BASIC DESIGN STUDY REPORT
ON
THE PROJECT
FOR
MARINDUQUE AGRICULTURAL DEVELOPMENT AND PROMOTION
IN
THE REPUBLIC OF THE PHILIPPINES

MARCH 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

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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 basic design study on the Project for Marinduque Agricultural Development and Promotion and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team headed by Mr. Yukiharu KOSO, Deputy Director, Agricultural Structural Improvement Bureau, Ministry of Agriculture, Forestry and Fisheries, from September 2 to October 11, 1991.

The team held discussions with the officials concerned of the Government of the Philippines and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to the Philippines in order to discuss a draft report and the present report was prepared.

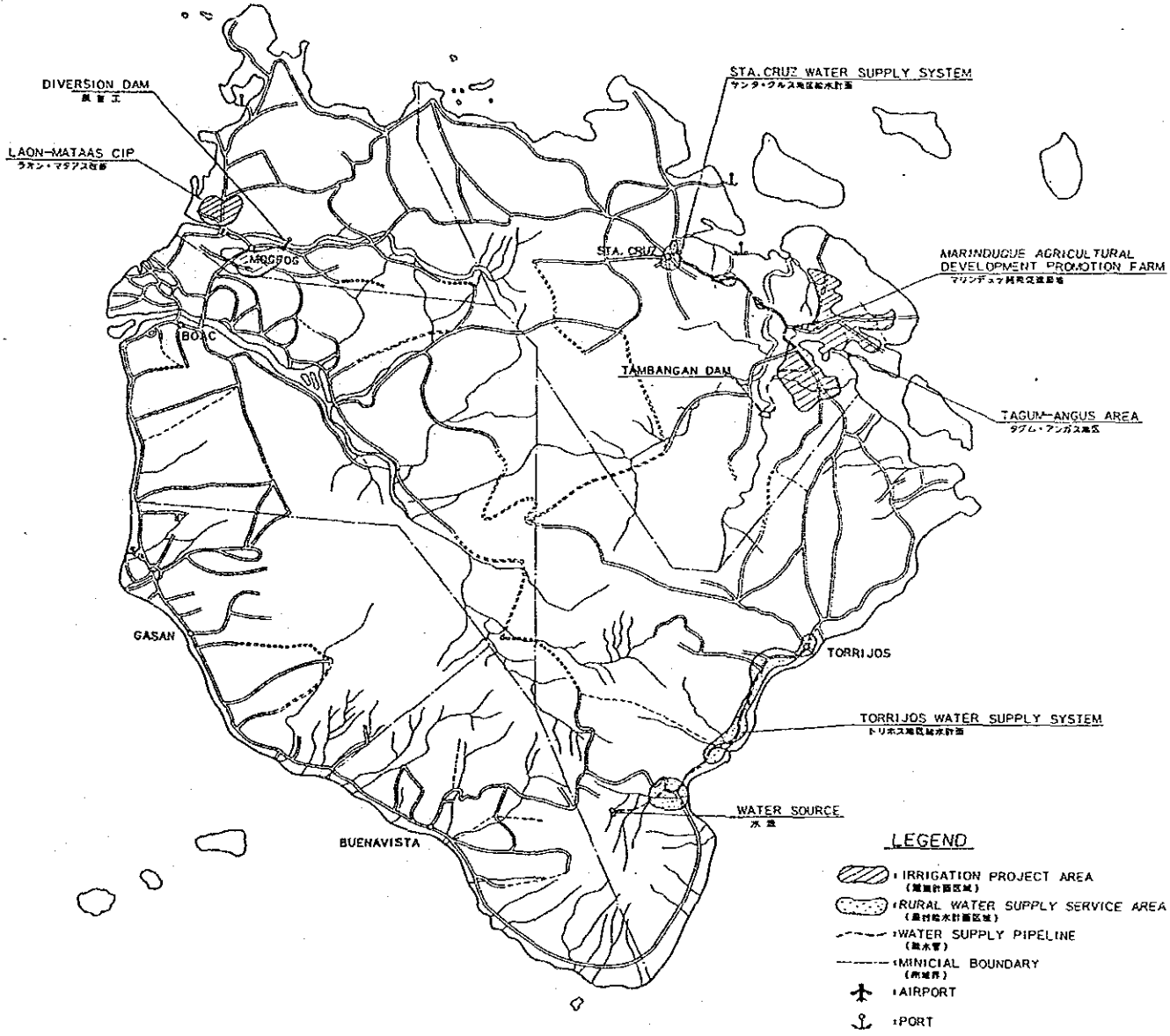
I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Philippines for their close cooperation extended to the teams.

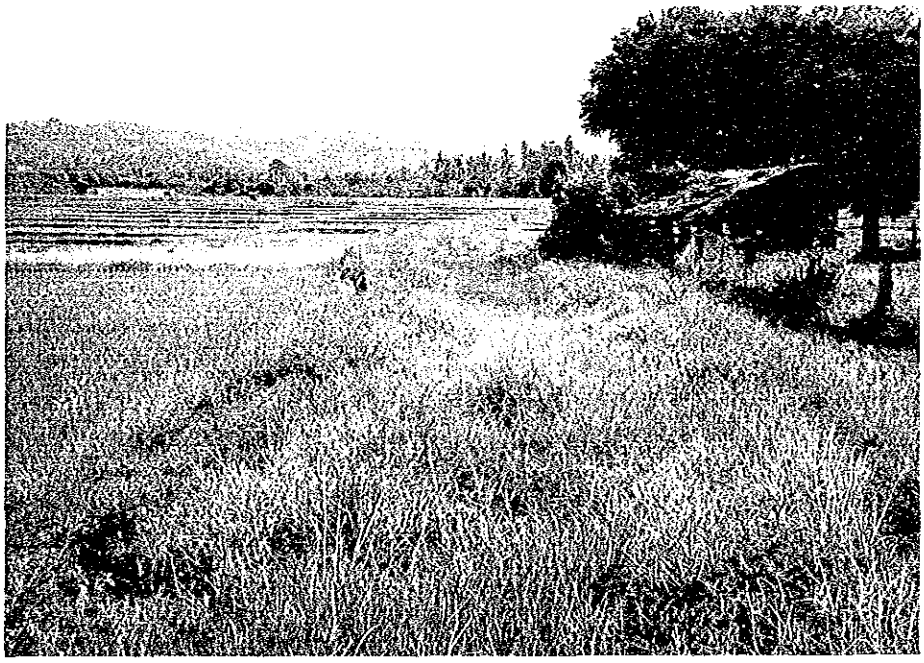
March, 1992

Kensuke YANAGIYA
President
Japan International Cooperation Agency

GENERAL PLAN



トリホス水道計画水源
WATER SOURCE FOR TORRIJOS WATER SUPPLY



灌漑区域及び水路跡 (タグム・アンガス地区)
IRRIGABLE AREA AND EXISTING CANAL IN TAGUM-ANGUS AREA

ダム軸右岸側(タンバンガンダム)
RIGHT ABUTMENT OF DAM AXIS
(TAMBANGAN DAM SITE)

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ABBREVIATION

BAS	Bureau of Agricultural Statistics
BAE_X	Bureau of Agricultural Extension
BFT	Bureau of Foreign Trade
BSWM	Bureau of Soils and Water Management
CIP	Communal Irrigation Project
CIS	Communal Irrigation System
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DBM	Department of Budget and Management
DENR	Department of Environment and Natural Resources
DFA	Department of Foreign Affairs
DLG	Department of Local Government
DOF	Department of Finance
DPWH	Department of Public Works and Highway
JICA	Japan International Cooperation Agency
LWUA	Local Water Utilities Administration
NCSO	National Census and Statistics Office
NEA	National Electrification Administration
NEDA	National Economic and Development Authority
NFA	National Food Authority
NIA	National Irrigation Administration
NPC	National Power Corporation
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Service Administration
SWIM	Small Water Impounding Management

SUMMARY

The share contributed by the Agricultural Sector in the gross national products (GNP) in the Philippines has been decreased from 31.5% in 1970 to 27.0% in 1990. Mosts of the Industrial Sector which has compensated for that part decreased in the Agricultural Sector, however, are of Agriculture-related light industries such as agro-industries for copra and etc. and textiles. Further, agricultural products shares still a substantial part at about 10% (1990) in the overall export earnings. Though the shares by the Agricultural Sector has been decreasing year by year as mentioned above, more than a half of total working population in the country engage in Agriculture and this Sector still remains as one of the important industrial sectors in the Philippines.

As the export items, primary products as coconut, sugar and banana as well as the processed products of the same are important among number of agricultural products in the Philippines, while domestically, rice and corn are important as the staple food of the people. Production of rice in the country has attained a considerable increase in 1970's by means of expansion of irrigation facilities and it was in early 1980's that the Government declared self-sufficiency of rice in the country. At the latter part of 1980's and thereafter however, production could not meet the demand as increased by population growth and conversion by some people of staple food from corn to rice. Moreover, damages in Central Luzon as caused by eruption of volcano Pinatubo in 1991 would worsen the situation to be more serious.

The fact that the lower production level in rural area with its dominant number of population results in lower standard of living in the rural area, as coupled with the minimum and low grade of social infrastructures provided so far.

It was in November, 1986 that the Government of the Republic of the Philippines conceived a Medium-Term National Development Plan for 1987-1992 period, where major development objectives were marked on the aspects of ①poverty alleviation, ②generation of more employment opportunity, ③promotion of equality and social justice and ④attaining of sustainable economic growth. Area-wise, under the Plan, emphasis was placed on the development of rural areas so as to lessen the income disparity between the

urban and rural areas. Basic concept involved in the rural development is to raise up the living standard of rural populations through attaining poverty alleviation and generation of productive employment opportunity in the rural areas.

Being situated at 170 km south-east direction from the Metropolitan Manila, Marinduque Province holds as much as 185,000 people over the 959.3km^2 area on Marinduque main Island and 17 other small islands. About half of the population are of farm household and engage in agriculture on the farm lands of around half of the provincial total area. Major crops grown are coconut, rice, maize and etc. Irrigated area, however, shares merely 3 percent of the overall farm lands and mostly the rest is of rainfed agriculture. As is the case, the yields per a unit area are considerably lower, and the self-sufficiency of foods remains only at 47 percent. Average family income of the Province is the second lowest among the 11 provinces in the South Tagalog Region in 1985.

Under such circumstances, the Government of the Philippines advanced a request to the Government of Japan to conduct an integrated agricultural development study on the Marinduque Island, where developments were generally lagged behind.

In response to the request, the Government of Japan carried out the Master Plan Study from November 1988 to August 1989. As the result of the study, the Provincial Government of Marinduque advanced a request for grant aid project to the Government of Japan. The grant aid project requested is of urgent nature and higher priority for the purpose of agricultural infrastructure improvement, promotion of irrigated agriculture and domestic water supply in Tagum-Angas areas of Sta. Cruz district, but no financial arrangement for required project cost could be made by the Government of the Philippines. In response to the above request, Japan International Cooperation Agency (JICA) decided to conduct a Preliminary Survey at April 1991 for confirmation of contents of request and implementation organization as well as for study on possible assistance under the Japan's Grant Aid Program, and it was Sept.2-Oct.11, 1991 that the Basic Design Study Mission was dispatched to the Philippines based on the confirmation made during the preliminary survey.

The Study Team made a thorough reviewal on the project development plan, examined appropriate contents to be covered by the Grant Aid Program

and its scale and, through further analysis made in Japan, prepared a draft report incorporating all the results therefrom.

Through the reviewal of the project development plan and relevant field survey, the Basic Design Study Mission has confirmed that the subject project will surely and largely contribute for alleviation of rural poverty, generation of productive employment and raise-up of standard of living for rural farmers.

1. Reinforcement of Agricultural Development Promotion Farm

In Marinduque Province, there is no adequate facility to conduct applied research on varieties and cultivation techniques of crops to be recommended for irrigated agriculture in Marinduque. Further, without technical knowledge on farming under irrigated agriculture, extension services are also not properly practised. Development of irrigated agriculture can be attained only when the farming techniques could be established and extension services be availed adequately. It is considered possible from its scale and required activities that management and operation of the subject Promotion Farm would be carried out by the personnels of various units of the Governments of the Philippines and of Marinduque Province.

2. Consolidation of Agricultural Infrastructures

In Tagum-Angas and Laon - Mataas areas, farming is practised under rainfed condition, and yields have been unreliable at very low level. By means of provision of irrigation facilities, yield increase of 4.0 ton/ha can be expected (with irrigation 2.5 ton/ha and without irrigation 1.5 ton/ha as per the present yields).

3. Road Rehabilitation

Roads existing in Tagum - Angas area are provided mainly to connect with Sta. Cruz where Municipality Office is located, and there is little roads connecting among villages. Moreover, most of the roads are of gravel-paved ones. Important sections of roads required for new construction could be substituted by O/M roads to be provided along the irrigation canals, and rehabilitation would be provided for surfacing and heightening for the

important sections from the dam site for O/M purpose and between Alakan - Angas. Further it is judged that the multipurpose paved roads are important for drying of paddy, readily available marketing place and communication square for village people.

4. Rural Water Supply

There are level 3 (Individually distributed) water supply systems existing in Sta. Cruz and Torrijos areas, but the supply can serve only 2 hours in a day. The situation is much inferior as compared with those of the other areas where Municipality Offices are located in the Province of Marinduque. For Tagum - Angas area and villages in between Tigwi and Torrijos, the system is of level 1 (1 source - 1 faucet supply) with the water source by well or spring. The supply can cover only 1 hour in a day. The well used as the water source for villages between Tigwi and Torrijos shows some saline content and not suitable as the source.

In view of the above, it was judged necessary to proceed with the constructions of irrigation facilities for Tagum - Angas area and Laon - Mataas area including the Tambangan Dam, Agricultural Development Promotion Farm, pavement for multipurpose road and rural water supply facilities as well as procurement of equipment for the Promotion Farm.

Facilities Construction

1. Accelerated Agricultural Development Promotion Farm

- Farm area	6.5	ha
- Crop field area	4.9	ha
- Training and administration building	583.2	sq.m
- Rehabilitation of existing building	L.S	

2. Agricultural Infrastructure Improvement

- Tambangan Dam and relevant irrigation facilities (Irrigation area : 630 ha)
  - Tambangan Dam (Height, 22.2m · Length, 165 m · Gross storage capacity, 2.4 MCM)

- · Irrigation canal (Feeder canal, 1.8 km · Main and lateral canals, 16.4 km)
- Laon-Mataas Communal Irrigation Project
  (Irrigation area ; 175 ha)
  - · Diversion work
  - · Irrigation canal (5.4 km)

3. Road facilities

- Rehabilitation of existing roads
- Multipurpose road pavement (800 m length)

4. Domestic Water Supply

- Sta. Cruz Domestic Water Supply System		
· Treatment facility and pumping station	1,507	cu.m/day
· Pressured Pipeline	11,640	m
· Public faucet	83	places
- Torrijos Water Supply System		
· Pressured pipeline	12,800	m
· Public faucet	33	places

Procurement of Equipment / Materials

- · General laboratory equipment
- · Soil testing equipment
- · Audio-visual education facilities
- · Farm machineries
- · Meteorological observation / measuring equipment
- · Vehicles
- · Office equipment

When proceeding the subject project implementation under the Grant Aid Program by the Government of Japan, the following task allocation is considered appropriate.

By the Government of Japan;

- Construction of agricultural development and promotion farm rehabilitation of road, multipurpose road pavement and domestic water supply facilities
- Procurement of equipment and materials for Accelerated Agricultural Development and Promotion Farm
- Detailed design, tendering and supervision for the construction works as stated above, and design and tendering for procurement of equipment and materials

By the Government of the Philippines ;

- Securing of lands needed for facilities construction
- Tax exemption arrangement for importing of required equipment and materials for construction works as well as procurement
- Tax exemption arrangement within the Philippines for those individuals and firms of Japanese nationals who engage in the subject project implementation
- Construction of depot for farm machineries
- Securing of staff and budget needed for O & M of the facilities provided under the subject project

The Government of the Philippines assigned the Provincial Government of Marinduque to be the subject project Executing Agency. The Provincial Government has never experienced any financial assistance in the form of soft loan either by foreign countries or international institutions and also in the form of Grant-in-Aid. In the subject project implementation, however, it is so arranged that the Region 4 offices of NEDA, NIA, DPWH and so forth will extend required administrative and technical cooperation and there would be no any difficulty in its implementation by the Provincial Government of Marinduque.

In terms of the project implementation, the schedule is planned as twelve (12) months period for construction works after the contract for construction works could be effected.

Benefits derived from the subject project implementation are summarized as follows.

Tagum-Angas and Laon-Mataas areas;

- Level-up of agricultural productivity
- Raising up of standard of living (Beneficiaries, 8,648 persons)

Sta. Cruz and Torrijos areas and vicinities;

- Raising up of living standard as derived from domestic water supply (Beneficiaries, 20,034 persons)

Whole the Marinduque Island;

- Improvement of agricultural farming technique by means of promotion farm demonstration (Beneficiaries, 137,830 persons)

Extension effects of these benefits as stated above are considered substantial and justifiable enough for the subject project to be taken up as a Grant Aid Project by the Government of Japan.

As the results of the Basic Design Study, the following recommendations shall be advanced to the Government of the Philippines.

1. To attain the project target as envisaged, construction of agricultural infrastructure facilities holds the primary importance. However, not only the main and lateral irrigation canals but also provision of on-farm level facilities at the earliest are of vital importance, and therefore, training of farmers by the Agencies concerned and construction of on-farm facilities by farmers are recommended.

2. Adequate operation and maintenance on the project facilities completed are to be fully seeked.

CHAPTER 1. INTRODUCTION

In November, 1986, the Government of the Republic of the Philippines announced a Medium Term National Development Plan for a period starting in 1987 and ending in 1992. The Plan envisaged four (4) development objectives as summarized below, where income disparities between the urban and rural areas are to be minimized through placing major emphasis in development efforts in rural areas.

① Poverty alleviation
② Generation of employment opportunity
③ Promotion of equality and social justice
④ Attaining of sustainable economic growth

Basic concepts applied for development of rural areas include poverty alleviation in rural areas, generation of productive employment opportunity and raising-up of standard of living of rural farmers.

The Province of Marinduque, located 170 km south-east from the Metropolitan Manila, consists of the Marinduque Main Island (35 km size both in North-South and East-West directions) and other 17 small and remote islands. The Province is of agricultural area having about 46.4% (445.5 sq.km) of farm land out of the total provincial area of 959.3 sq.km. The Province holds as much as 185,000 people and only copper mining industry is considered substantial aside from the agriculture. About 75% (26,947 households) of the provincial total number of households engage in agriculture and cultivate mainly coconut, rice, maize and etc. Irrigated area, however, shares only three (3) percent of the total, leaving the rest under rainfed condition. As is the case, the yields per a unit area are quite low, and the self-sufficiency of foods remains only at 47%. Average family income of the Province is the second lowest among the 11 provinces in the South Tagalog Region in the year 1985.

Under such circumstances, the Government of the Philippines advanced a request to the Government of Japan to conduct an integrated agricultural development study on the Marinduque Island, where developments were generally lagged behind. In response to the request, the Government of Japan carried out the Master Plan Study from November 1988

to August 1989. As the result of the study, the Provincial Government of Marinduque advanced a request for grant aid project to the Government of Japan. The grant aid project requested is of urgent nature and higher priority for the purpose of agricultural infrastructure improvement, promotion of irrigated agriculture and domestic water supply in Tagum-Angas areas of Sta. Cruz district, but no financial arrangement for required project cost could be made by the Government of the Philippines. In response to the above request, Japan International Cooperation Agency (JICA) decided to conduct a Preliminary Survey at April 1991 for confirmation of contents of request and implementation organization as well as for study on possible assistance under the Japan's Grant Aid Program, and it was Sept. 2 - Oct. 11, 1991 that the Basic Design Study Mission, as headed by Mr. Yukiharu KOSO, Deputy Director, Design Division, Agricultural Structural Improvement Bureau, Ministry of Agriculture, Forestry and Fisheries, was dispatched to the Philippines based on the confirmation made during the preliminary survey. (Ref. Appendix for Survey Schedule)

The Basic Design Study Mission has had a series of discussion meetings with the Philippine Government officials concerned on the contents of basic design, proceeded with the field survey and collected data information needed. Such basic matters agreed upon by both parties through a series of consultation meeting have been compiled as Minutes of Discussion on which signing by representatives of both parties were effected dated on September 10, 1991. (Refer Appendix for List of Meeting Attendances and Minutes of Discussion)

The study team made the draft of basic design of facilities, selection of equipment, cost estimates, and operation and maintenance plan of the Project. JICA dispatched the mission to the Philippines in order to explain the draft report during the period from March 5 to March 12, 1992 and discussed about the details of the Project with agencies concerned.

This report represents the final report after its arrangement based on the discussions in the above period.

CHAPTER 2. BACKGROUND OF THE PROJECT

2.1 PRESENT STATUS OF AGRICULTURE IN THE PHILIPPINES

2.1.1 Importance of Agriculture

Agriculture plays a vitally important role in the national economy in the Philippines. As shown in Table 2-1, share of agricultural sector in the Gross Domestic Products (GDP) was reduced from 31.5 percent in 1970 to 27.0 percent in 1990, and the difference has gone to the manufacturing sector, most of which belongs to the light industries relating to agriculture, such as copra processing, textile industries, etc.

TABLE 2-1 SECTORAL SHARES IN GDP

Year	Agricultural Sector	Industrial Sector	Services Sector
	%	%	%
1970	31.5	25.0	43.6
1975	26.8	34.1	39.1
1980	25.6	26.2	38.2
1985	28.8	31.9	39.3
1990	27.0	33.0	40.0

Sources : NEDA 1990 Economic and Social Indicators

Agriculture has been greatly contributing to national economy in producing national staple foods of rice, corn, and furthermore, in earning foreign exchange by export of coconut, sugar, banana, mango, etc. The share of agricultural sector in the total export still occupies as large as about 10 percent in 1990, although in declining trend. (The addition of 2.1 percent from those of Non-traditional and Non-manufacturing sectors as processed coconut, sugarcane, mango, banana, etc. in Table 2-2)

TABLE 2-2 COMPOSITION OF EXPORT GOODS

	1980	1985	1990
	%	%	%
Traditional Export Goods	43.9	24.6	17.6
Relating to Coconut	13.4	9.5	6.1
Sugar	10.4	3.5	1.6
Forestry Goods	7.2	4.2	1.1
Mining Goods	9.9	2.1	4.4
Others	3.3	5.4	4.5

TABLE 2-2 COMPOSITION OF EXPORT GOODS (cont'ed)

	1980	1985	1990
	%	%	%
Non-traditional Export Goods	55.4	75.4	81.0
Non-traditional Manufacturing Industries	39.9	66.1	73.2
Electric and electronic Equipment & Appliance	11.5	22.9	24.0
Clothings	8.6	13.4	21.7
Chemicals	1.6	3.3	3.2
Non-metalic Goods	1.0	0.5	0.7
Machinery, transportation Equipment/devices	0.9	0.8	1.8
Fibers	1.3	0.5	1.1
Others	14.9	24.8	20.7
Non-traditional non-manufacturing Goods	15.5	9.2	7.8
Others	0.3	0	1.4

Source : NEDA 1990 Economic and Social Indicators

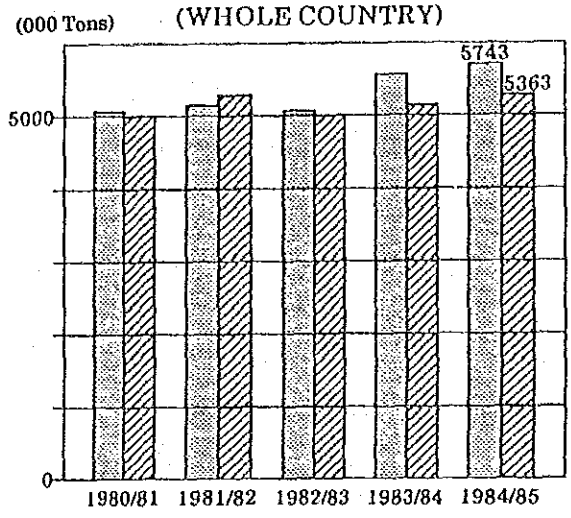
The employment in the agricultural sector in 1987 occupied as large as 50.0 percent of the national total employment, and agriculture is the largest sector to attract the labour power, although having low productivity.

The Philippines, under tropical monsoon, have two kinds of climate as the one with clearly divided dry and wet seasons and the other with unclearly divided dry and wet season like the Marinduque Province. Paddy cropping is practiced throughout the country, but there are some places to give a stress on corn cultivation because of inability in rice self sufficiency in the southern region of the country or being left behind the agricultural development in islands like Marinduque. Export crops of coconut, sugarcane, coffee, banana, etc. have been much cultivated. For animal husbandry, pork is the major item of production, and production of chicken, egg, and beef has been rapidly increased in the recent year to result in sharp increase in importing feed corn. Home consumption still occupies a large part of catches in fisheries, while fish cultivation has become prosperous for market-oriented fish production. In forestry, timber export was once a big foreign exchange earner of the nation, but has been now banned due to excessive fell-down. At present, forestry development aims not at timber production increase but at environmental protection.

Although, in early 1980, it was declared that the self-sufficiency of rice as staple food of the nation was attained, supply has not been able to catch up with demand again, since 1983.(ref. to Figure 2-1) In 1988 and 1989, the county imported rice by 180 thousand tons and 220 thousand tons, respectively.

Furthermore, the situation will be worsened by eruption of volcano Pinatubo in 1991.

FIGURE 2-1 DEMAND AND SUPPLY BALANCE OF STAPLE FOOD



The special features of the agricultural development of the country can be summarized as following three points.

Firstly, in the middle of 1960s, the development in area was come to an end, and an intensive farming has become extended with irrigation facilities provided, since then. In those islands like Marinduque, however, where the agricultural development is left behind, improvement of the agricultural productivity was much delayed.

Secondly, the improvement of varieties and farming technology developed by International Rice Research Institute (IRRI), Philippines Rice Research Institute (PRRI), etc. has been extended to the agri-advanced areas in the Luzon and there around, but in the remoted areas and islands like Marinduque, applied technology and extension works have been left intact for establishment.

Thirdly, high rate of population growth has resulted in serious restraint of the land with pressure stronger and stronger. On the other hand, large scale plantations operated successively from Spanish Colony area have been still growing coconut, sugarcane, banana, etc., and there has been a

considerably large gap exist in farm management scale between such large scale farming and medium/small scale farmers.

Those problems that the Philippines are now facing can be summarized as follows.

① The international market prices of the traditional export-oriented crops such as coconut, sugar, etc. have been low to result in decrease in international trade income of farm products.

② The agrarian reform required to be powerfully carried out is not promoted smoothly due to stringent resistance of the land owners, and shortage in funds.

③ Although diversified farming has been planned and promoted to correspond the low prices of the traditional export crops, diversified domestic demand, increase in rural labour forces, etc., there are many problems to solve in establishment and extension of locally applicable farming technology, marketing mechanism and processing system.

④ Since agricultural infrastructure consolidation, especially the irrigation facilities consolidation in the remoted islands, is delayed in development, many paddy fields have remained rainfed to be affected by natural conditions, and under such situation, paddy production has been unstable and productivity of other crops is low as well.

2. 1. 2 Present Farmland Consolidation

In 1985, the total paddy field in the country was 3.1 million hectares in acreage, about 47 percent of which, 1.47 million hectares, was provided with irrigation facilities, but the rest, about 53 percent, remained rainfed.

Improvement of paddy productivity requires to raise irrigation efficiency by rehabilitation of the existing facilities and construction of new irrigation facilities as well, and furthermore, the irrigation water sources should be developed to utilize effectively and efficiently. The National Irrigation Administration (NIA) has been promoting to construct storage dams,

and small storage dams for securing water sources, and has been trying to raise the irrigation efficiency by constructing irrigation facilities including canal networks, etc. intake facilities, etc.

As shown in Table 2-3, the operation and maintenance of the irrigation facilities have been made in the classification by national level, communal level and pumping.

TABLE 2-3 NOS. OF IRRIGATION SYSTEMS AND IRRIGATED ACREAGE BY KINDS OF ADMINISTRATION (1984)

	National	
	Number of Systems	Acreage (ha)
Total Irrigable Area	-	3,100,000
Irrigation Facilities		
National Irrigation Systems	8,145	1,410,000
Communal Irrigation Systems	125	560,000
Pumping Irrigation Systems	2,280	150,000

Sources : NIA

The irrigation development projects conducted by NIA are classified into the following three kinds : National irrigation systems with irrigable area of more than 1000 hectares, Communal irrigation systems and Pumping irrigation systems. The National Irrigation Systems are planned and constructed by NIA which collect the water charges from beneficiary farmers, and the Operation and Maintenance (O/M) works of the on-farm facilities will be gradually transferred to the farmers. Consequently, these National Irrigation Systems have been adequately maintained to keep irrigation efficiency high.

In other respect, the Communal Irrigation Systems (small scale irrigation facilities) are constructed by the Irrigators' Associations of the local farmers under the technical assistance of the NIA's regional offices or engineers of the NIA's provincial offices, or NIA constructs the necessary facilities and most of the construction cost will be borne by the farmers concerned by 50 years installed payment, and the O/M works of the facilities will be made by the Irrigators' Associations. For the dams with embankment height of more than 5.0 m the O/M works of the dams are made by NIA, while that of canal and other facilities by the farmers concerned. There few systems of those communal and pumping irrigation systems found well maintained due

to shortage in both technology and funds. Contrarily, many of these dams had been damaged by typhoons or torrential rain to be left intact without any rehabilitation and to be turned to rainfed fields.

For the pumping irrigation systems, there are some systems found not operated due to the fact that the farmers concerned cannot pay the necessary water charges for O/M of the facilities.

2. 2 OUTLINES OF RELEVANT DEVELOPMENT PLANS

2. 2. 1 National Development Plan

The Government of the Philippines announced as the Presidential Decree in December 1986 the Mid-term Development Plan for 1987 to 1992 as target year so as to solve the problems of ① long-lasting poverty and unfair income ② high rate of unemployment and potential unemployment and ③disparity between urban and rural areas.

In this development plan the following targets are taken up ①eradication of poverty ②creation of employment opportunity ③promotion of social fairness and justice, and ④attainment of sustainable economic growth. For reaching the goal the plan shows that economic revitalization is the current target. The plan set the annual average growth rate on the actual basis by 6.8 percent for a period from 1987 to 1992 : however, this rate was revised to 6.5 percent in February 1987. And the target of the growth of the percapita GDP is set that 1597 pesos per capita GDP in 1986 (1972value) should be increased at the annual rate of 4.4 percent on the annual average basis to reach 29 percent in net value in 1992. By industry-wise share in the total GDP, the agricultural sector will grow at 5.0 percent annual average to reach 26.6 percent of the total in 1992. The industry sector with growth rate of 8.8 percent to reach 34.7 percent in 1992. The service sector with growth rate of 6.6 percent to reach 38.7 percent in 1992, respectively. And social development also aims to improve health hygiene and nourishing conditions as well as to raise the education level in general, and will have a purpose to lower the households below poverty from 60 percent in 1985 to 45 percent in 1992 in its rate. (ref. to Table 2-4)

Since implementation of the program, GNP, per capita GDP, agricultural sector and industrial sector have been kept growing on an annual average rate of 16.5, 2.9, 2.3 and 6.3 percent respectively.

TABLE 2 - 4 MAJOR ECONOMIC INDEX IN THE MID-TERM DEVELOPMENT PROGRAM

Total Population	64,300,000head	Rate Against Population (Urban Areas 44%,Local Areas 56%)
Population Increasing Rate	2.32 %	(Annual Average)
GNP Growth Rate	6.8 %	(Annual Average)
GDP Growth Rate	6.9 %	(Annual Average)
Population Growth Rate	5.0 %	(Annual Average)
Growth Rate of Agri/Forest Industries	8.8 %	(Annual Average)
Growth Rate of the Third Industries	6.6 %	(Annual Average)
Poverty Improvement Targets	45.4 %	(59.3%,1985)
Poverty Line	2,382 P/Mot/Family	National Level
Poverty Line	3,282	Metropolitan Area
Poverty Line	2,912	Urban Level
Poverty Line	2,066	Rural Level

Sources : Mid-term Development Program by NEDA (1987-1992)

Although the Program takes up a considerably high level of targets in covering general fields as above, the current strategy is to center about the direction to rural employment opportunity increase for local income increase so as to rebuild the economy. The Program states that rural employment creation and income increase can keep the economic development continuous in future as well.

The short-term development strategy is that the national economy will be recovered by demand increase through national, especially rural income increase, and in particular, stress is placed on the rural employment opportunity creation. The small-scaled infrastructure development will be strongly promoted in providing farm roads, irrigation facilities, schooling facilities, rural water supply systems, etc. and especially in the agriculture and forestry, reforestation, seeds production, distribution of farm production materials.

As the basic target of the agricultural development, the Mid-term Development program takes up to provide the foundation for equality, efficient and ecologically continuous development in the agricultural field. The

Program aims not only to raise the agricultural productivity but also to increase farm income. Furthermore, the program clearly describes that the successful realization of the Program exists in active participation of the local farmers to the Program, although the Government will provide the fundamental agricultural productive facilities and study/research together with cooperation non-government organizations. Besides, it is clearly said that the active measures should be taken to make development of agriculture and industry in parallel because of increasing population pressure to land.

The Mid-term Development Program includes the following seven (7) points to be realized in the agricultural sector.

① to increase the small farmers' income
② to keep farm production increase continuous
③ to make fare distribution of the agri-inputs and agri-products
④ to make food production increase for nourishment improvement
⑤ to create agri-based employment opportunity for small farmers / landless farmers as well as small fishermen
⑥ to improve the distribution systems to supply agri-inputs, products, and related services.
⑦ to make institution for positive participation of farmers to the Program works through agricultural Cooperatives and farmers' organizations.

As shown in the following table covering concrete targets to be achieved, the crop-wise annual growth rate are determined together with the production level of each crop in 1992. Also the budgetary sum of 19 billion pesos upto 1992 is presented for rehabilitation/improvement of irrigation facilities new projects covering 206,000 ha..

For corn production increase, it is described that high yield yellow corn will be grown for feeds of swine and chicken husbandry as well as white corn for ordinary foods. And crop diversification and promotion of intermittent cropping in the areas of sugarcane and coconut growing as well. And the program touches on the encouragement and promotion of animal and chicken husbandry for the market home and abroad as well as commercial fishing and fish cultivation. Such be in the case, the population employed in the agricultural sector is considered to keep occupying a half of the national total in 1992.

TABLE 2-5 CROP GROWTH RATE IN THE MID-TERM DEVELOPMENT PROGRAM

(Annual Average from 1987 to 1992)

Total	3.9 (%)
Food Crops	4.1
Paddy	3.7
Corn	6.4
Vegetables	1.7
Potatoes	1.9
Cassava	4.1
Peanut	3.6
Mongobean	3.2
Others	1.0
Commercial Crops	2.1
Coconut	0.5
Sugarcane	1.4
Banana	2.2
Mango	4.7
Pineapple	2.4
Coffee	6.8
Cacao	7.4
Tobacco	5.4
Avaca	2.1
Rubber	7.2
Others	1.5

As the concrete strategy the Mid-term Development Program advocates such policies closely related to agricultural production as efficient land use, crop diversification, farming technology innovation, reduction of input materials prices,soils/forests conservation, marketing support, commodities prices consolidation of rural market infrastructures/marketing system/farming direction of crops to meet the international market conditions, etc.

2. 2. 2 Regional Development Plan

1) South Tagalog Region Mid-term Development Plan

The South Tagalog Region the largest Region of the Philippines consists of 11 provinces including Marinduque. The South Tagalog Region Mid-term Development Plan (STRMDP, 1987-1992)was worked out along with the basic policy given in the Philippines Mid-term Development Program so as

to bring possibility early revitalization of economy and its long lasting growth in the Region. And the relevant targets are shown as follows.

① The regional population is considered to grow at the annual rate of 2.64 percent on an average to reach 8.5 million in 1992.

② The Gross Regional Domestic Products (GRDP) was set by 13.57 billion pesos by 1972 value and is planned to increase at the annual rate of 6.74 percent to reach 13.8 billion pesos in 1992.

③ The regional employment will increase at the annual rate of 6.32 percent from 2.7 million in 1987 to 3.3 million in 1992.

④ The shares of the respective sectors in GRDP are as 32.8 percent for agricultural sector. 34.4 percent for industrial sector and 32.8 percent for services sector, while the unemployment is planned to go down to 4.08 percent in 1992 from 10.33 percent in 1987.

2) Development Strategy of Marinduque Province

In corresponding to the national policy of poverty eradication and disparity correction between urban and rural areas, the regional Development Strategy gives an accent to the comprehensive agricultural development from the view that the employment rate of the agriculture and fisheries in the Province occupies as high as about 59 percent of the regional total. The Marinduque Comprehensive Agricultural Development Master Plan (MCADMP) aims to secure basic foods in short term and further development continuously in long term. In the Province the development of the paddy fields existing in the lowlying flat land has been left behind with low productivity of agriculture,and most of the hills and mountain areas have been denuded by total felldown.

Under the circumstances, most effective and efficient use of limited land and water resources with rehabilitation of these natural resources is quite essential for eradication of poverty and potential unemployment. Conservation of soils and recharging of water resources are required as approach so as to realize the plan. The development guidelines of the Province can be pointed out as follows.

① to increase the agricultural productivity through irrigated farm land development by consolidation of irrigation facilities,

② to improve productivity in highland agriculture by including agro-forestry and cropping between coconut trees in combination with erosion control. While in lowlying land agriculture by farming with animals by animal husbandry or domestic ones,

③ to conserve the existing recharging forests for water sources,

④ to increase production of fisheries in the sea along the coast and inland fisheries,

⑤ to encourage the marketing and processing of agricultural products to create the employment,

⑥ to develop the medium/small scale industries in the rural areas, and

⑦ to provide and consolidate the rural infrastructures.

The Marinduque island would have a chance to develop new farming technology as the island is remoted from supply sources of pest/diseases by sea. In other respect the island has a possibility to be developed as tourism farming site because the tourism development has been started recently as one of the nearest islands from Metro Manila. Such a variety of agricultural development work will require the researches and tests for local applicability of crops and technology so as to materialize the promoting work and encouraging local agriculture.

2.3 HISTORY AND DETAILS OF REQUEST

2.3.1 History of Request

The Marinduque Province located about 170 km southeast of Metro Manila consists of 18 islands including Marinduque island having width and length both by 35 km, where about 185 thousand people have inhabited. Almost a half of the total number of households have been engaged in agriculture in growing mainly coconut, paddy, corn, etc. Delay, however, in agri-inputs application and consolidation of irrigation facilities have become a serious problem of low yield per unit acreage the food sufficiency rate of the Province is only 47 percent. And the average land holding of the area is smaller by 2.3 ha than the national average. In other respect the average annual income per household of the province is about 18,330 pesos in 1985, which come second to the last in the South Tagalog. With such background the Government of the Philippines has requested the Government of Japan to work out the development plan of the province which is left behind in development. In compliance with the request, the Government of Japan conducted the master plan study for a period from November 1988 to August 1989, and the following four projects were proposed as those with priority.

① agricultural development projects
② agricultural infrastructure consolidation projects
③ rural electrification projects
④ fisheries and fish cultivation projects

As a result, the Provincial Government has made a request to the Japanese Government through the Government of the Philippines to implement on the grant basis some schemes of agricultural and agri-infrastructures including rural water supply in the area centering about Tagum-Angas of Sta.Cruz, which has a high priority but shortage in necessary cost for realization.

In response to the request, the Japan International Cooperation Agency (JICA) conducted the preliminary survey and examined the components to be included in the Grant Aid Project with paying careful attentions on the following points.

① The project be considered suitable to the Grant Aid Program to be implemented by the Government of Japan in terms of the implementation period, project components and its scale.

② The plan be so formulated that the number of beneficiaries could be the maximum number.

③ After the project implementation under the Grant Aid Program, Operation and maintenance and further development of the project could be secured by the Philippines side alone.

④ Taking into consideration of the overall development level of the Island, attention be paid on well-balanced plan so as not to cause excessive concentration of development effort in a certain area.

Through the consultation with the Philippine Government Agencies concerned such as NEDA, DA, NIA, DPWH and Provincial Government of Marinduque as well as through the field survey conducted, examinations on the project components and justification to be taken up as a Grant Aid Project by the Government of Japan have been furthered, and project components were fixed and the Terms of Reference was drafted to be applied for Basic Design work to be accomplished.

The purposes and request items confirmed through preliminary study are shown as follows.

2. 3. 2 Items Requested

a) Purpose

The proposed project is a comprehensive agricultural development aiming at agriculture and rural life development in the Marinduque Island along with the direction of the Philippines' Mid-term Development Program proposing the eradication of poverty, correction of social disparity, etc.

b) Executing Agency

The executing agency of the Project is the Government of Marinduque Province, and NEDA, DPWH, NIA and DA will extend the technical assistance to Provincial Government for successful implementation.

c) Items Requested

The request items confirmed through the preliminary study are shown as follows.

① Agricultural development plan
   * Rehabilitation of Tamayo agricultural development farm

② Agri-infrastructures consolidation
   * Consolidation of irrigation facilities, Tagum-Angas irrigation, Laon - Mataas communal irrigation, Tawiran communal irrigation
   * Road facilities consolidation

③ Rural domestic water supply
   * Tagum-Angas Domestic water supply
   * Sta. Cruz domestic water supply
   * Torrijos domestic water supply

For Tamayo plan, however, the detailed items such as follows will be further studied by the Provincial Government as major part. (① Objective trainees and subjects, ② crops grown in demonstration farms and farming staffs, ③ cooperation system of related organizations for effective management of the farms, budget, etc.)

The aforesaid matters thoroughly studied to be reference for final decision of the concrete subject and works to be practised in the proposed demonstration farm.

Under the circumstances, the basic design study to be followed will make further detailed study and confirmation on the above matters for successfully materializing the plan.

d) Facilities and Equipment Requested

The major facilities requested for the works are as follows.

1) Agriculture Promotion Plan

① Agricultural development promotion farm

* Rehabilitation and Expansion of Administration building, Lecture rooms, Laboratory, Study rooms, and Dormitory for trainees.
* Rehabilitation/construction of Farms and Irrigation Facilities
* Provision of Vehicles for Extension Services and On-farm Use Equipment

2) Agri-infrastructures Consolidation Plan

i) Tagum-Angas Irrigation Plan

* Construction of Storage Dam for Irrigation
* Construction of Fedder Canals
* Construction of Irrigation Canals (Main and Laterals)

ii) Construction of Laon - Mataas Communal Irrigation Project

* Construction work of Diversion Dams
* Supplemental work of Fedder Canal
* Construction work of Main Canal

iii) Construction of Tawilan Communal Irrigation Project

* Embankment Protection Works of Diversion Dam
* Construction work of Apron at the downstream side
* Works for Gates

3) Construction/Rehabilitation of Road Facilities

i) Construction of Roads in Tagum-Angas (along the Main Canal)
ii) Rehabilitation of Road Facilities in Tagum-Angas
iii) Construction of Multipurpose Road Pavement in Tagum-Angas
iv) Construction of a Bridge over the Napopira River

4) Domestic Water Supply Plan

i) Construction of Domestic Water Supply System for Sta. Cruz
ii) Construction of Domestic water Supply System for Torrijos

2.4 THE PROJECT AREA

2.4.1 Location of the Project Area

Marinduque Province with the Project Area located extends about 170 km south of Metro Manila and there lies the Marinduque island between Bondoc peninsula and Mindro island surrounded by those islands of Tres · Reyes, Polo, Maniwaya, Mongpong, Salomague, etc. in total of large and small 17 islands.

The sea between Marinduque island and Bondoc peninsula is Mongpong waterway, and that between the island and Mindro is Tablas Strait. And these straits continues to the Sibyan Sea.

The Marinduque island lies in a range from Long. 121.50E to Long. 122.10E and from Lat. 13.10N to Lat. 13.42N. The total area of the Province is about 959.3 sq.km.

2.4.2 Natural Conditions

1) Meteorology and Hydrology

According to the Colonas Weather Classification based on specific features of rainfall distribution, which is prepared by the Philippine Meteorological Agency (PAGASA), the Marinduque island has rainfall throughout the year, and belongs to IV Weather Class without clear change of the dry and the wet season.

The average annual rainfall is about 2,034.6 mm, having little rainfall period from January to May with monthly rainfall less than 150 mm and pluvious period from June to December with monthly rainfall more than 150 mm. The pluvious period marks about 73 percent of the annual rainfall, and farming depending on rainwater such as rainfed paddy cropping is practised in the period. On the other hand, paddy farming with irrigation facilities grows two paddy crops a year or five crops for three years.

The annual mean temperature is about 27.0°C and monthly maximum takes place in May, while monthly minimum in January; however, the difference between the maximum and the minimum is as small as 6 to 8 degrees without large fluctuation. The general information on the meteorology of Sta. Cruz Marinduque is shown below.

TABLE 2-6 MEAN TEMPERATURE IN STA. CRUZ, MARINDUQUE

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average Rainfall mm	166.0	95.6	54.1	69.9	149.0	232.2	257.2	193.1	200.7	431.0	289.4	220.8
Mean Temperature °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
Max. Temperature °C	29.1	29.1	30.5	31.8	32.9	32.2	31.6	31.6	31.3	30.7	30.0	28.2
Min. Temperature °C	22.7	22.7	23.4	24.3	24.4	24.1	23.9	23.9	23.8	23.7	23.6	22.6
Humidity %	84	82	79	78	79	82	85	84	86	86	86	84

2) Topography and Geology

In general the Marinduque island presents largely undulated hilly and mountainous topography except some coastal areas. The highest peak of the island is Volcano Marlanga located in the southern tip of the island and its elevation is 1,157m. In the center of the island the mountain ranging with elevation from 600 to 800m run in parallel from NW-WE.

Consequently the streams run cutting down the mountain valleys with tendency ranging in the direction of NW-SE and in the right angle to the above.

The alluvial lowlying land develops in narrow strip along the skirt of these mountainous areas up to the coastal areas. And especially, the alluvial land penetrates deep into mountain side along the major rivers of Boac, Mongpong, Tawilan and Napo.

As descried above, the Marinduque island is composed with the central mountain areas and lowlying land along the coast, and is divided into the following four topographical regions in view of topography together with geological distribution and structures.

- Quaternary volcanic topography (ES, WS and Southern most areas of island)
- Holst topography (NW area of island)
- Central mountain ranges (Center of island)
- Limestone Hills (NE of island)

In terms of geological structure, the island is in the same system of the Luzon Island from which the island is separated only by Mongpog water way as shallow as less than 50 m deep. And the Marinduque island as a whole is regarded as the moving mass in inclination in the same system as the Luzon island.

3) Soils

Out of the total land area of the Province of about 959.3 sq.km (95,929 ha), the alluvial plain and mountain side fields occupy about 6,800 ha, composed of alluvial soils such as Samuel loam, and these soils hold a rather deep cultivable soils with high fertility and well-drainage suitable to various crop husbandry.

For hilly land and mountainous land (total: 68,500 ha), there can be the soils divided into three kinds as Marandigu clay soils (17,100 ha), Banto clay-loam (about 15,500 ha). Banhigan clay-loam (about 11,500 ha, and Marandigu clay soils have low fertility and are apt to be eroded easily, although some differences in characteristic features are observed with other two soils. But, at any rate, all of these soils are considered suitable to crop cultivation.

4) Land Use

The farm land in the present land use of Marinduque Province is 44,550 ha (46.4%), the forest land is 44,370 ha (46.3%), the marsh land is 5,270 ha (5.5%), and others 1,734 ha (1.2%).

As illustrated in Figure 2-2, the rainfed fields extend in partial concentration to Mogpog area in the west, Tagum-Angas area in the east, and mountainous areas in the central district.

2. 4. 3 Social Conditions

1) Administration Divisions and Population

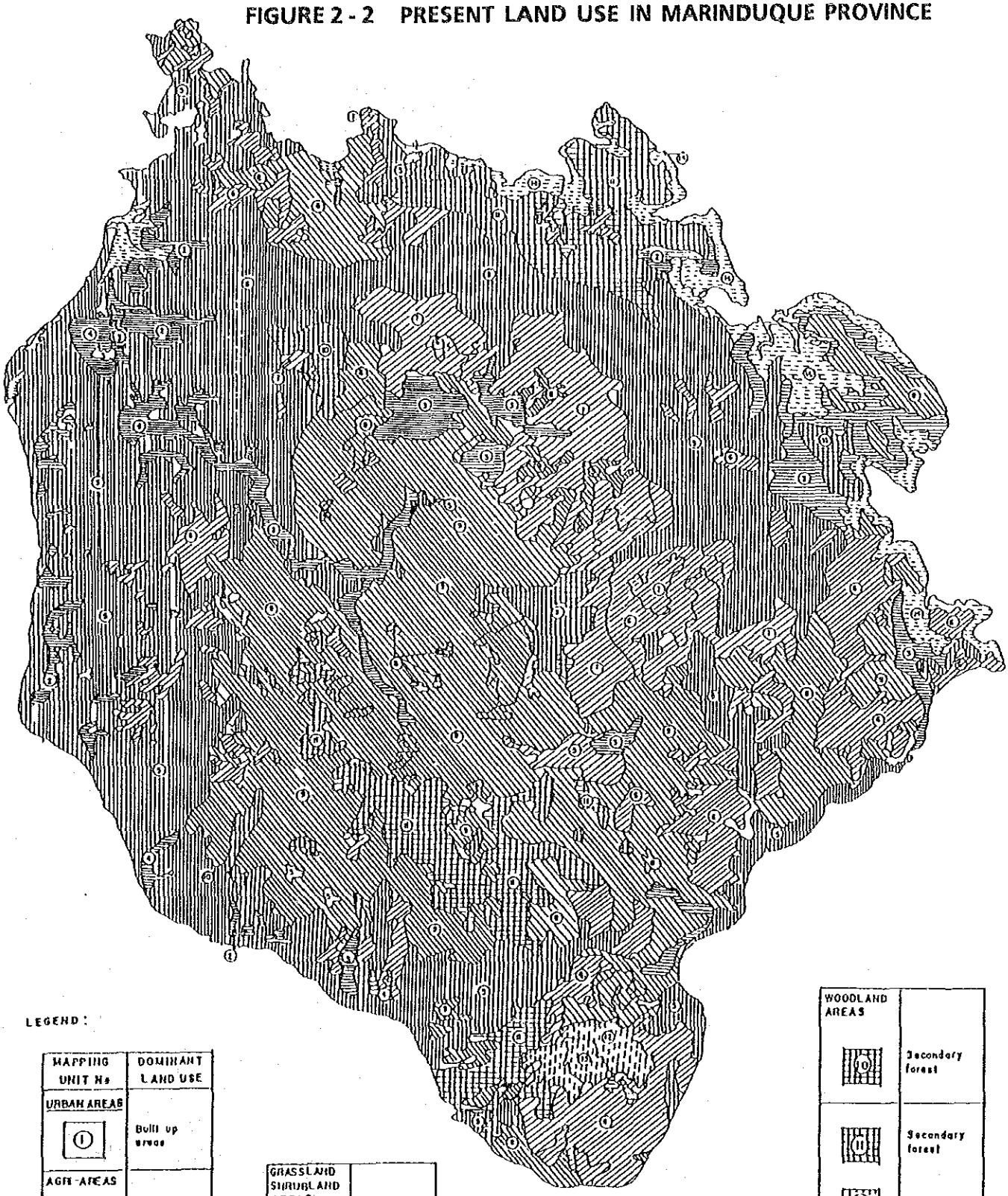
The Marinduque Province belongs administratively to the South Tagalog of the Regional IV, consisting of six districts of Mogpog, Boac, Sta. Cruz, Torrijos, Buenavista and Gasan, and their urban areas extend closely to the coastal line.

The total population of the island was 173,715 persons in 1980, and increase to 185,614 persons up to 1991 at the growth rate of 0.62 percent on the annual average. This is quite lower than the national average of 2.3 percent.

The number of family members of the Province is 5.1 persons on an average which is almost equal to the national average. It is considered due to population outflow from the Province that the Provincial population growth rate is lower than the national average in spite of the fact the number of the family members per household is in the same level of the nation.

And the municipal-wise number of house holds and population can be shown as follows.

FIGURE 2 - 2 PRESENT LAND USE IN MARINDUQUE PROVINCE



LEGEND :

MAPPING UNIT Ns	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 SHRUBLAND AREAS	
⑥	Grasses
⑦	Grasses
⑧	Shrubs and Brushes
⑨	Shrubs and brushes

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

TABLE 2-7 DISTRICT WISE POPULATION AND NUMBER OF HOUSEHOLDS IN MARINDUQUE PROVINCE

Municipality	Area (km^2)	No. of Barangay	Population (head)	No.of Household (no.)			Ave. No. of Family Members	Population Density (Head/km^2)
				Farm	Non-Farm Household	Total		
Boac	212.7	61	41,051	5,794	2,253	8,047	5.1	193
Mogpog	87.8	37	25,351	3,830	1,417	5,247	4.8	289
Sta. Cruz	246.6	55	52,988	7,197	3,234	10,431	5.1	215
Torrijos	214.3	25	25,487	4,372	264	4,636	5.5	119
Buenavista	37.6	15	15,495	2,551	450	3,001	5.2	197
Gasan	119.3	25	25,232	3,203	1,724	4,927	5.1	212
Total	959.3	218	185,614	26,947	9,342	36,289	5.1	193

Sources : NCSO, As of January, 1991

2) Transportation (Land, Sea And Air)

There is an airport in Gasan with daily regular flights between Manila and Marinduque island and are two major seaports at Baranakan and Buyabod for regular navigations with Busena city. The daily navigation to Baranakan is made by 2,000 ton class ferry boat with passengers and about 30 vehicles on board. Buyabodo port in Sta. Cruz is regularly visited by ferry boat and cargo ship but does not provide the cargo unloading facilities. As others an exclusive copper shipment port is located north of Buyabodo and used for unloading port of copper mining equipment and materials required for the mining operation. There are other 18 small sea ports constructed by each municipal office.

On land transportation in the island, there are national roads, provincial roads, municipal roads, barangay roads, and a private roads by copper miners, running along the coastal line, and most of these roads have been gravel or earth lined pavement roads, except a half of the national roads with asphalt or concrete-paved surface.

3) Economy

Agriculture plays a main role in the local economy in growing coconut as a major crop followed by paddy and corn. Fisheries are also one of the important industry to support the economy.

In the Marinduque island, a copper mine is operated to produce copper of about 13 percent of the national total production.

The commercial activities have been developed in close relations with those of Lusena city, Kern Province, Luzon. The annual average family income was about 18,830 pesos in 1985, which is accounted for about 59.6 percent of the national average by 30,748 pesos. And yet, the above local family income marks the 10th of the South tagalog, the third lowest to the last. About 48.9 percent of the Provincial total households has earned annual income of less than 10,000 pesos.

TABLE 2-8 FAMILY INCOME OF THE SOUTH TAGALOG (1985)

Provinces	Total Family Income (Million Pesos)	No. of Families (1000 head)	Average Family Income (pesos)	Order
Matanga	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
Occidental Mindro	1,773.8	49.8	35,638	4
Oriental Mindro	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
Rizard	4,694.1	121.8	38,547	3
Lonblong	636.2	40.1	15,856	11
Ourong	401.0	21.7	18,479	9
South Tagalog Total	39,091.7	1,303.7	29,985	-
National Total	294,142.8	9,566.3	30,748	-

Source : 1985 Family Income and Expenditure Survey (NCSO)

2. 4. 4 Rural Conditions in the Project Area

1) Present Agriculture

a) Agriculture in Marinduque

In 1990, the population engaged in agriculture and fisheries in the Marinduque Province was 59.2 percent of the total employment and it is revealed that the provincial life is supported by those people of farmers and fishermen. The local agriculture and fisheries, however, produce only 25.7 percent of the Provincial Products and this has been resulted from the fact that agriculture and fisheries of the Province are low in productivity and of self-consumption type. This is because the export-oriented farm products are only some banana and copra.

The self-sufficiency rate for paddy in the Province was 47 percent in 1989, and the self-sufficiency rate of rice is considerably low, in spite that the agriculture of the Province is of self-consumption type.

The agricultural census in 1980 reveals that the farmland of the Province is 44,555 hectares out of which about 88 percent, 39,120 hectares, is utilized for cropping one-year or perennial crops for production. The perennial crops represented by coconut is grown as 75 percent of the above cropping acreage, and the local agriculture places a stress on the coconut cultivation. Since coconut market, however, is dull, it is required to find out any other new marketable crops for the area.

The total cropping area is 54,426 hectare and the related cropping intensity has resulted in 131 percent.

TABLE 2-9 CROP-WISE CROPPING ACREAGES

Land Use	Acreage (ha)	Remarks
Farm Land		
Cultivated Land	9,651	
* One-year crops cropping acreage	2,649	
* Furrow Land	12,300	
Sub-Total	29,361	
Perennial crops cropping acreage	1,562	
Perennial grass land and pasture land	1,332	
Forest land (Privately Owned Land) Others	44,555	
Non-farm Land	51,365	National Forest and Waste Land, Residential Land, etc
Grand Total	95,920	

As shown in Table 2-10, the irrigation systems are 27 facilities covering 1,240 hectares, the comparative rate of the farm land to the cropping areas with perennial crops is about only 3.2 percent. Among the above, those systems with smooth and successful irrigation practiced have been well operated and maintained, and the repayment of farmers' burden has been smoothly carried out.

TABLE 2-10 IRRIGATION FACILITIES OF MARINDUQUE

Name of Irrigation Facilities	Irrigation Areas (ha)	Water intake Type
CIS Mansabang	150	Direct Intake
CIS Amaingon	10	Diversion Dam
CIS Moybe-Malbog	13	〃
CIS Katubugan	16	〃
CIS Pawa-Tagwak	32	〃
CIS Balanacan	15	〃
CIS Landy-Balls	60	〃
CIS Lipa	10	〃
CIS Matuyatuya	23	〃
CIS Sibuyoo	11	〃
CIS Banllw	20	〃
CIS Poctoy	15	〃
CIS Busay	5	〃
CIS Malindig	27	〃
CIS Itaya	19	〃
CIS Maringga	22	〃
CIS Mabuhay	15	〃
CIS Malinga	12	〃
CIS Bagtingan	9	〃
CIS Malbag	133	〃
CIS Banuya	30	〃
CP Masiga	55	Pump
CP Laon	59	〃
CP Bintakay	12	〃
CP Mabuhay	27	Diversion Dam
SWIM Pawa	12	Dam
SWIM Bantad	17	〃
Total	827	
Other	413	
Total	1,240	

CIA : Communal Irrigation System
CP : Communal project
SWIM : Small Water Impounding Project

For the production of the major crops in 1990. paddy/upland paddy cropping acreage was 9,619 hectares and paddy production was 12,300 tons. The paddy yield was about 1.28 ton/ha which is equivalent to about 46 percent only of the national average of 2.18 ton/ha.(ref. to Figure 2-11) Such low yield has been resulted from the fact that the irrigated paddy fields occupies as low as 8.7 percent in total cropping acreage and irrigation efficiency is low due to inability in successful year-round irrigation. Little amount of corn and others than coconut and banana have been traded out to the other provinces. And the paddy yield of the Province is below the averages of the country and the South Tagalog.(ref. to Figure 2-12) For animal husbandry on the other hand, a grass land extending in the mountainous land and steep hilly land is planned to be utilized for animal husbandry to increase beef-cattle and calves in number; however, the cattle production increase has not reached the goal, the trade or outflow of female cattle and calves to the outside island have been prohibited.

TABLE 2-11 CROPPING ACREAGES OF MAJOR CROPS OF MARINDUQUE

Crops		Cropping Acreage (ha)	Yield (ton/ha)	Production (ton)
Paddy	- Irrigated Paddy	837	2.51	2,100
	- Rainfed Paddy	7,520	1.20	8,994
	- Upland Paddy	1,262	0.98	1,240
	Sub-Total	9,619	1.28	12,334
Corn		610	0.64	391
Mongobean		42	0.61	26
Peanut		45	0.84	38
Potatoes		90	0.50	45
Vegetables	- Fruit Vegetables	35	3.20	111
	- Leaf Vegetables	25	3.18	81
Banana		612	0.73	450
Other Tree Crops		222	1.87	43
Coffee		24	1.42	34
Cacao		6	0.48	3
Coconut		33,355	0.30	10,086

Source : BAS, Department of Agriculture

TABLE 2-12 COMPARISON OF YIELDS OF PADDY AND CORN (Unit : ton/ha)

	National Average	The Average of The Fourth Division	Average of Marinduque
Irrigated Paddy Cropping	3.2	3.0	2.5
Non-irrigated Paddy Cropping	2.1	2.2	1.2
Upland Paddy	1.2	1.1	0.8
Corn	1.2	1.0	0.5

Source : BAS, Department of Agriculture (1986 - 1988)

Present agriculture of the Marinduque Province is as explained as above, while the major troubles and problems encountered presently are described as below.

* Coconut planted specifically in concentration to the sloped land has been long declined in the market conditions, and any other crops production are required in place of coconut.

* There are still few farm lands consolidated with irrigation facilities in the total agricultural land, and most of the crops grown in the area have lower unit yield than those of national average. Since yearly fluctuation of unit yield of the crops is unstably large, the irrigation facilities are urgently required to stabilize the production.

* Comprehensive food production is urged to successfully secure the food self sufficiency, as production of vegetables and fruit crops besides staple food crops of rice and corn is quite low.

The agricultural technology extension works in the Marinduque have been carried out in separate services by both the local offices of Department of Agriculture and the agricultural office of Marinduque. The works in charge of the respective offices are illustrated in Figure 2-3 and 2-4 with service items and organizations. Twenty six agricultural technologists belong to the district office of the Department of Agriculture, and 14 technologists belong to the extension section and service section of the Provincial Agricultural Office. And the former staffs have 8 assistants and the latter 4 assistants under the agents, respectively. There are 218 Barangays in Marinduque Province in total, and an agent covers 5.5 Barangay/100 ha for the services. The difficulties and problems in the extension works in the area are presented as follow.

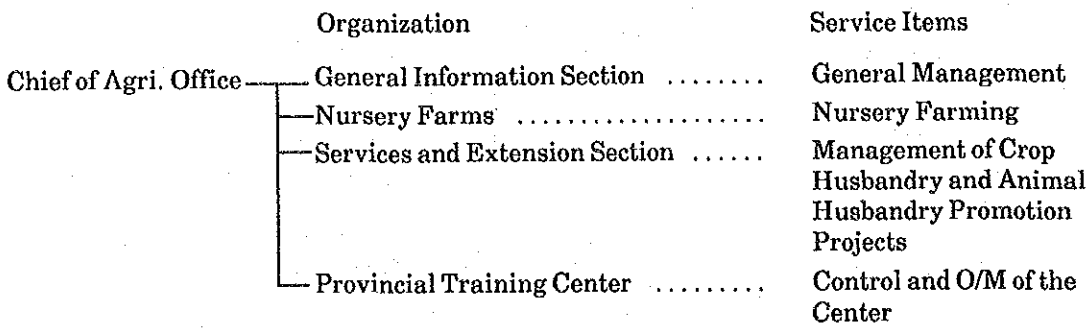
* to establish the farming technology verified to local applicability and to provide training facilities for agents/trainees to receive training of the technology available for the local farming.

* to provide transportation facilities for agents to move easily for their services and to give training to the leaders of the farmers' groups so as to ensure the training effect.

FIGURE 2-3 ORGANIZATION AND WORK ITEMS OF LOCAL EXTENSION OFFICE OF DA

Organization	Service Items
Provincial Office Chief of DA Extension Sectioon	
General Information Section	Management. General and Communication
Planning Section	General Planning
Information Section	Collection of Information and Public Relations
Services Section	Operation/Management of Crops Production and Encouragement of Animal Husbandry
Engineering/Technology Section	Implementation of Projects of Seeds Inspection, Registration of Rice Seedlings, and Distribution of Superior Animal together with Artificial Insemination
Study/Research Section	Various Insection (Seeds Inspection, Prevention of Animal Disease, Restriction in Fisheries) and Study of Extension Works
District Extension Office	Improvement and Extension of Farming Technology
Fish Cultivation Station for Inland Fisheries	Demonstration of Fish Culture Technology
Livestock Breeding Center	Seedling Animal Breeding, Artificial Insemination, Improvement
Extension Agents of Land Improvement District Office	Extension of Fish Culture Technology for Agricultural Land Improvement District

FIGURE 2-4 ORGANIZATION OF MARINDUQUE PROVINCIAL AGRICULTURAL OFFICE AND THE SERVICES RENDERED



b) Present Agriculture and its Problems in Sta. Cruz

Fundamentally, Sta. Cruz District lives on agriculture and fisheries. In the Project Area, there exists the Agriculture Training Center under the administration of the Provincial Agricultural Office and the Sta. Cruz Animal Breeding Station located nearby the Center.

The farm land of Sta. Cruz Dist. including the Project Area was 12,131 ha in 1990, which is equivalent almost to 45 percent of the total provincial land area of 26,986 ha.

For the land with slope between 0 and 3 percent, paddy is grown, that with slope between 3 and 8 percent corn, mungbean, peanut, and potatoes are mainly grown.

Cropping acreage of paddy is about 2,026ha (about 21.1 percent of the Provincial Total) out of which 9.8 percent is occupied by irrigated paddy and most part is occupied by rainfed paddy.

Corn, mungbean, peanut, potatoes, and vegetables and tree fruits are grown in the area of 194 ha in total which are only about 7 percent of the paddy cropping area. The yields are as low as those of the provincial average. Banana is cropped in the area of 177 ha which are considered comparatively large, and the cropping acreage of coconut is about 7,621 ha which is more than three times of the paddy cropping acreages.

According to the agricultural census in 1990, the share of land holding by land ownerships is 66.4 percent for land owned, while 33.6 percent for rented land respectively. The average land acreage owned per household is about 2.7 ha.

The most serious problem to the local farmers is insufficient water supply to their fields because of the rainfed fields. In 1989, there were the communal irrigation facilities exist in the municipality as follow.

TABLE 2 - 13 BENEFITED AREAS BY COMMUNAL IRRIGATION SYSTEMS IN STA. CRUZ

Communal Irrigation Systems	Benefited Areas(ha)
Landy-Baliis	60
Lipa	10
Tawiran	60
Total	130

Source : Master Plan Study on the Integrated Agricultural Development Project in Marinduque, 1990

Since the amount of annual rainfall heavily fluctuates and the cycle of the dry and the wet season is quite unstable, the rainfed paddy cropping cannot hold stable and there have been more than 200ha of paddy fields found difficult in paddy cropping by years. Such water shortage has caused paddy yield unstable and most of the local farmers have been practising the extensive farming due to price hike of agri-inputs like fertilizers and chemicals.

In Sta. Cruz the total nine technologists, assigned by DA and provincial Agricultural Office, have been rendering extension services in their own areas charged, but little extension services have been introduced yet on irrigated agriculture technology. In addition, lack of movability without vehicles and any others suitable transportation facilities available has limited their activities.

On the other hand, at the existing demonstration farm upland crops husbandry between coconut trees of the plantation has been tried and experimental irrigation cropping of corn and vegetables have been started in the demonstration farm, but the test cropping has not been successfully carried out due to shortage in research staffs and insufficiency in experiment facilities and equipment together with related materials.

The Project Area of Tugum-Angas has about 1,000 farm households, including eight Barangay at Sta. Cruz. And 630 ha out of 700 ha of farm land are irrigabale area under the Project. The Project Area lies almost flat and the soils are Marauding clay soils belonging to the Tagum Clay-loam. The Marauding clay is the well-developed soils with about 30cm thick in red or reddish brown and as the lower layer with about 70cm thick clay with gravelly soils including weathered volcanic stones and gravel.

The Tagum clay-loam soils have about 30cm thick surface soils in blackish brown or grey to black color and its lower layer is the clay-loam soils with about 70cm thick and in black color. These soils are acid soils with comparatively low permeability.

TABLE 2-14 MAJOR CROPS AND THEIR CROPPING ACREAGE IN STA. CRUZ (1990)

Crops	Cropping Acreage (ha)	Yield (ton/ha)	Production (ton)
Paddy - Irrigated Paddy	200	2.75	549
- Rainfed Paddy	1,497	1.33	1,997
- Upland Paddy	330	0.90	300
Sub-Total	2,027	1.40	2,846
Corn	125	0.65	80
Mongobean	12	0.61	8
Peanut	13	0.84	11
Potatoes	26	0.50	13
Vegetables Fruit Vegetables	10	3.25	32
- Leaf Vegetables	7	3.18	23
Sub-Total	17		55
Banana	177	0.74	131
Other Fruit Crops	64	0.19	12
Coffee	-	1.42	10
Cacao	2	0.20	1
Coconut	7,621	0.38	2,925

Source : BAS, Department of Agriculture

2) Present Water Supply

There are three types of water supply in the Marinduque : they are Level 3 for urban domestic water supply (individual water supply to each household), Level 1 for rural or Barangay water supply (water supply by water sources) and Level 2 (water supply by public faucet).

For the urban water supply as shown in Table2-15, Level 3 systems are provided in the urban area except Buenavista.

Operation and maintenance (O/M) of these systems have been given by Water Supply sections of respective municipal offices. Since, however, these facilities have long served to be time-worned heavily, water shortage in supply has been caused from leakage from water driving pipes and distribution pipes.

All systems are under time restriction for water supply : 9 hours a day in Boac, 7 hours in Mogpog, 16 hours in Gasan,in particular only two to three hours a day in Sta. Cruz and Torrijos.

For rural water supply, most of all the relevant systems are in Level 1 with their water sources dependent on wells or spring.

Level 1 water supply is limited in its water amount available as sources. However, both of number of water sources and amount of water available are insufficient and the water fetching from streams or ponds/lakes is daily routine works of women and girls. Besides, the water quality is not always good because of natural water intake.

Domestic water supply to Sta. Cruz is dependent on a springing water source and is limited in supply hours by two to three hours a day in the dry season. The amount of water in shortage is covered by purchase at the rate of about P2 per 5 gallons and a family is forced to pay as much as about P10 for water costs occupy a considerable part of the daily expenditure of the local people.

Present O/M services for water supply facilities in Sta. Cruz have been carried out by staffs of the Water Supply Section of Dist. Office. Sta. Cruz and the organization chart is presented as Figure 2-5.

TABLE 2 - 15 URBAN WATER SUPPLY

Name of Municipality		Sta. Cruz	Torrijos	Boac	Mongpog	Gasan
	Spring Capacity (cu.m)	1 site -	1 site 3,500	4 sites 820	2 sites 110	- -
	River Capacity (cu.m)	- -	- -	1 site 820	- -	- -
	Tube-well Capacity (cu.m)	- -	- -	2 sites 1,930	4 sites 2,700	2 sites Unclarified
Water Storage Tank		440cu.m+660cu.m	122cu.m+238cu.m	1,300cu.m+660cu.m	190cu.m+114cu.m+32cu.m	110cu.m(Dry Season Only)
Pumping Facilities		-	-	Diesel Engine 60 hp 30 hp	-	Submerge Pumps 2 units
System		Level 3	Level 2, 3	Level 3	Level 3	Level 3
Total Population		8,111 head	2,074 head	41,034 head (Total Population of Dist.)	25,337 head (Total Population of Dist.)	25,236 head (Total Population of Dist.)
Consumers		8,111 head	3,049 head (Including some Barangay)	12,000 head	3,273 head	1,956 head
Managing Agency		Sta. Cruz Dist. W.W. S	Torrijos Dist. W.W.S	Boac Dist. W.W.S	Mongpog Dist. W.W.S	Gasan Dist. W.W.S
Collection of Water Charges		Accounting Section of Sta. Cruz Dist.	Accounting Section of Torrijos Dist.	Accounting Section of Boac Dist.	Accounting Section of Mongpog Dist.	Accounting Section of Gasan Dist.
Water Charge		Without meters 30 P/month · P12 upto 10cu.m for Residence, and for 1.0cu.m exceeded, P 1.0 · P20 upto 10cu.m for business, and for 1.0cu.m exceeded P2.0 required	P15/month · household	· P 45 /month, for residence · P150 /month for business	· P 30 /month, for residence · P150 /month for business	· P50/15cu.m for residence · P70/15cu.m for business
Annual Income		P 179,834	P 25,567	P 408,311	P 131,115	P 47,712
Annual Expenditure		P 187,310	P 65,000	P 447,148	P 288,485	P 156,181
Supply Hours		Two to three hours in a day	Two to three hours in a day	Lake (Dry Season) -5:00~12:00 Lake(Wet Season) -5:00~14:00 Tube-Well -5:00~7:00	5:00~12: 00	4:00~20: 00

FIGURE 2-5 ORGANIZATION OF O/M FOR WATER SUPPLY SYSTEM IN STA. CRUZ

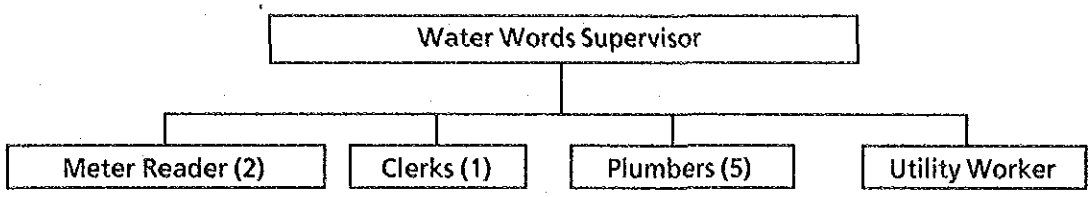


Figure in ( ) are the staff numbers to be assigned.

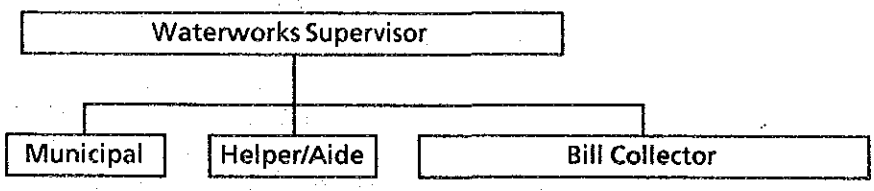
Water charge collection has been carried out by accounting section of Sta. Cruz municipal office. The charges are decided as follows.

Case for Without-metrers		3 peso/month
Case for With-meters		
For residence use	upto 10cu.m ...	12 peso/month
	Additional	1.0 pesos for every excess of 1cu.m
for business use upto	10cu.m	20 peso/month
	Additional	2.0 peso/month Additional 2.0 peso/cu.m for every 1cu.m

The balance of water supply management in 1990 taken as example is that income is 179,834 pesos while expenditure is 187,310 pesos, and this result in red figures. This would be because the income in dry season is reduced due to water shortage.

Present O/M in Torrijos is carried out by Water Supply section of Torrijos. The said organization is a municipal plumber, helper/aide and bill collector as shown below.

FIGURE 2-6 ORGANIZATION OF O/M OF WATER SUPPLY SYSTEM IN TORRIJOS



The charges are set at the rate of P15 /month and the balance of water charge in 1990 was that income was 25,567 pesos while expenditure was 65,000 pesos where the expenditure largely exceeded income. The reason for this income shortage will come from the income shortage in the dry season due to shortage in the dry season due to shortage in amount of water supplied as in the same reason as the case of Sta. Cruz.

As clearly learnt from the above both the water supply works in Sta. Cruz and Torrijos have been operated in red figures. The amount to be shortened has been supplemented by municipal budget.

3) Present Road Conditions

The road network in Marinduque consists of national roads, provincial roads, municipal roads and barangay roads.

As shown in Table 2-16, 32.9 percent of the total road length of 666.47km in the Province is the national roads and the pavement rate is 25.5 percent. The pavement is made mainly between Gasan and Boac and around the poblacions.

The national roads running through Tagum-Angas as one of the proposed project areas especially Napo are paved with asphalt. The pavement rate under provincial roads is 11.3 present, and most of the paved roads have been concentrated to the residential areas.

TABLE 2-16 ROAD EXTENSION IN MARINDUQUE

	Extension (km)	Concrete Pavement (km)	Asphalt Pavement (km)	Gravel Pavement (km)	Non-Pavement (km)
National Roads	219.18 (32.9 %)	2.86	53.11	142.81	20.40
Provincial Roads	173.38 (26.0 %)	4.90	23.29	145.19	-
District Roads	135.09 (20.3 %)	15.68	6.70	65.19	47.52
Barangay Roads	138.82 (20.8 %)	-	-	116.90	21.92
Total	666.47 (100 %)	23.44	83.10	470.09	89.84

For national roads, planning, designing, construction and O/M works have been made by Department of Public Works. The provincial roads and further low-class roads have been planned, constructed and maintained by the

respective local government offices, and provincial engineering office has lent to the said office O/M equipment as well as the technical assistance.

In the Project Area, the road running from Sta. Cruz to Torrijos along the coastal line is only the national road, and other roads are in the lower classes than the provincial roads.

Barangay Napo has a concrete paved road running in the Barangay and others are gravel paved roads.

Although the provincial road running to Barangay Angas along the Tamayo Farm after branching off from the national road plays a vitally important role in the area, the said road with low elevation has defects of submergence in high tide unsuitably provided under drains difficulty in passing when raining.

CHAPTER 3. OUTLINE OF THE PROJECT

3.1 OBJECTIVES

The working population in the agricultural sector shares more than 50 percent of the total working population in Marinduque province. Most of the farmers cultivate the land under rainfed condition because only three percent of the cultivated land are irrigated. Naturally the crop production is unstable with low level of yield, resulting in the second lowest average income among the eleven (11) provinces of the Southern Tagalog Region. For the purpose of overcoming the depressed economic conditions, the Philippine Government requested the Japanese Government to conduct the master plan study on the Integrated Agricultural Development Project, of which the study was completed in 1989. In the master plan study, the project of Marinduque Agricultural Development and Promotion was identified as the first priority project which has the project component of development of agricultural infrastructure in Tagum-Angas area, establishment of Agricultural Development and Promotion Farm, development of rural road network, and development of rural water supply systems for the rural people, aiming at stabilizing and upgrading of living standard in the rural area through raising agricultural productivity and through providing the facilities of roads and rural water.

3. 2 STUDY AND EXAMINATION ON THE REQUEST

3. 2. 1 Justification and Necessity of the Project

The development of agricultural infrastructure in the project includes construction of irrigation facilities in the Tagum-Angas area, which is located in the northern area of the island, rehabilitation of the Laon-Mataas Communal Irrigation Project (CIP), establishment of a farm for promotion of agricultural development, and development of water supply systems in the Sta. Cruz and Torrijos area.

The Tagum-Angas area is one of the consolidated potential area for irrigated agriculture, comparing to other agricultural areas in the province. The project has the role to stabilize agricultural production with increase of crop yield as shown in Table 2-12, where it is expected that the paddy yield will be increased at least from 1.2 ton/ha (the average yield in rainfed area in the province) to 2.5 ton/ha (the average yield in irrigated area) due to irrigation. The proposed irrigation area is located in the lowland plain land with average slope of 0 to four percent, which is covered by cultivated paddy land and a few acreage of pasture land or other kind of land.

It is planned that the irrigation water is supplied in the project area through construction of a dam/reservoir. The reservoir water is also used for the proposed rural water supply system in the Sta. Cruz area. As for the water source of the proposed rural water, there will be three kinds of water source, namely pumping-up of ground water, intaking water through construction of diversion dam, and pumping up river water. The water cost is high in case of pumping-up water. The water supply of diversion dam is not stable because the river discharge fluctuates according to rainfall amount. The unstable water source is not suitable for rural water supply. Any other works including land leveling than construction of irrigation facilities may not be required in the irrigation project area. Then there are a few problems in construction and even in operation and maintenance for the dam and reservoir. In the proposed reservoir area there are limited area of cultivated land except for coconut plantation area. The area to be submerged by the reservoir, which has an elevation of lower than 35 m, does not include any specific land which require preservation due to the natural monuments, ruins and habitats of special birds or animals.

The irrigation service area of the Tagum-Angas Communal Irrigation Area is subdivided into two areas, namely the Napo area, which has concrete paved roads as main road, and the Angas area which is served by the trunk roads of the existing gravel paved road. All of these roads connect the town of Sta. Cruz with both service areas and have no function to connect among villages. The proposed maintenance roads which links to the existing village roads may serve for the transportation of farm inputs and farm products. In the Angas area, there are several parts of the existing roads where the transportation is disturbed due to the following reasons : submergence of gravel roads by water during high tide in low elevation areas, overflow of flood water due to poor drainage, muddy roads during heavy rainfall, which have a thin depth of gravel pavement and improper embankment materials. Since these disturb agricultural as well as non-agricultural transportation, the concerned rehabilitation work of related roads is included in the proposed road improvement plan, where increase of road embankment height, improvement of drainage, and improvement of road pavement area included.

The plan of Laon-Mataas Communal Irrigation Project, located in Mogpog municipality, was formulated with net irrigation area of 175 ha by NIA and has been partially implemented. However the project is in a state of abeyance due to the shortage of budget. The Project would contribute to attaining an increase in self sufficiency evolving food production and in stabilization of farm income : this is the aim of the national Medium-Term Development Plan. The members of the Irrigation Association have requested the government to implement as early as possible.

The establishment of the Agricultural Development and Promotion aims to promote agricultural development not only in the area of the Integrated Agricultural Development Project, rather in the whole province. Through conducting field trials based on the technology researched at regional or central and varying experiment stations, the new agricultural technology which is adaptable under Marinduque conditions will be generated. The package of recommendable technology will be transferred to agricultural extension staff and farmers' leaders in the proposed training activities on the related practical knowledge and skills. The main economic activities in Marinduque is agricultural sector. However no significant production technology on irrigated agriculture has been introduced in the province under the condition of remote and rater small island with very limited area coverage of all year round

irrigation. Therefore, it is planned to conduct field trials on production technology and to strengthen training activities with following detailed objectives;

* To conduct field trials for technological verification on production technology of irrigated paddy, diversified crops, irrigated vegetables and industrial crops.

* To select recommendable crops/varieties with a package of respective production technology and to demonstrate the technology.

* To transfer the production technology through training farmers' leaders and agricultural extension staff for raising land productivity.

To raise land productivity it is essential to apply the technology of irrigated agriculture with improved varieties and to improve farming practices of nursery, fertilizing, soil amendment, pest control and so on. Therefore it is necessary to generate following technology through conducting field trials ; ① package production technology of irrigated paddy ② package production technology of corn ③ package production technology of groundnut and beans ④ package production technology of industrial crops like arrowroot and Ubi ⑤ package production technology of irrigated vegetables ⑥ package production technology of coconut multistory cropping ⑦ the technology on soil/soil profile improvement and irrigation for diversified crops/upland crops ⑧ the technology on crop rotation, mixed cropping.

For conducting field trials it is needed to establish an experimental farm. 6.5 ha of land has been acquired to establish a farm by the provincial government. In addition to the acquired land, the government got a few hectares of coconut land, which are located in the adjacent area of the acquired land for the trials on coconut multistory cropping.

Then following items of research and training equipment and facilities are required for research and training activities at the proposed farm; ① common equipments for yield and seed test ② equipments for soil analysis and for production of fungus for rapid composing and root nodule bacteria ③

audio-visual equipments for training ④ farm machineries to utilize at the farm ⑤ agroclimatological observation equipments ⑥ transportation equipments for training and research activities ⑦ office equipments for training activities.

It is considered that these equipments could be utilized in training activities. Further for the transportation equipments, it is necessary to include a micro bus which is utilized for the transportation of trainees, taking into account the poor transportation conditions in Marinduque.

After examine the necessity of all requested equipments, it becomes clear that they are essential for the proposed research and training activities.

For all the seven (7) poblacions in the Marinduque province, there are water supply systems of level III to supply water independently to each beneficiary, though the supply is of limited hours in a day. The supply hours cover merely 2~3 hours in case of Sta. Cruz and Torrijos areas while it is longer than 10 hours other than Sta. Cruz and Torrijos. In Sta. Cruz and Torrijos, therefore, most of the people has to rely on the other sources for their daily needs for water consumption.

Water source for the Sta. Cruz Water Supply System is the spring water existing at the western mountain side of the municipal office. The quantity of spring water is, however, not enough to satisfy the demand for domestic use in the dry season. Further, there is no other spring, and there is no other potential than getting domestic water supply from the reservoir to be built for irrigation of Tagum-Augas area. The system would be planned as level II.

For the domestic water supply to Tagum-Augas area, the plan shall cover Sta. Cruz area and the area along the pipeline.

The water work for Torrijos area presently relies on the water source from the spring located at the north-western mountain side from the municipal office. The water quantity from this spring is sufficient enough to meet the standard for domestic water use for the area, but in fact supply is not enough due to the damaged pipeline between the water source and the storage tank. For the improvement of Torrijos Water Supply System, there are two (2) plans possible for implementation. One is to repair the existing pipeline or relocate

the pipeline route and the other is to develop a new water source. Groundwater includes some saline content and not suited for the new source of water. Through the survey, it was found out that the spring water availed at the foot of Volcano Marlanga is suitable as new water source for Torrijos Water Supply System both in its quality and quantity.

Under the Torrijos System, it is requested to supply the water to all Barangays along Tigwi - Torrijos. As shown in the Table 3-1, there considered three (3) alternative plans as follows and relevant comparative studies have been made. As per the study result, the plan to supply to all requesting Barangays with new water source is of the highest effective one for the implementation.

TABLE 3-1 COMPARISON OF DOMESTIC WATER SUPPLY PLANS FOR TORRIJOS AREA

		①	②	③
Population		6,993	6,993	3,049
Average Daily Supply (cu.m/day)		498	498	250
Pipeline Length (m)	ø 200 mm	6,600	11,500	-
	ø 150 mm	6,200	6,200	-
	ø 75 mm	-	4,500	11,500
	ø 25 mm	-	-	-
	Total Length	12,800	22,200	11,500
Pipe Cost (peso)		104,518	175,008	58,236
Cost Per Head		14,774	24,739	24,285

① Supply to all Barangays between Tigwi and Torrijos (New water source)

② Supply to all Barangays between Tigwi and Torrijos (Existing water source)

③ Supply to only the existing beneficiaries by relocating the pipeline (Existing water source)

In order to stabilize the daily lives of the people through prolonging the supply hours by securing enough water source for the above two (2) areas, it is quite important to avail the new water sources as Tombangan dam for Sta. Cruz area and spring water for the peoples' daily lives will surely contribute to raising-up of standard of living of the people in the project area.

Benefits on supply hours and increased number of people benefited are as shown in Table 3-2. There are some saline content included in the existing water supply between Tigwi and Torrijos, but the water quality would be improved under the subject project.

TABLE 3-2 SUPPLY HOURS AND NUMBER OF PEOPLE BENEFITED

	Present		Plan	
	Hours	Number	Hours	Number
Sta. Cruz	2 ~ 3	8,111	24	14,731
Tagum-Angas	1	4,612		13,041 *
Torrijos	2 ~ 3	3,049	24	7,628
Chigui-Torrijos	1	3,584		6,993 *

Note: * ... With only new water source

The Number of people benefited from these water supply plans would be as shown below.

TABLE 3-3 NUMBER OF PEOPLE TO BE BENEFITED BY EACH PROJECT COMPONENT

Plans	Benefited Area	Number of Beneficiary People
Agricultural Promotion Farm		137,830
Agricultural Infra. Improvement		
Tagum-Angas Irrigation	630 ha	5,343
Laon-Mataas CIP	175 ha	3,305
Road Facilities Improvement		7,709
Domestic Water Supply		
Sta. Cruz Area		13,041
Torrijos Area		6,993

As indicated above, the subject project aims at stabilization of rural people's life in the project area through attaining raise-up of agricultural productivity and resultant increase of farmers' income and improved supply of rural domestic water, which can be derived from agricultural infrastructure consolidation and rehabilitation of agricultural promotion farm to be provided under the project. As the scale of development is considered adequate and the