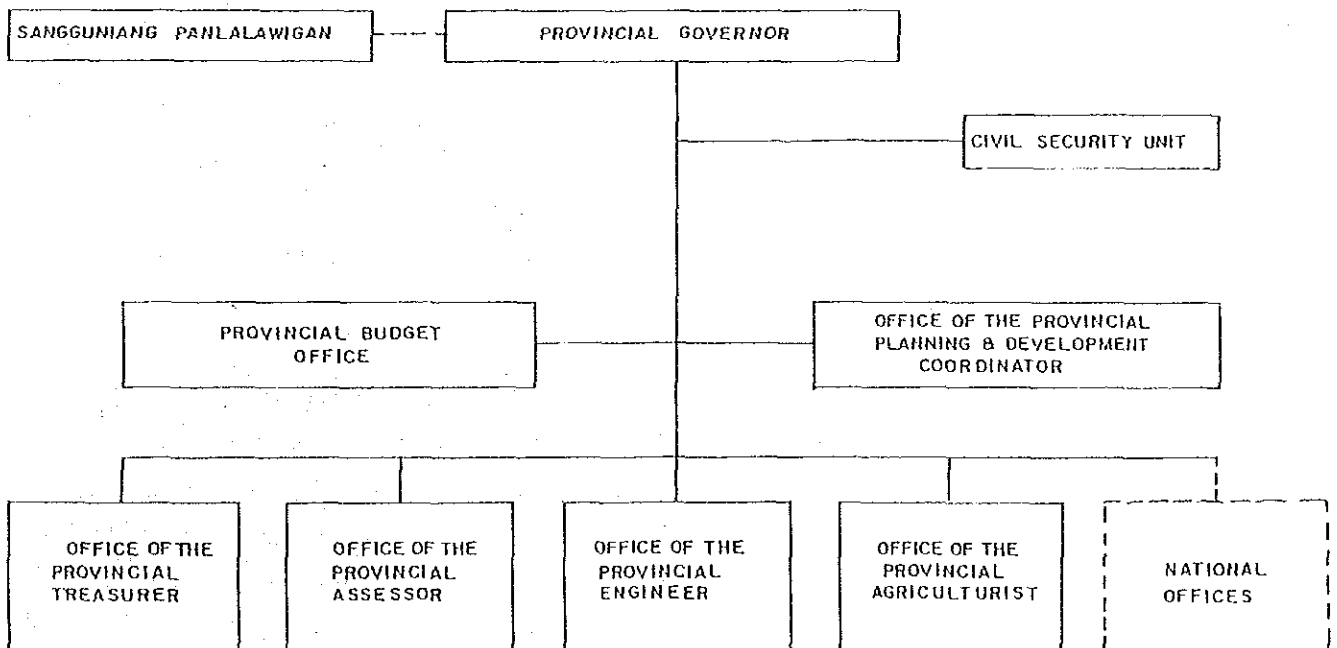


Figure 3.2.2 Organizational Chart of Marinduque Provincial Government



3.3. Present Condition of Agriculture

3.3.1. Numbers of Farm Households and Farming Population

Marinduque province has a population of 173,715 and the number of households is 32,263, including a farming population of 26,935 by age group ranging from 15 to 60 of age and farm households of 16,395 households, respectively. Population growth rate for the area is assumed to be 1.9% per annum for forecasting the population after 1980. This growth rate has resulted in a population of 205,780, a farming population of 31,910, 38,220 households, and 19,420 farm households, respectively in the forecast as of 1989.

The number of internal migrants from Marinduque averaged about 1,100 persons per annum from 1960 to 1970.

3.3.2. Present Land Use

Agricultural areas, including the area for shifting cultivation, account for 44,700 ha (or 55.5% of the study area). The most dominant crop is coconut comprising 32,470 ha (or 40.3%). Due to limited land resources in Marinduque, coconut is planted even on the steep mountain sides with slopes of more than 18%.

Lowland rice occupies about 5,400 ha (or 6.7%), of which irrigated and rainfed rice fields account for 900 ha and 4,500 ha, respectively. Upland rice accounts for 3,500 ha (4.3%) although harvested area and production may vary year to year depending on weather conditions.

Banana, pineapple, coffee, rootcrops, etc., are cultivated on a part of the coconut area. Meadows and others account for 2,810 ha, while forest and cogon grasslands occupy an area of 29,900 ha

(37.1%) which includes forest areas of 5,530 ha (6.9%). Mangrove/nipa lands account for 4,910 ha (6.2%), of which some land is planned for fishpond operations. (refer to Table 3.3.1 and Figure 3.3.1.)

The cogon area abandoned by farmers as unsuitable for cultivation is vast. The area was converted because of plunderous farming without farm inputs and top soil erosion.

3.3.3. Land Tenure System

a) Land Holding

The average farm size of 3.57 ha in 1971 decreased to 2.71 ha in 1980, which was about 4% less than the national average of 2.84 ha. The number of farm households increased by 34% whereas agricultural land increased by only 2.4%, from which it is estimated that expansion of agricultural land is nearing its maximum. There are about 19,420 farm households with 44,700 ha of agricultural land which is equivalent to 2.3 ha per farm. The farmer has 0.5 ha of cultivated land on average.

b) Land Tenure System

In terms of land tenure status, number of tenants increased at higher rates than full owner or part owner. Share of landowner in 1971 (87%) decreased to 76% in 1980 whereas share of tenants increased by 11%. The average farm size was 2.72 ha in 1980. (refer to Appendix E-1)

c) Agrarian Reform

The history of the agrarian reform in the country began with establishment of the first agrarian reform act in 1955 by the then President Magsaysay. In March 1957, however, this act was abolished

due to the president's accidental death. Similar acts have been proclaimed by his successors since then. But, none have been actuated due to heavy resistance by landlords. For about 16 years, between 1972 and early August 1988, agrarian reform was promoted very slowly under Presidential Decree No.27, issued in 1972 for releasing paddy and corn fields. This had resulted in releasing only 27.3 ha of fields, giving birth to 27 tenants turned owner-farmers in Marinduque.

Since then, however, the Republic Act No.6657 Comprehensive Agrarian Reform Program (CARP) has been proclaimed with the change of government and about 120.1 ha of paddy fields have been smoothly released for 321 tenant farmers to become owner-farmers in a period of only nine months from August 1988 to April 1989. By April 1989, 348 beneficiaries are able to benefit from 147 ha of cultivated land, under the agrarian reform.

Since the present programme aims to release a total of 283 ha of farmland to 639 beneficiaries by 1992, the accomplishment ratios of the agrarian reform are 52% in acreage and 54% in number of beneficiaries.

The accomplishment ratios by Municipality are 74% in Boac, 67% in Mogpog, 63% in Sta. Cruz, 47% in Torrijos and 45% in Gazan. The Buenavista municipality has made no progress in agrarian reform due to unfinished land survey. (refer to Appendix E-4.)

The number of landowners offering their farmland to sell is 66, with 175 farm lots and 834.9 ha in acreage as of April, 1989. The Bureau of Land, Department of Agriculture is now pressed with much survey work, which has come to a temporary halt due to shortage of funds.

For four months between January and April, 1989, only seven landowners have made the papers and documents ready for the proposed sale with 11 plots and 56.2 ha in acreage after the surveying is complete.

On the other hand, the leasehold contracts have been drawn up between 1,840 landowners and 2,332 farmers, covering 1,022.7 ha.

3.3.4. Present Conditions of Agriculture

a) Farming System

The dominant crop in Marinduque is coconut, followed by rice, cassava, sweet potato, corn, and legumes. Present typical cropping patterns are: (i) coconut + rice + diversified crops (cassava, sweet potato, potato), (ii) coconut + rice + fruits (e.g. banana), (iii) coconut + rice + livestock, (iv) coconut + rice + vegetables, (v) upland rice + upland crops (shifting agriculture).

Those farmers practicing slash-and-burn farming are new farmers who have no coconut plantations, and it is no exaggeration to say that almost all the cultivable lands with slope below 18% have been planted with coconut. It is necessary, as a consequence, to make effective use of areas in the plantations with the cultivation of fruits, and other diversified crops under coconut trees. (refer to Appendix E-1)

b) Cropping Pattern

Cropping seasons for the first and second paddy in an irrigated field are May to September and November to March, respectively. Cropping seasons of rainfed rice are July to November in the case of one cropping and June to October and December to April for the first and second crops, respectively, in the case of double cropping. Upland rice is usually cultivated between May and September while corn and legumes are planted in other months. (refer to Figure 3.3.2)

Cropping intensity is estimated at 190% for irrigated rice in small areas. Cropping intensity of upland rice and other crops is also estimated at 140%. Upland rice is cropped during the rainy season, after this crop, corn, root crop, and beans will be planted. A cropping intensity of 140% is estimated. Cropping intensity of crops grown on coconut plantations is estimated at less than 5%.

c) Farming Practices

High yielding varieties (HYV) such as IR-62, -64, -66 and -70 are transplanted at interval of 12 to 15 cm after two weeks of seeding. About ten seedlings are planted in each stub. The standard application of basal fertilizers is set by DA as follows: 60 kg for N, 30 kg for P_2O_5 , and 30 kg for K_2O . However, farmers cannot always follow this standard due to the high prices of fertilizer. No specific management is practiced except some weed control. Water management is only practiced to provide supplemental water just in case of water shortages.

HYVs are also planted in rainfed paddy fields. However, patterns of growth are not consistent because of the mixture of different varieties. The cultivation method is almost the same as in the case of irrigated rice apart from water management which is dependent on weather conditions. Although the standard application of basal fertilizers is the same as in the case of irrigated rice, this standard is not always applied due to the high prices.

Local varieties are planted in upland rice cultivation by way of broadcasting. No specific farm management except weeding is practiced. Although standard applications of fertilizers are set in the manual, no fertilizer/agro-chemicals are applied in practice. Application of farm inputs such as fertilizers and agro-chemicals is not common in the case of coconut, corn, rootcrops, legume and fruits. For improved vegetable cultivation, the introduction of

ridge building method will be required in order to protect against humidity damage, therefore, a ridge building machine (ridger) needs to be introduced in addition to draft animals.

d) Farm Mechanization

Carabaos and cattle are widely used for ploughing and harrowing. There are ten privately-owned and two publicly-owned power tillers in the area, as of 1989.

There is little usage of farm machinery in the Study Area. Ploughing and harrowing works are conducted by using carabao or cattle with plow or tooth harrow. About half of the total farm households own these tools. There are only twelve power tillers in the whole province, of which ten units are privately owned. 43 units of privately-owned and one unit of publicly-owned power thresher can be found in the province. Part of the sloped land of less than 18% was reclaimed manually which needs too much labor force. Most farmers find difficulty in transporting their produce due to lack of roads and transportation facilities, particularly in the interior of the province. Even for carrying tools such as barrows are not available.

e) Production and Yield

Coconut trees are planted in about 33,500 ha, producing, annually, 32,200 tons with an average yield of 0.99 ton/ha, which is lower than the average yield (three to four tons) of other countries. The reason for this is that in spite of the necessity for replanting of older coconut trees, it is difficult for farmers to do this as there is a need for a considerable amount of investment. It is also difficult for farmers to find other income sources before the planted trees are mature enough to bear fruit.

The average planted area of palay and upland rice during the last five years reached about 10,900 ha which produced annually about 16,600 tons of palay. This yield of 1.52 ton/ha is far below the national average of 2.5 ton/ha. Low productivity is attributable to mixed seed application and excessively dense planting with a low use of fertilizer. Land planted with corn totals 1,020 ha yields about 640 tons with average yield of 630 kg/ha, far below the national average of 1.0 ton/ha. Mungbeans are planted on 130 ha yielding about 90 tons with an average yield of 700 kg/ha which is about the same as the national average. Banana is planted on 580 ha, and yields 4,135 ton. Banana is exported to other provinces. (refer to Appendix E-1.)

f) Supply and Demand

The total amount of palay in Marinduque is calculated at 32,200 tons based on the per capita consumption of 103 kg of rice. Since the production of palay in the Province is 16,600 ton, the self sufficiency rate is 47%. The imported volume of vegetables and production are 800 tons and 900 tons, respectively. The per capita consumption is only 8 kg or 40% of the national average. A total of 1,700 tons of vegetables are consumed annually.

g) Livestock

Livestock has increased in numbers between 1980 and 1987. Among others, the number of cattle has increased from 6,540 to 8,080, carabaos from 20,679 to 25,262, swine from 43,220 to 55,568, and chickens from 213,246 to 297,087. (refer to Appendix E-1)

The provincial government intends to ban the export of cattle to other provinces in order to increase their numbers. DA has established a livestock breeding center in Sta. Cruz where the mating of superior species and training of inseminators are being carried out. For artificial insemination, a storage tank is

necessary. Recently, tanks have been introduced in Marinduque. Because of the lack of cold storage facilities, before the introduction of tanks artificial insemination had to be carried out within a day after taking the semen and hence artificial insemination could be carried out on a limited basis. Artificial insemination is currently being done with swine and goats. In the future plan, the station intends to conduct artificial insemination for larger livestock such as cattle. Preventive injections are made to livestock at the DA's expense although there exists no livestock health center in the province. There are three injectors and two trainees in the station in spite of the fact that foot and mouth disease and sepsis can almost be controlled by vaccine.

Livestock breeding in the province is conducted on a small scale and are mostly raised for self-consumption. It is observed, however, that the number of livestock farmers has a tendency to increase in Buenavista and Torrijos, where some farmers take their livestock to pasture for tethering and grazing. The number of animals slaughtered in 1987 was 916 head of cattle, 1,112 head of carabao and 10,843 head of swine. The largest number of cattle slaughtered was in Sta. Cruz, 543 heads which take up more than half the total, while only five head were slaughtered in Buenavista and 80 to 110 head in other municipalities. For slaughtered carabaos, 402 head was the largest number, in Mogpog, as many as 300 to 310 head in Boac and Gasan, and around 30 head in the other three municipalities.

It is considered a serious matter that in Buenavista and Torrijos, such a small number of animals were slaughtered. The reason is that there are many poorer farmers in both municipalities.

The Gasan slaughterhouse has been improved with modernized buildings and facilities, but other slaughterhouses remained unchanged.

3.3.5. Post-Harvest Works

Post-harvest works such as threshing and drying of paddy are usually conducted manually. Corn threshing is also carried out manually. Recently, some farmers have introduced power threshers for the purpose of labor-saving and the improvement of quality. There are 43 power threshers in the Study Area, of which 42 are privately owned. There is no mechanical paddy drier in the province. Sun drying of paddy and corn tend to lower the quality of these crops. Lower quality of crops is attributable to uneven drying, mixture of foreign substances, incomplete cleaning and grading, and a lack of proper storage facilities. Construction of cooperative storage facilities and rice milling would be essential to improve the quality of agricultural products. There exist 76 rice mills in the province, most of which are small-scale mills called "kiskisan". (refer to Appendix E-1.)

3.3.6. Marketing of Agricultural Products

Due mainly to its physical constraints, Marinduque is not self-sufficient in foodcrops production, particularly for rice and vegetables. Most of the rice deficit in the province has been supplied through NFA and commercial traders by importing rice from the neighbouring provinces. In addition to rice, some vegetables are also imported from the neighbouring provinces of Quezon and Oriental Mindoro. Vegetables such as tomato, garlic, red and white onions, carrots, cabbage, etc. are shipped from Lucena City to Marinduque and are sold at public and private markets in the province.

Coconut has been the most important agricultural product in Marinduque, although the production has tended to decrease. Consumption of coconut in Marinduque is estimated to be about 5% of the total production. The remaining coconut will be converted to copra and sold to copra buyers. There are more than 50 copra buyers

in Marinduque. These copra buyers ship the collected copra to the copra processing mills in Lucena City. Due to heavy damage caused by the typhoons in 1987, however, coconut production in 1988 showed a sharp decline which adversely affected the Marinduque economy.

Every municipality has one public market. Among the products sold are vegetables, meat, fish, fruits, and dried foods. In addition to the public markets, there are some barangay markets in the province. Markets usually operate once a week, with the most common market day being Sunday. On market days, several vendors come from neighbouring places to sell their products. Agricultural produce is transported to the market place using carts pulled by horses or carried on foot.

3.3.7. Present Condition of Agro-processing

Agro-processing industries are important among small-scale and cottage industries in the province. Agricultural products produced in the province are either consumed within the island or transported to other provinces without processing. Wood resources are also exported without processing.

3.3.8. Agricultural Credit

Agricultural credit services are provided through the Philippine National Bank (PNB) at Boac and the Rural Bank of Santa Cruz, Inc. Out of five rural banks in Marinduque, four banks are not in a position to extend loans to farmers or traders due to financial constraints. These banks' activities are concentrated on the collection of outstanding loans. Aside from these formal lending institutions, there are also informal lenders such as traders and other types of private financing arrangements.

Farmers' organizations can be important conduits for channeling credit to small farmers. Credit facilities could be available for cooperatives in accordance with the amount accumulated in each cooperative. Small coconut farmers' organizations, promoted under the guidance of the Philippine Coconut Authority, also have access to agricultural credit services to increase farm productivity.

3.3.9. Farmer's Organization

There are several types of farmer's organizations in the province. Farmers' associations (FAA) and fishermen's associations (FIA) are organized under the guidance of DA in order to transfer agricultural technology and information to farmers. Irrigators' associations (IAs) are organized under the guidance of NIA for the purpose of collecting irrigation fees and the operation and maintenance of communal irrigation systems. In addition, there exist small coconut farmers' organizations and several types of agricultural cooperatives in the project area. In 1988, there were 67 FAAs, 11 FIAs, 21 IAs, 62 Precooperatives (Samahang Nayan), 1 marketing cooperative, and 2 multipurpose cooperatives in the province. In general, most agricultural cooperatives are weak and have financial and operational problems because of lack of adequate management staff.

3.3.10. Agricultural Research and Extension Services

There are 54 extension workers in Marinduque, of which 41 belong to the provincial office of DA and 13 belong to the agricultural office of the provincial government. Average coverage of one extension technician is five Barangays at the national level. Extension technicians in Marinduque cover 218 Barangays with an average coverage of about four Barangays per technician. Although the ratio of extension workers to the number of Barangays seem to be appropriate, extension services in the province suffer from the following constraints: (refer to Appendix E-1.)

- Frequency of extension technicians' visit to farmers is low due to lack of road and transport facilities. It is reported that a technician can visit Barangays located near the national road only once or twice in one cropping season.
- Agricultural research and extension services have been focused primarily on rice and corn in the province due to the technician's lack of knowledge regarding other crops.
- Most extension technicians lack full knowledge and technology of extension services due to poor training facilities.

Although the provincial office of DA and the provincial agricultural office are extending various kinds of agricultural services in the province, Marinduque has no agricultural institution. The provincial agricultural office (DA Region IV) is composed of divisions of administration, operations, and research. Five research staff are conducting research work on rice. Vegetable cultivation is conducted in demonstration farms in each municipality without providing any advanced technical guidance. For the promotion of vegetable cultivation and animal husbandry in the province, provision of training for provincial research staff will be essential.

3.3.11. Farm Economy

In order to update existing data inputs, agro-economic survey was conducted in 20 Barangays during the field survey. 20 Barangays were selected in six municipalities at random. Four Barangays were selected in each of Boac and Sta. Cruz, and three Barangays in each of the four municipalities of Buenavista, Gasan, Mogpog and Torrijos.

Major findings obtained in the survey are briefly presented as follows:

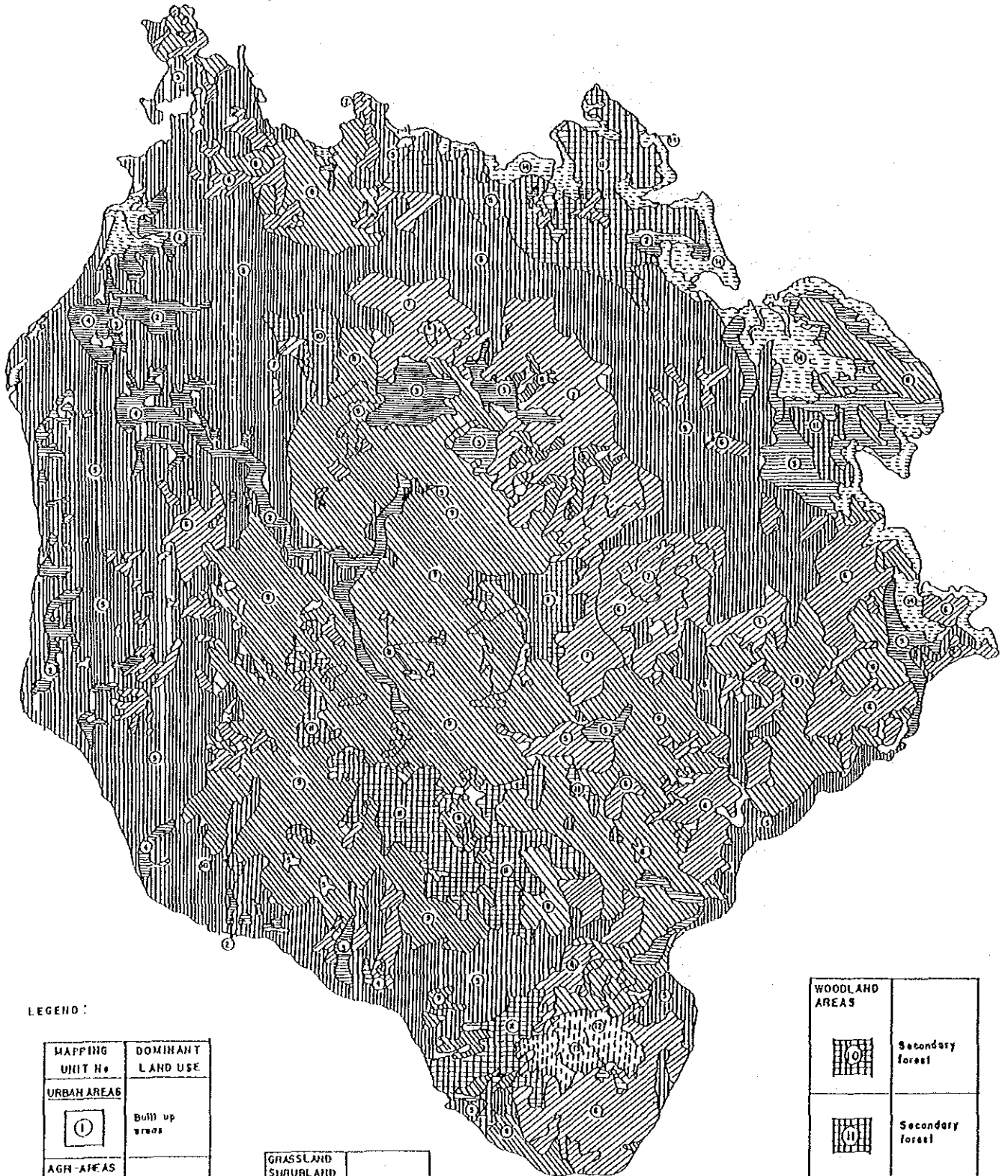
- (1) Percentage of farm families in a Barangay is 62%.
- (2) Percentage of landownership is:
 - full owner: 42%
 - tenant : 58%
- (3) Average landholding per landowner is 1.8 ha.
- (4) Average landholding of tenant is 1.6 ha.
- (5) Average farm size is 0.9 ha for paddy, 0.4 ha for corn and 1.8 ha for coconut field.
- (6) Average palay production is 60 cavan during the dry season and 70 cavan during the wet season.
- (7) Average corn production is 12.9 cavan/ha.
- (8) Average crop-sharing rate is 25% for palay and 65% for coconut.
- (9) Average farm gate prices: palay at 3.60 pesos and copra at 3.70 pesos.
- (10) Average livestock consumption per household per year: Carabao 1.4, hogs, 1.7 and chicken 5.5.
- (11) Average cost of human and animal labor: Human labor at 32 pesos and animal labor at 22 pesos.
- (12) Average family income is 10,207 pesos per year.
- (13) The busiest months: 1st: Jun. 2nd: Oct. 3rd: Nov.
- (14) The slackest months: 1st: Aug. 2nd: Feb. 3rd: Jan.
- (15) Percentage of electrified Barangays: 75%
- (16) Development needs ranking: 1st: Agriculture 2nd: Water supply 3rd: Roads

Table 3.3.1. Present Land Use

(unit: ha or %)

Land Use Category	Marinduque		Study Area	
	Acreage	Rate	Acreage	Rate
1. Agricultural Area				
- Paddy field	5,400	5.6	5,400	6.7
(Irrigated)	(900)	(0.9)	(900)	(1.1)
(Rainfed)	(4,500)	(4.7)	(4,500)	(5.6)
- Diversified crops	4,070	4.2	4,020	5.0
- Coconut land	32,910	34.4	32,470	40.3
- Meadow, others	2,850	3.0	2,810	3.5
<u>Sub-total</u>	<u>45,230</u>	<u>47.2</u>	<u>44,700</u>	<u>55.5</u>
2. Forest Area				
- Shrub/grasses	34,460	35.9	24,370	30.3
- Forest	9,910	10.3	5,530	6.9
<u>Sub-total</u>	<u>44,370</u>	<u>46.2</u>	<u>29,900</u>	<u>37.2</u>
3. Wetland Area				
- Mangrove/Nipa	3,900	4.1	3,540	4.4
- Fishpond	700	0.7	700	0.9
- Minespit site	670	0.7	670	0.8
<u>Sub-total</u>	<u>5,270</u>	<u>5.5</u>	<u>4,910</u>	<u>6.1</u>
4. Others				
- River, road built-up area, etc.	1,050	1.1	990	1.2
<u>Total</u>	<u>95,920</u>	<u>100.0</u>	<u>80,500</u>	<u>100.0</u>

Figure 3.3.1 Present Land Use Map



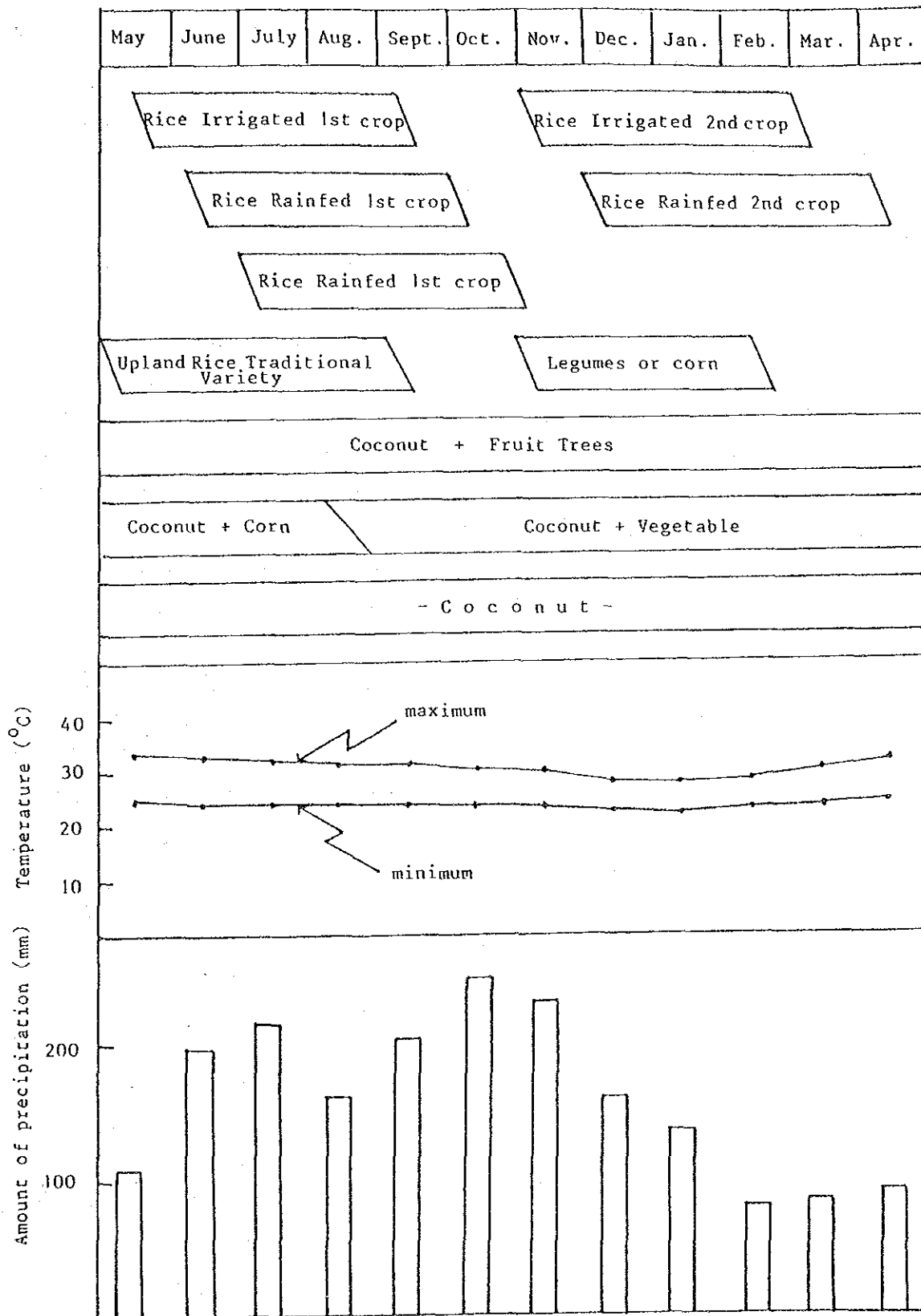
LEGEND :

MAPPING UNIT No	DOMINANT LAND USE
URBAN AREAS	
①	Built up areas
AGRI-AREAS	
②	Paddy rice (rainfed)
③	Paddy rice (rainfed)
④	Paddy rice (irrigated)
⑤	Coconut

GRASSLAND AND SHRUBLAND AREAS	
⑥	Grasses
⑦	Grasses
⑧	Shrubs and Brusses
⑨	Shrubs and brusses

WOODLAND AREAS	
⑩	Secondary forest
⑪	Secondary forest
⑫	Primary mossy forest
⑬	Primary mossy forest
WET LAND AREAS	
⑭	Mangro and Fishpond
⑮	Mangro and Fishpond

Figure 3.3.2 Present Cropping Pattern



3.4. Small-Scale and Cottage Industries

Manufacturing operations in the province have been closely linked with the agricultural sector and have been largely carried out by small-scale operators in the areas of grain milling, food processing, woodcraft, weaving, etc.

Handicraft operation is one of the main manufacturing activities in the province. Although there are no exact data on the handicraft establishments, it is estimated that more than 30 establishments are operating for the manufacture of wooden birds, napkin rings, bamboo fans, nito baskets, etc. There exists only a few establishments which can employ more than 100 workers. A handicraft establishment in Gasan employs about 300 workers and produces 620,000 pcs. of wooden birds and other fashion accessories. Another establishment in Gasan employs about 140 workers to produce 740,000 pcs. of wooden birds and other decorative items. Most woodcraft establishments are located in Gasan while others are located in other municipalities.

One of the major problems in woodcraft manufacturing is the shortage of raw materials. Supply of logs suitable for handicraft is decreasing annually. The manufacturers feel it imperative to make plantation of several species such as Santol, Dita, Lanete, Taloto and Bonliw to secure raw materials in the future.

3.5. Present Condition of Agricultural Infrastructure Facilities

3.5.1. Irrigation

a) Facilities and Conditions

There are five types of irrigation systems in Marinduque; Communal Irrigation System (CIS) by NIA, Communal Projects and Small Water Impounding Projects (SWIP) by DA, individual pump managed by NIA and Self-Irrigation System. All the Communal Irrigation Systems by NIA are irrigated by gravity system from intake to diversion structures. Meanwhile, the Communal Projects of DA are operated by means of pumps and gravity diversion.

The potential area amounts to 1,240 ha of paddy fields, while the actual irrigated acreage amounts to 900 ha which is equivalent to a service rate of 73%.

<u>Irrigation system</u>	<u>Potential Area</u> (ha)	<u>Irri. Area</u> (ha)	<u>Service Rate</u> (%)
CIS (NIA)	647	447	69
Individual Pump (NIA)	32	15	47
Pump (DA)	124	63	51
Gravity (DA)	27	-	-
SWIP (DA)	29	7	24
Self Irrigation	381	374	98
<u>Total</u>	<u>1,240</u>	<u>906</u>	<u>73</u>

As of August 1989, NIA has 21 existing CISs, ten of which are fully-operational, seven partially-operational, and four non-operational. They are not fully operational because they have not been rehabilitated after it has been damaged by floods and/or defective constructions of intake works. (refer to Figure 3.5.1 and Appendix F-1-1.)

DA has three projects run by pumps which are all operational, and one project of a gravity diversion type which is non-operational due to poor water supply and heavy siltation of the main canal. Of the two SWIP projects, one is partially operational due to inadequate canalization and the other is non-operational due to lack of diversion works. There are ten individual pumps of NIA, six of which are non-operational due to engine breakdown and unavailability of spare parts in Marinduque. Farmers need quick actions by the agencies concerned regarding these problems.

b) O & M Organization

Management of CIS is exercised by the Irrigators' Association (IA) organized by the farmers themselves. IA has a financial obligation to pay periodically; hence, the officers have to collect a water charge of 1.5 cavan/ha/year from members (beneficiaries) for O & M expenses and amortization of construction costs. Amortization payment rate is low, only 26.0% because of the beneficiaries' unwillingness or failure to pay due to very low yield, resulting from typhoons, droughts, and traditional rice production practices. Another factor is poor management whereby officers do not plan or enforce proper collection strategies, and impose no penalty to non-payers.

For IAs, only 19% or four out of 21 IAs have good management while 81% or 17 IAs have poor management. The case is similar to associations under DA.

3.5.2. Drainage and Flood Damage

a) Drainage Conditions and Facilities

Most of the farmlands have no drainage facility because the land slope is generally steep. Flood occur during typhoons and continuous heavy rains. However, damages to crops are slight. The

duration of submergence ranges from 3 to 24 hours and the height of water ranges from 0.3 to 1.5 m. There are ten places inundated during typhoons and continuous heavy rains. Out of these, two had the biggest damages - in the downstream areas of the Mogpog and Boac rivers. The area of about 100 ha at the southern part of the Poblacion of Mogpog, frequently suffers from submergence due to inadequate drainage facilities, and high tide. The downstream part of the Boac river, has limitation in the protection dike but the length is not enough. The affected area is estimated at 150 ha. (refer to Figure 3.5.2 and Appendix F-2-1.)

b) Flood Protection Facilities

The 8.6 km of dikes in Marinduque have 20 flood protection facilities. The dike is classified into three; (1) open channel - improvement of existing rivers/creeks and drainage channel (2.7 km), (2) earth dike - earth-fill protection dike (1.3 km), and (3) revetment - concrete protection dike (4.6 km). It has been discovered that many facilities suffer from flood damage and need immediate repair, particularly for two protection dikes which were totally washed out. Improvement of the dikes is essential (refer to Appendix F-2-1.)

c) O & M Organization

DPWH is an agency for flood protection facilities and responsible for their maintenance. Since the agency has limited funds, only repair work of existing facilities can be undertaken leaving the new projects incomplete or not started.

3.5.3. Roads

a) Present Conditions

Roads in Marinduque province are classified into four categories, i.e. national roads, provincial roads, municipal roads and Barangay roads. The main road network is formed by a circumferential road (national road) around the Island. The present road system covers a total length of 666 km, of which 219 km are national roads, 173 km are provincial roads, 135 km are municipal roads and 139 km are Barangay roads. (refer to Figure 3.5.3 and Appendix G-1-1.)

Conditions of the roads, particularly provincial and Barangay roads, farm-to-market roads, and even some national roads are poor because of frequent typhoon damage and inadequate maintenance/rehabilitation due to lack of funds and maintenance equipment. During the wet season, many sections of farm road become impassable and dangerous for motor vehicles.

As to the adequacy of the road network, the road density in the province in 1987 was 0.69 km/sq.km of land area and 3.36km/1,000 population. This is fairly extensive compared to the national average of 0.53 km/sq.km of land and 2.75 km/1,000 population. This extensive road network, however, is limited to the area along the circumferential road, while the road network in the interior Barangays is still in poor condition. (refer to Appendix G-1-1.)

Problems of the present road network are summarized as follows:

- Lack of farm-to-market roads particularly in the interior agricultural areas,
- Lack of farm roads through agricultural land,
- Poor road maintenance activities due to lack of operation and maintenance equipment, and

Inadequacy and lack of road protection structures such as side ditches, road crossing culverts, side slope protections, etc.

b) Typhoon and Flood Damage

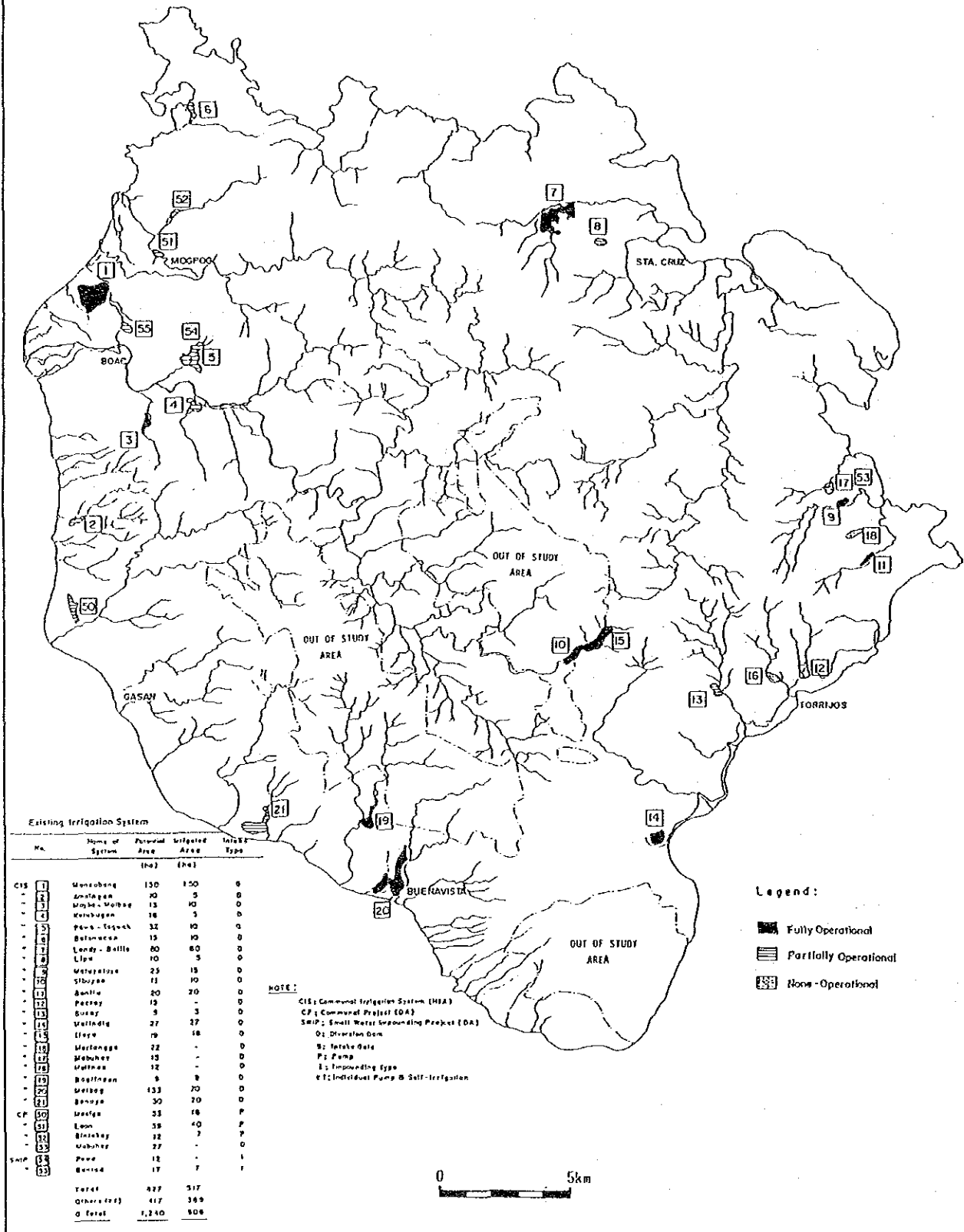
Since Marinduque Province is composed of hilly and mountainous land, many road sections are winding, rolling, and with steep gradient having either gravel or earth surface. In such road conditions, road beds are easily eroded and washed out by heavy and excessive rain water. As a consequence, roadways are often obstructed or closed due to landslides when hit by strong typhoon.

c) O & M Organization

Roads and bridges are public infrastructures to be maintained by the government. There are three governmental organizations which undertake operation and maintenance of roads, i.e. DPWH, PEO and the municipal governments.

DPWH is responsible for all national roads and most Barangay roads, while PEO undertakes all provincial roads and part of the municipal and Barangay roads. The municipal governments maintain most municipal roads. Maintenance work, however, has been seriously suffered affected by lack of equipment especially in the Motor Pool of the provincial government. (refer to Appendix G-1-1.)

Figure 3.5.1 EXISTING IRRIGATION SYSTEM



Existing Irrigation System

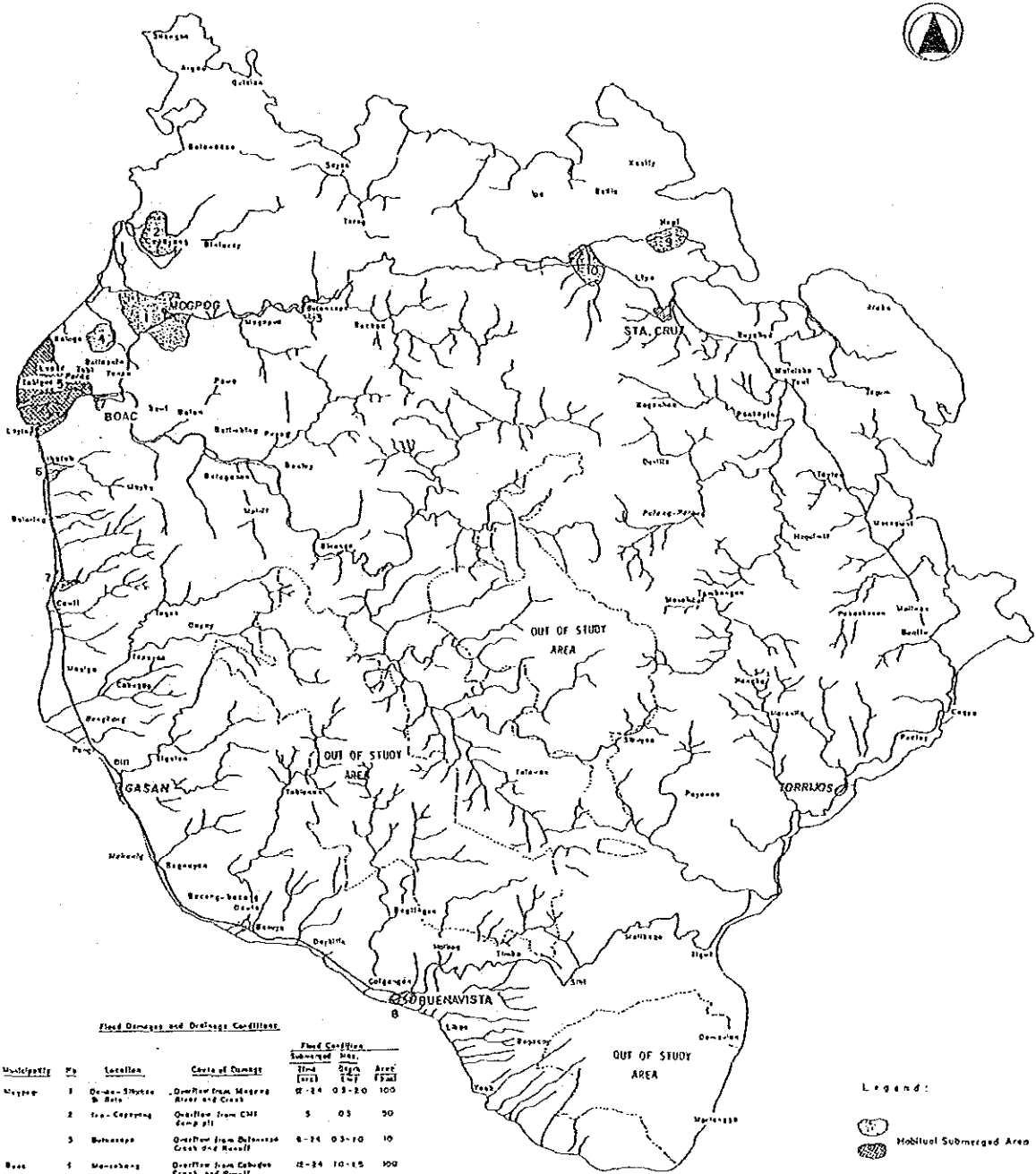
No.	Name of System	Potential Irrigated Area (ha)	Actual Irrigated Area (ha)	Intake Type
CIS	Mansabang	130	150	0
-	Amatagan	20	5	0
-	Mayba - Molba	13	10	0
-	Watabagan	18	5	0
-	Wau - Topok	32	10	0
-	Bulmagan	15	10	0
-	Landy - Balle	60	60	0
-	Lipa	10	5	0
-	Mataputaza	25	15	0
-	Sibuyan	11	10	0
-	Buntla	20	20	0
-	Pasay	19	-	0
-	Quay	5	3	0
-	Vallidig	27	37	0
-	Uyo	19	18	0
-	Mactanga	22	-	0
-	Mabuhay	13	-	0
-	Mulmas	12	-	0
-	Bogfagan	5	8	0
-	Mabag	133	70	0
-	Banaga	30	70	0
CP	Isataga	33	18	P
-	Leon	38	40	P
-	Birichay	22	7	P
-	Mabuhay	27	-	0
SMIP	Pua	12	-	I
-	Burisa	17	7	I
Total		927	517	
Others (not)		417	369	
Grand Total		1,344	886	

NOTE:
 CIS: Communal Irrigation System (MIA)
 CP: Communal Project (DA)
 SMIP: Small Water Irrigating Project (DA)
 D: Diversion Dam
 W: Water Gate
 P: Pump
 I: Impounding Type
 S: Individual Pump & Self-Irrigation

Legend:
 Fully Operational
 Partially Operational
 Non-Operational



Figure 3.5.2 PRESENT DRAINAGE CONDITIONS



Flood Damages and Drainage Conditions

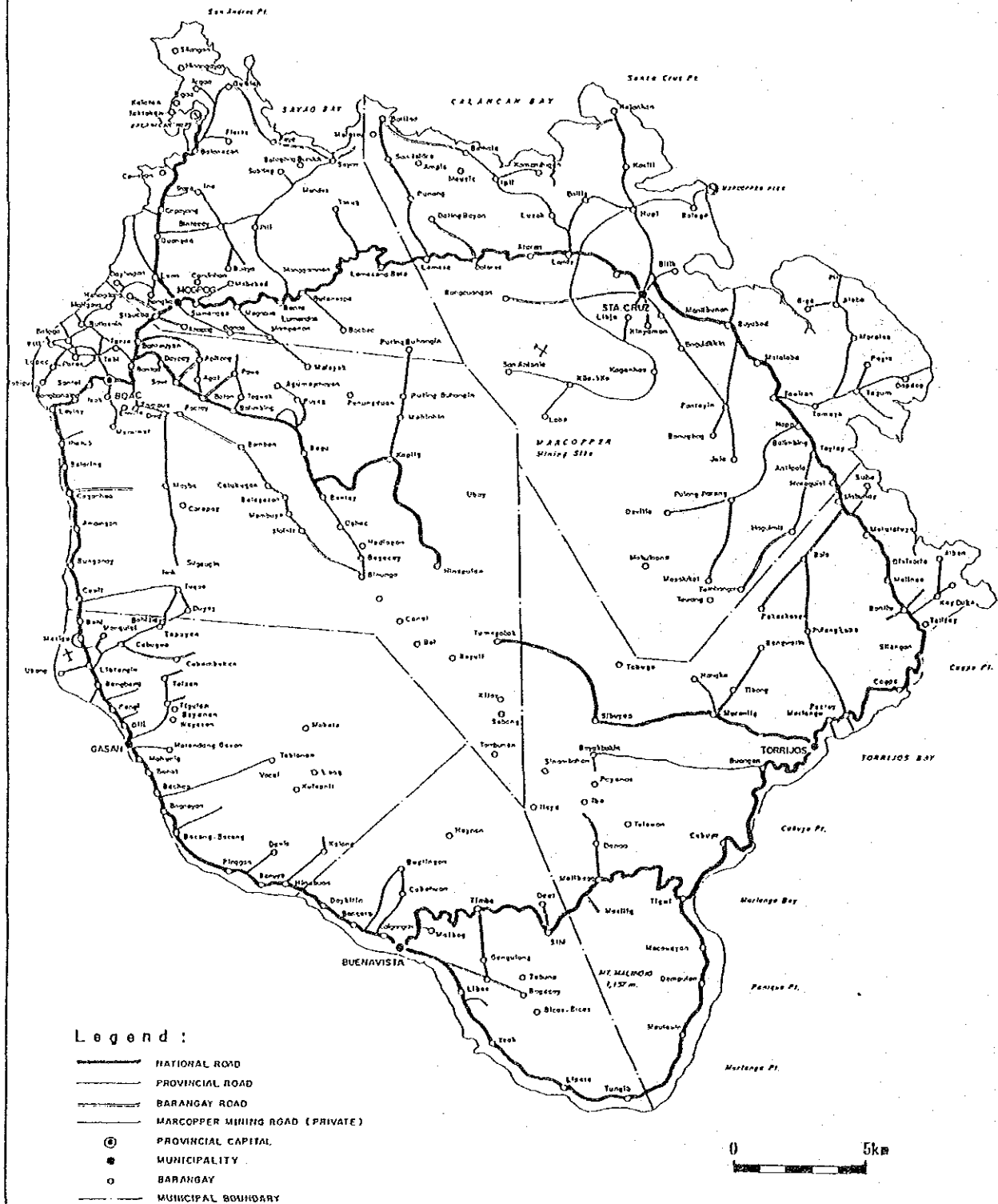
Municipality	No.	Localities	Cause of Damage	Flood Conditions		
				Time (Days)	Area (Ha)	Area (Km ²)
Nayaya	1	Davao, Shutes & Mata	Overflow from Magsara River and Creek	12-24	0.5-2.0	100
	2	San. Cooroyan	Overflow from CNF Camp #11	5	0.5	50
	3	Batasayan	Overflow from Bulnaran Creek and Buall	6-24	0.5-10	10
Boac	4	Manabang	Overflow from Cabiden Creek and Buall	12-24	10-15	100
	5	Taliga	Overflow from Bana River	6	0.5-0.5	100
Gasan	6	Itatub	Overflow from Itatub Creek	4-6	0.5	10
	7	Bungayon	Overflow from Creek	6	0.5	15
Buenavista	8	San. Calongon and Pabilitan	Overflow	4	0.5-0.5	15
	9	Hual	Rainfall Water	3-6	0.5-0.5	50
Sta. Cruz	10	Landy	Overflow from Creek	3-4	0.5-0.5	40
Total						320

Source: Provincial Engineering Office and JICA Study Team (as of Aug 1983)



Legend:
 Habitual Submerged Area

Figure 3.5.3 EXISTING ROAD NETWORK



3.6. Present Condition of Rural Infrastructure Facilities

3.6.1. Rural Water Supply

Water for domestic use in Marinduque is generally taken from wells and springs. Water supply for urban areas is managed by the Municipal government. There are 44 public water supply facilities in the urban areas, which consist of 34 deep wells with a pump and ten springs. All municipalities except Buenavista have water works but there are no water meters. Only Gasan has water meters. The water supply system is inadequate, since the distribution lines have old pipes. Hence a large amount of water leaks from the cracks in the old pipes, thus water quality is poor because it is contaminated with rust from the old pipes. The total service population serviced, under the present water works system, is about 18,700, which is 74% of the urban population.

On the other hand, sources of water in rural areas are groundwater from deep and shallow wells brought up by manual pump. There are 424 public wells made up of 293 deep wells, 131 shallow wells, and some private wells. The total population served by public wells is approximately 101,200, which is only 55% of the population in the rural areas. About 45% of the people in the rural areas get their water from sources such as privately-owned wells or other means. All deep wells and around 90% of the shallow wells are capable of supplying water throughout the year. (refer to Appendix I-2-1)

3.6.2. Rural Electrification

The electric power consumed in the province is supplied by the Marinduque Electric Cooperative, Inc. (MARELCO) through the Marcopper Mining Corporation. The six municipalities are energized while 64% of Barangays are connected with distribution lines.

The main transmission line (power line) is strung along the national road to connect to the poblacion of each municipality. As of 1988, MARELCO has a total of about 8,350 house-connections mostly located near the power line, the average diffusion rate, however, is only 25%. The total consumption reached 2.9 million KWH per annum and the average monthly power consumption per house is only 7 KWH.

The transmission line, power distribution station and other related facilities are provided and electric power is supplied 24 hours a day. The average load is 334 KW. The maximum demand is 1,300 KW, and the load factor is nearly 26%. The total length of existing transmission line is about 416 km. The transmission line, however, is often closed by strong winds and heavy rain. In 1987, the length of the transmission line damaged by two strong typhoons reached 17.5 km. (refer to Appendix I-2-2.)

3.6.3. Transportation Systems

The internal transportation system in Marinduque consists of trucks, jeepneys and tricycles. The total number of registered vehicles is 1,128 in the province, which gives a very low rate of ownership of 5.4 vehicles per 1,000 persons. These are composed of 3.7% cars, 7.2% trucks, 15.8% motorcycles, 49.3% jeeps and 24% tricycles.

Jeepneys are the normal means of transportation on the intermunicipal routes usually full of passengers, because of limited availability of vehicles. After 6 PM, the traffic volume is greatly reduced. On the other hand, the tricycles are generally used for passengers within the urban area.

The heaviest traffic flows are observed on the roads between Boac and Nopog municipalities. The main commodities being transported are groceries, bottled soft drinks, copra, rice, and general cargoes. Some areas, however, are not served by motor