

CHAPTER 2. BACKGROUND OF THE PROJECT

CHAPTER 2. BACKGROUND OF THE PROJECT

2.1 Socioeconomic Conditions

2.1.1 National Level

a) National Economy

The Philippine economy which was growing at an annual rate of 2.5% from 1980 to 1983 experienced its worst economic crisis since its post war history in 1984 and 1985 due to worldwide depression. The Philippines experienced negative economic growth of 14.6% during these two (2) years while the rate of unemployment also began to increase from 7.9% in 1983 to 11.1% in 1986. In 1986, the economy of the Philippines started to recover with an economic growth of 3.4% and steadily increased to 6.8% in 1988. Unemployment rate also decreased from 11.1% in 1986 to 8.6% in 1992. However, growth ratio started to again decline in 1989, due to the gulf war and the various calamities that occurred in the country, such as earthquake, floods, typhoons, etc. Per capita GDP in 1990 was 17,300 pesos, equivalent to 715 US dollars. (refer to Table 2.1.1)

Population of the Philippines was about 60.7 million in 1990, increasing at an annual rate of 2.35% between 1980 and 1990. Some 51% of the population live in the rural areas, and compared to 1970-1980, this ratio decreased by about 20%. On the other hand, population in the urban areas have been increasing.

The agriculture sector still occupies important status in the Philippine economy, contributing 23% of GDP in 1992. About 45% of the economically active population are engaged in agriculture and related activities, while more than 51% of the population live in the rural areas. The export value of the agricultural commodities such as banana, coconut oil and copra etc. occupies about one third of the total export. However, the growth ratio of the sector in the recent years remained stagnant with an average annual rate of increase of only 1.1% since 1980 compared to the services and other sectors.

The Philippines attained self-sufficiency in paddy in 1977. However, it started to import rice after this year due to drought, typhoon and increase in population and imported about 600 thousand tons of paddy in 1990.

Despite the large contribution of the agriculture sector to the Philippine economy, the majority of the farmers in the rural areas remain poor, living on an annual income of 41,199 pesos per family in 1990, compared to 89,571 pesos in the urban areas. Some 46.5% of the total population and 40.7% of the total number of families live on incomes below the poverty level (7,350 pesos per capita/year) in 1991. About 70% of these poor families live in the rural areas and are engaged in the agricultural sector. In addition, many of these farmers are considered landless farmers, which is one of the current social problems in the Philippines. Under this condition, CARP has been implemented to promote the distribution of lands to farmer beneficiaries and to intensify agricultural production through provision of necessary rural facilities to alleviate poverty. This Project forms a link in the chain of CARP.

b) Medium-Term Philippine Development Plan (MTPDP)

The MTPDP was formulated and updated to guide development efforts in both the public and private sectors for the next six (6) years for the period 1993 to 1998. During the last six (6) years, 1987 to 1992, the economy of the Philippines did not prosper. The experience of the government during these years highlighted the need for programs that would focus on strengthening both external and internal reforms and policies.

The long-term goal of the development plan is the alleviation of poverty, improvement of income and equal distribution of wealth while the major macroeconomics objectives are: ① sustained and broadbased growth of output and employment; ② price stability; and ③ a sound balance of payment positions. (refer to Table 2.1.2)

The following are the targets of the MTPDP;

- to reduce the proportion of families below the poverty threshold, from 40.7% in 1991 to 30% by the end of 1998;
- to attain a 7.3% annual growth rate of GNP during the period;

- to increase real per capita income from 11,298 pesos in 1993 to 14,783 pesos in 1998;
- to raise annual growth rate of GDP from 3% to 10% in 1998;
- to ensure an inflation rate of less than 5.8% per year, and;
- to reduce unemployment ratio from 9.6% in 1993 to 6.3% in 1998.

As to the agricultural sector, the following are the identified policies and strategies;

- to increase government investment for basic infrastructure and services in the rural areas;
- to continue to strengthen agricultural research and development to improve productivity;
- to reduce tariff rates on agricultural inputs;
- to reduce government intervention in the production, marketing and processing of agricultural inputs and outputs;
- to undertake seed development program;
- to liberalize shipping and port management policies;
- to strengthen and expand the agricultural credit and crop insurance programs;
- to adopt a land use policy consistent with the agrarian reform objectives;
- to implement an integrated pest management program;
- to stop the use of pesticides banned in other countries, and;
- to promote the production of high-valued commodities.

2.1.2 Regional Level

a) Regional Economy

Region IV is one of the 15 regions constituting the Philippine Island. It is also known as the Southern Tagalog Region and is composed of 11 provinces. In 1990, the region's total population was about 8.26 million accounting for 14% of the country's total population, making it the most populated region. About 46% of the total population of the region live in the

rural areas while about 37% of the economically active population are working in the agricultural sector.

The Gross Regional Domestic Product (GRDP) for 1991 was 102.5 billion pesos, representing about 14% of the GDP of the Philippines. The region contributed significantly to national income ranking second and next to Metro Manila in terms of GRDP share among the 15 regions of the country. This maybe due to its proximity to Metro Manila and its tendency to assimilate the effect of Metro Manila's urban and industrial expansion.

The region's economy has improved during the period 1987 to 1991. However, the improvement was attributed mainly to the contribution of the so called growth corridor provinces which are located near Metro Manila. The economy of the island provinces of the region has not really improved, including Palawan. This is due to concentration of development efforts in the provinces proximate to Metro Manila. The other provinces like Palawan, Romblon, Mindoro, etc. has not been fully developed. Basic infrastructure facilities like power supply, telephone services, water supply, transportation, irrigation are still insufficient to meet the requirement for development.

The region's annual average family income in 1991 was 68,960 pesos. Though this amount is higher than the national average of 65,186 pesos, and ranked second, next to Region III among the 15 regions excluding Metro Manila, the total families with incomes below poverty threshold is about 38%. In addition, there is a big disparity in the income between the island provinces (Palawan, Romblon, Marinduque, Mindoro Occidental and Oriental) and the growth corridor provinces. (Cavite, Rizal, Laguna, Batangas) (refer to Tables 2.1.3 and 2.1.4)

b) Medium-Term Development Plan for Region IV (1993-1998)

The Medium-Term Development Plan was formulated based on the policies of the MTPDP (1993-1998), aimed at the immediate restoration and sustainable growth of the economy in the region.

Region IV is composed of six (6) provinces in Luzon islands and five (5) island provinces. There is a difference, therefore, in the level of resources and potentials of the region. The strategy for the development of Region IV calls for

the delineation of the region into three (3) sub-regions as follows; ① growth corridor sub-region; ② Island sub-region; and ③ Aurora sub-region. Hence, the development strategy for each sub-region will differ depending on the particular resources, needs and potentials of the sub-regions but taking into consideration the advantages of each sub-region in enhancing and attaining the goals and objectives of the region. The overall spatial strategy for the region has two (2) components, namely; ① Linear Urban Growth Corridor Strategy and ② Agricultural Modernization Strategy. (refer to Appendix A.2)

The Agricultural Modernization Strategy will focus on the development of the agricultural potentials and utilization of the natural resources of the municipalities and cities in the island provinces and the non-growth center areas and with focus on commercial type production of high value crops and livestock and the use of capital intensive methods of agricultural production such as modern technologies, improved organizational structure for production, provision of marketing and storage, conduct of continuous research to increase productivity and introduction of wide range of processed products. The island provinces shall be developed wholly through the implementation of Integrated Area Development (IAD) Programs.

2.1.3 Palawan Province

The Palawan province, with an area of 14,896 sq.km, composed of main island Palawan and some other islands, is located at the westernmost part of the Philippines. The province is divided administratively into one (1) city, 21 municipalities and 414 barangays. The capital of the province is Puerto Princesa city, located at the center of Palawan main island. Population in 1990 was about 528,000, increasing at an annual rate of 3.58%, higher than the national average of 2.35%. This high growth rate is attributed to the number of immigrants from other provinces, amounting to 3,000 to 4,000 people annually. The province has a household of 101,117. The provinces' annual average family income is 41,415 pesos, ranking 10th lowest among 11 provinces and 30th lowest among 75 provinces in the country in 1991. Figures in 1991 shows that some 52.9% of the families live on incomes below the poverty threshold. (refer to Table 2.1.4)

Agriculture, fishery and forestry are the mainstay of the province. Of the 313,000 economically active population, 69% are working in the agricultural sector in 1990. About 150,000 ha are planted to paddy, maize, coconut, mangoes, cashew nut, banana and others. The outbounding products from Palawan are paddy, maize, copra, fish, rattan and resin. At present mangoes cannot be exported to other provinces as it is preventing the spread of harmful insects which has since infested the fruit. Though there is a recorded shortage of paddy in 1982, production of paddy meet the demand of the province in the recent years. However, paddy production is irregular since it is very dependent on the climate condition.

Other than agricultural products, the province produces nickel, mercury, copper, silica, limestone and sulfur. The province has abundant forest resources, also considered as one of its main industry.

Under the situation, the provincial government presented the Medium Term Development Plan (1994-2000) on September 1993 to provide development vision regarding agriculture, tourism, environment and social infrastructure etc. till year 2000. The major targets in the Plan are as follows;

- increase annual farm household income from the current income of 14,350 to 37,978 pesos;
- expand irrigated land from 38,600 (1992) to 65,000 ha until year 2000
- increase agricultural production from 122,372 to 391, 875 tons until year 2000;
- increase paddy yield from 2.6 to 6.0 ton/ha;
- implement agricultural processing facilities, post harvest facilities and social infrastructure; and
- strengthen marketing, credit services, technical development.

Table 2. 1. 1 Economic Indicators of the Philippines

		1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
GDP	at Current Price	369,077	524,481	571,883	608,887	682,764	799,182	925,444	1,073,098	1,244,741	1,338,421
	at Constant (million) 1985 Price	665,717	616,962	571,883	591,423	616,923	658,581	699,448	718,069	712,316	710,396
	Growth Rate (%)	1.9	-7.3	-7.3	3.4	4.3	6.8	6.2	2.7	-0.8	-0.3
Wholesale											
Price Index (1978 = 100)	Metro Manila	208.0	346.5	409.3	410.6	444.0	498.5	550.7	607.5	689.3	720.1
	Annual Change (%)	16.2	66.5	18.2	0.3	8.1	12.3	10.5	10.3	13.5	4.5
Balance of Payment	Export	5,005	5,391	4,629	4,842	5,720	7,074	7,821	8,186	8,840	9,824
	Import	-7,487	-6,070	-5,111	-5,044	-6,737	-8,159	-10,419	-12,206	-12,051	-14,519
	Services	-740	-823	26	783	0	-80	303	618	1,351	2,879
	Transfer	472	386	379	441	573	775	830	714	827	817
	Balance	-2,750	-1,116	-77	1,022	-444	-390	-1,465	-2,688	-1,033	-999
Labour Force (1000)	Total	20,130	20,756	21,239	22,072	22,880	23,452	23,859	24,525	25,246	26,940
	Employed	18,543	18,550	18,967	19,631	20,795	21,498	21,849	22,532	22,980	24,618
	Unemployed	1,587	2,206	2,362	2,441	2,085	1,954	2,010	1,993	2,266	2,322
	Unemployed Rate (%)	7.9	10.6	11.1	11.1	9.1	8.3	8.4	8.1	9.0	8.6

Source: Statistical Yearbook, NSCB

Table 2. 1. 2 Aggregate Targets of the MTPDP (1993-1998)

Item	1993	1994	1995	1996	1997	1998	Annual Average
Growth Rate of GNP (%) (1985 price)	3.5	6.5	7.5	8.0	8.5	10.0	7.3
Growth Rate of Per Capita GNP (%) (1985 price)	1.0	3.9	4.8	5.4	6.0	7.6	4.8
Per Capita GNP (US\$) (1992 price)	855	910	966	1,031	1,113	1,220	
Growth of Exports (%)	4.5	10.0	13.0	15.0	18.0	19.0	13.3
Growth of Imports (%)	6.3	10.0	11.5	12.0	14.0	15.0	11.5
Growth Rate of GDP (%)	3.0	6.7	7.7	8.2	8.8	10.0	7.4
Growth Rate of Agriculture in GDP (%)	3.8	3.4	3.9	4.1	4.3	4.6	4.0
Growth Rate of Industry in GDP (%)	2.3	7.7	10.2	10.6	11.1	12.4	9.1
Growth Rate of GDP in the Region 4 (%)	3.4	7.5	8.8	9.9	11.2	12.9	8.9

Source: Medium-Term Philippine Development (1993-1998)

Table 2. 1.3 Annual per Capita Poverty Thresholds and Incidence of Families

	1988			1991		
	Annual Per Capita Poverty Threshold (pesos)	Magnitude of Families	Incidence (%)	Annual Per Capita Poverty Threshold (pesos)	Magnitude of Families	Incidence (%)
Philippines	4,777	4,230,484	40.2	7,350	4,879,620	40.7
NCR	6,576	310,284	21.6	9,471	245,018	14.9
Area Outside NCR	4,489	3,920,200	43.1	7,004	4,634,602	44.9
CAR	5,116	89,572	41.9	6,574	85,666	37.6
Region I	4,934	280,344	44.9	8,123	332,014	49.4
Region II	4,573	177,072	40.4	7,072	210,977	43.1
Region III	5,242	304,313	29.3	8,293	394,612	33.0
Region IV	4,832	527,360	41.1	8,083	613,452	38.0
Region V	4,144	402,522	54.5	6,476	461,776	56.1
Region VI	4,344	472,909	49.4	6,545	499,975	46.7
Region VII	3,711	388,571	46.8	5,650	383,210	42.4
Region VIII	3,818	292,953	48.9	5,240	269,471	40.7
Region IX	3,793	208,710	38.7	6,957	329,525	54.5
Region X	4,523	279,900	46.1	6,564	378,170	55.2
Region XI	4,876	318,117	43.1	6,529	394,416	47.2
Region XII	4,147	177,807	36.1	6,913	281,339	51.0

Source: Statistical Yearbook, 1993, NSCB

Table 2. 1.4 Average Family Income and Poverty Incidence, Palawan

	1988				1991			
	No. of Families	Poverty Incidence (%)	Magnitude of Families	Mean Annual Income (pesos)	No. of Families	Poverty Incidence (%)	Magnitude of Families	Mean Annual Income (pesos)
Philippines	10,533,927	40.2	4,230,484	40,408	11,975,400	40.7	4,878,620	65,186
Region IV	1,284,464	41.1	527,360	37,978	1,615,857	38.0	613,452	68,960
Aurora	25,433	49.5	12,595	34,141	30,048	41.4	12,425	49,548
Batangas	253,014	29.4	74,279	43,240	277,920	28.9	80,200	74,108
Cavite	195,934	22.6	44,343	45,506	225,857	18.9	42,781	85,416
Laguna	229,681	23.5	54,033	52,660	271,926	22.4	61,010	87,030
Marinduque	37,734	65.6	24,735	25,123	42,436	61.5	26,094	67,761
Mindoro Occ.	51,480	31.9	16,413	46,701	58,803	45.9	26,986	61,132
Mindoro Ori.	102,498	66.7	68,402	21,846	113,943	55.5	63,219	51,725
Palawan	91,685	54.3	49,829	27,722	101,541	52.9	53,742	41,415
Quezon	256,549	59.2	151,979	27,991	288,394	48.4	139,577	47,325
Rizal		NA			160,769	26.9	43,211	93,046
Romblon	40,457	76.0	30,753	16,002	44,220	74.9	33,100	27,387

Source: Family Income and Expenditure Survey 1991, NSO
Southern Tagalog Statistical Yearbook, 1991

2.2 Comprehensive Agrarian Reform Program

2.2.1 National Level

CARP is the agrarian reform system distributing three (3) ha of land to landless farmers and farmers who owns less than three (3) ha in order to increase income through agricultural production and to alleviate poverty. The agrarian reform system has started and continued since 1955 but CARP itself commenced on June 1988, and this Project forms a link in the chain of CARP.

The DAR is the lead agency in the implementation of CARP, however, there are other agencies involved in the implementation of CARP, such as the DENR, DA, etc. In the operation of its activities, the DAR has its regional, provincial and municipal offices. Also, CARP Implementing Teams (CIT) were created at the national, regional, provincial and municipal levels to accelerate the development and implementation of CARP programs and projects. (refer to Appendix A.2)

The projected areas under the CARP for ten (10) years from 1987 to 1997 is about 5.5 million ha. Since the launching of CARP, the accomplishment of the program shows a high rate of 437% as to the number of beneficiaries assisted and 292% as to acreage distributed until 1992. In the corn lands, paddy fields and state settlements, the ratio of accomplishment is about 70%. However, the rate is lower in other areas. (refer to Table 2.2.1)

The MTPDP is now being implemented. In the MTPDP, CARP is considered as one of the important policy to alleviate poverty and is thus being promoted speedily and effectively. For the period, about 2.52 million hectares are planned to be distributed to the farmer beneficiaries, which consist of paddy field and corn land of 251,724 ha, government owned lands of 181,644 ha, resettlement area and plantations of 84,998 ha, and personally owned lands of 1,999,144 ha.

2.2.2 Regional Level

There exists about 412,055 ha of CARP areas in Region IV accounting to 7.5% of the total CARP areas of about 5.5 million ha in the country. As of

July 1994, accomplishment is estimated at 35%, of which an area of about 145,417 ha has already been distributed. However, the accomplishment in Region IV for the period January to August of 1994 shows only a 40% distribution (about 13,400 ha of the targeted area of 33,340 ha already distributed), indicating a lower percentage as compared with the national average of 51% for the same period. The Palawan province, however, attained a 100% distribution on an area basis.

The annual family income in the rural areas in Region IV in 1991 is 49,502 pesos and 87,203 pesos in the urban areas. Some 38% of these families live on incomes below the poverty line with most of them living in the rural areas. There is, therefore, the necessity of accelerating the promotion of CARP in the region in order to alleviate poverty and increase income.

2.2.3 Provincial Level

The Palawan province is considered as a frontier area in the Philippines, resulting in the easier promotion of the CARP. As of July 1994, about 30,054 ha of the CARP area in Palawan were already distributed to 10,177 farmers, accounting to 64% of the target in the area. Only about 20 thousand hectares are still to be distributed. (refer to Table 2.2.2)

2.2.4 Study Area

The Study Area, about 2,000 ha, which includes the Tagumpay settlement area and its outlying area, is one of the priority CARP areas, transferred to the DAR from the DOJ based on an Executive Order 407 issued on June 1990 aiming at the development of the government owned land as the CARP area.

The Tagumpay settlement was established in 1954. The first settlers were the qualified colonists released from the Iwahig penal colony. So far, the land has been distributed to 332 beneficiaries and the land occupation per farm was fixed. In 1990, there were a total of 459 official residents and 102 households in the Tagumpay area. This population has a tendency to grow because of the existence of a residential area ready for occupancy. However, the

number of settled households accounts about one (1) third of 332 beneficiaries, during the recent years because of the following reasons:

- lack of the irrigation facilities in the Area;
- rural infrastructures such as electricity, domestic water, farm roads and clinic facilities have not yet been provided;
- farmlands have not been developed hence, very minimal agricultural activities are undergoing;

The reasons for the low income is attributed to the limited cultivable areas and low yield of crops dependent on rainfed condition. Therefore, a complete cycle can be speculated with these background, thus, low income - lower inputs of fertilizer/pesticides - low crop yield - low income.

Table 2. 2. 1 Projected CARP by Region (1987-1997)

	Phase I	Phase II	Phase III	Total
	Area (ha)	Area (ha)	Area (ha)	Area (ha)
Philippines	1,149,353	1,596,313	2,760,171	5,505,837
CAR	29,651	25,114	35,329	90,094
Region 1	27,280	18,416	59,040	104,736
Region 2	116,254	65,140	101,381	282,775
Region 3	232,833	111,641	102,435	446,909
Region 4	67,577	142,533	239,216	449,326
Region 5	103,636	262,003	444,164	809,803
Region 6	86,984	286,745	287,769	661,498
Region 7	51,829	82,203	184,001	318,033
Region 8	53,254	70,445	273,280	396,979
Region 9	38,595	76,255	285,711	400,561
Region 10	152,320	105,365	206,217	463,902
Region 11	53,172	109,971	352,684	515,827
Region 12	135,968	240,482	188,944	565,394

Source: DAR

Table 2. 2. 2 Accomplishment of CARP Land Distribution, Palawan
(as of Dec., 1993)

Municipality	Scope Area (ha)	Cumulative as of Dec. 1993		Balance (ha)
		Area (ha)	Farmer/Beneficiaries	
Aborlan	1,682	1,239	625	443
Balabac	1,775	654	222	1,121
Bataraza	4,698	738	297	3,960
Brook's Point	2,158	944	400	1,214
Busuanga	297	17	5	280
Coron	4,286	135	86	4,151
Cuyo	19			19
El Nido	573	33	26	540
Narra	19,333	18,629	4,851	704
Araceli	36			36
Dumaran	633	6	2	627
P.P City	5,945	2,215	1,086	3,730
Roxas	2,299	979	533	1,320
Quezon	1,603	69	33	1,534
Rizal	152			152
San Vicente	100			100
Taytay	1,319	1,265	499	54
Total	46,908	26,923	8,665	19,985

Source: DAR, Palawan

CHAPTER 3. THE PROJECT AREA

CHAPTER 3. THE PROJECT AREA

3.1 Natural Conditions

3.1.1 Location, Area and Topographic Conditions

a) Location

The Study Area is located at the Inagawan sub-colony, 55 km away from the national road at the southernmost part of Puerto Princesa city. It is about 550 km southwest of Manila. The Study Area is bounded by the city/municipal boundary at the south-west, by the contour line of 100 m at the north-west, by the national road at the south-east, and by the Inagawan river and the Inagawan penal colony farm at the north-east. (refer to General Development Plan)

b) Area

The acreage of the Study Area is 1,929 ha excluding the 137 ha bombing range of the Philippine Air Force. Of this area, about 1,023 ha, referred to as the Tagumpay area, was already released to the 332 beneficiaries by the DAR. The outlying area has not yet been released to the beneficiaries.

Item	Tagumpay Settlement	Outlying Area	Total
	(ha)	(ha)	(ha)
Gross Area	1,067	999	2,066
PAF Area	44	93	137
Study Area	1,023	906	1,929

c) Topographical Conditions

1) Altitude

The altitude of the Study Area ranged from 1.4 to 100 m MSL. The lowest portion, 1.4 m MSL is located at the existing paddy field along the national road while the highest, 100 m MSL, at the north-western part of the Study Area.

2) Land Slope

The longitudinal profile of the Study Area facing the mountainous area from the national road shows a gentle slope up to the place of about four (4) kilometers from the national road. From this place toward the north, the land slope is steep. At the southwest to the northeast direction, lands slope is gentle. At the southern part of the line, the average land slope is 1/80, while at the central part, 1/110 and at the northern part, 1/200. The higher the elevation, the more steep is the slope.

3) Topography

The Study Area shows a rolling and undulating topography with many small valleys with a difference of ten (10) to 20 meters between the bottom of the valley and the surrounding area. The side slope is very steep, more than 18%. A stream located at the bottom of the valley dries up during the dry season and drains water gathered at the bottom of the valley during the wet season. The valley has tributaries widely located at the downstream to the central part of the Study Area.

3.1.2 Soil and Land Use

a) Soil

Based on land management unit map prepared by the BSWM in 1988, the soil in the Study Area was generally classified into two (2) units as ① minor alluvial plains, which are distributed at the river basins of Isog and Isaub river and ② terrace (residual soils), which occupies more than 80% of the Area. (refer to Figure 3.1.1)

Most of the soil of the Study Area have less than three (3) layers, and thickness of each layer differ from 10 to 100 cm. Soil with gravel are not common in the Area, but some subsoil horizons have gravel with more than 20%. Hence, if surface soil are not thick enough, it may need extra operation to remove the bigger ones before commencement of farming.

Soil hardness is very important to determine the workability of land. Some indexes of the soil compactness are more than 20 mm, which show that the soil belongs to hard soil which needs ample tillage.

The dominant soil texture in the Study Area are clayey loam and light clay. Aluminum is not common, but acidity, high iron content and clayey soils are observed in some soil. Therefore, neutralization and application of more phosphate fertilizer than usual will be needed.

Humus is less than 1% in the Study Area. Humus affects the nature of soil entirely, like increasing nutrient supply and buffer function and Cation Exchange Capacity (CEC), so application of organic fertilizer is necessary from both chemical and physical viewpoints.

As a conclusion, the Study Area has no serious negative factors for agriculture in terms of soil conditions. Adequate countermeasures to correct acidity and fertilization will be required to a certain extent, but these are necessary operations undertaken in any kind of soil.

Land classification survey was conducted mainly to establish the location and extent of arable and non-arable lands and to classify the lands that are suitable for the agricultural development. Arable lands classified as suitable for irrigation have a total area of 1,545 ha while non-arable lands considered not suitable for cultivation cover an area of 521 ha.

b) Land Use

The forest and shrubs comprise about 65% of the Study Area, while grasslands and others, about 31%. Land utilized for farm cultivation is only about 4% during dry season. Flat and low level lands located along the national highway are mostly utilized for paddy cultivation. In areas where spring water are available to a very limited extent, double cropping is practiced. (refer to Table 3.1.1)

Forest areas are dominant at higher level lands, in the western and northern parts of the Study Area. Major trees found are ipil, kamagong, bangkal, etc. These areas extend to the mountainous forest.

3.1.3 Geographical, Geological and Hydrogeological Conditions

a) Geographical Conditions

The Study Area and surrounding areas are divided into three (3) categories ① Central mountain area, ② Diluvial hill area, and ③ Alluvial plain area.

Central mountain area, which is characterized by abundant tropical forest area, is situated almost at the center of central Palawan, and consists of steeply sloping mountain ranges with altitude ranging from 400 to 1300 m along the crest of the ridge. The north and northwestern portions of the surrounding area belong to this categories.

The Study Area is generally covered by gentle slope diluvial hills, which are composed of diluvial fan deposits, ranging in elevation from 15 to 40 m on the surface of its hills. This hill area has rolling and undulating topography and many small valleys. Alluvial plain extends widely starting near the national highway to the coastal area with elevation of less than ten (10) meters. Furthermore, fluvial flood plain similar to alluvial plain are distributed mainly along the Inagawan river and its tributaries.

b) Geological Conditions

Palawan Island is divided into north and south Palawan, including central Palawan, by the Sabang fault crossing the Palawan Island with north-south direction, located northeastward about 50 km from Puerto Princesa city. South Palawan is thought to be constructed by the northwestward thrust movement of overlying ophiolite to the north Palawan block during the formation of the South China Sea and the Sulu Sea. South Palawan has a basement composed essentially of an oceanic crust and turbiditic sediments where an ophiolite suite consisting of ultramafics, gabbro and basalt was overthrust. (refer to Figure 3.1.2)

The north and northwestern portions of the Study Area are composed of these basement rocks. On the other hand, most of the Area are underlain by diluvial deposits, called the Iwahig Formation, and are made up of poorly consolidated old fan and old talus deposits. The alluvial deposits, which

correspond to the recent deposits, are distributed at the flood plain from the national highway to the coast line and along the downstream of the Inagawan river.

c) Hydrogeological Conditions

As to geological conditions, the aquifer is restricted to the diluvial deposits, alluvial deposits and a part of sedimentary rocks because these geological members contain sand and gravel layer, which usually transmits more water than any other rocks. The distribution of these geological members also correspond topographically to the diluvial hill area and alluvial plain area.

Based on the report of the NWRC, this area is also divided into two (2) groundwater areas as follows :

- Shallow well area :

The depth of wells are not greater than 20 m and the static water levels generally within 6 m below ground surface.

- Deep well area :

The depth of wells are greater than 20 m and the static water levels usually exceed 6 m below ground surface.

The shallow well area generally consists of recent formation like alluvial plain, with the possibility of the presence of deep water aquifers exist in this area. The deep well area is correlative with Pleistocene formation like diluvial deposits. In the case of this deposits, the chances of good shallow well are rare since the aquifer is generally found greater than 15 to 20 m below ground surface.

3.1.4 Climate Conditions

a) Climate Conditions

Since there is no climate observatory in the Study Area, the data of the nearest PAGASA observatory in Aborlan, which is about 19 km away in the

direction of south-west from the Area, are applied for this study. The data observed were recorded continuously for 17 years from 1977 to 1993.

The annual mean, mean maximum and mean minimum temperatures are 27.2, 31.3 and 22.9 centigrade, respectively. The difference between the maximum and minimum monthly mean temperatures is only 2.0 degrees throughout the year. The annual mean relative humidity is 87.3%, which indicates a high humid condition. The annual mean cloudiness of 5.1 oktas is recorded, considered relatively a high value. Mean wind directions are southwards during the dry season and north-west during the wet season with an average wind speed of 1.0 m/sec (equivalent to 82.2 km/day). The Study Area is located outside the typhoon belt, hence, there are no recorded significant damages caused by typhoon. (refer to Table 3.1.2 and Appendix C-1)

The mean annual rainfall is measured at 1,587.1 mm at the Aborlan station, of which 1,454.7 mm (about 90% of the annual rainfall) is measured for eight (8) months from May to December. During the dry season of four (4) months from January to April, 132.4 mm of rainfall is recorded. However, the beginning of the wet season usually fluctuates, while the end of the wet season also differs from November to December, the amount of monthly rainfall of which is sometimes less than the mean monthly rainfall. Most of rainfall occurrences show a character of spot rainfall as a tropical rainfall pattern. (refer to Table 3.1.2 and Appendix C-1)

b) Climatic Character for Agriculture

From the climatic point of view, the Study Area is generally suitable for agricultural production. With almost year round temperature, crops could be cultivated throughout the year. However, with a relatively high humidity, drying and storage of grain crops can become difficult. The average annual cloudiness although slightly lower than the average annual cloudiness of the Philippines and being an influential factor in solar radiation directly affect crop yield. Although rainfall on an annual basis appears to support crop production, rainfall pattern vary to some extent even within both seasons thereby requiring irrigated agriculture to secure stable crop production and to increase crop production.

3.1.5 Hydrological Condition

a) Hydrological Survey and its Analysis

Measurement data of the water level has been collected at three (3) water level gauging stations which were installed at the Inagawan river in May, 1993. Some of the observed data were lacking, however, the collected data were used for the hydrological analysis. The rating curves have been developed at No. 2 and No. 3 gauging stations. As a result of the analysis, the coefficient of correlation obtained was 0.982 at the No. 2 gauging station and 0.538 at the No.3 station. The river discharge of the Inagawan river was calibrated by applying the rating curve of the No.2 gauging station.

b) Long-term Run-off Analysis

The Tank Model method to calculate the river discharge was applied because of the simple character of the river basin, non utilization of water at the upstream and the availability of meteorological data. As input data, the daily rainfall data at Aborlan PAGASA station and the evapotranspiration rate estimated by the modified Penman method were used. As a result of the analysis, the coefficient of correlation obtained was 0.610. The annual mean run-off of 106 MCM was calculated at the No.2 gauging station with a run-off coefficient of 47%. The total run-off discharges calculated were about 17 MCM during the dry season and 89 MCM during the wet season (refer to Appendix C-2).

c) Probable Run-off Discharge

Based on the results of the probable run-off discharge analysis, drought water discharge was estimated at 0.314 cu.m/sec with a 10-year return period. Accordingly, with the evaluation of the long term analysis for 17 years, 1977, 1990, 1991 and 1992 were selected as drought years (refer to Appendix C-2).

Table 3. 1. 1 Present Land Use of the Study Area

as of Sept., 1994

Land Categories	Land Use	Study Area (ha)		Ratio to Total (%)		Remarks
		Wet Season	Dry Season	Wet Season	Dry Season	
Farm Land	Paddy F.	48.2	48.2	2.5	2.5	
	Upland P. F.	74.8	0.0	3.9	0.0	
	Upland F.	296.0	9.6	15.3	0.5	
	Coconut	14.3	14.3	0.8	0.8	
	Cashewnut	8.4	8.4	0.4	0.4	
Sub-Total		441.7	80.5	22.9	4.2	
Forest	Broad Leaf	605.3	605.3	31.4	31.4	
	Bush/shrub	648.5	648.5	33.6	33.0	
Sub-Total		1,253.8	1,253.8	65.0	65.0	
Grassland etc.	Grassland	186.2	547.4	9.7	28.4	
	Bamboo	26.6	26.6	1.4	1.4	
	Swamp/Marsh	0.5	0.5	0.0	0.0	
	Rivers	12.2	12.2	0.6	0.6	
	Roads	3.9	3.9	0.2	0.2	
	Home Lot*	4.1	4.1	0.2	0.2	
Sub-Total		233.4	594.7	12.1	30.8	
Total		1,929.0	1,929.0	100.0	100.0	

Note : *Mark means the actual housing area.

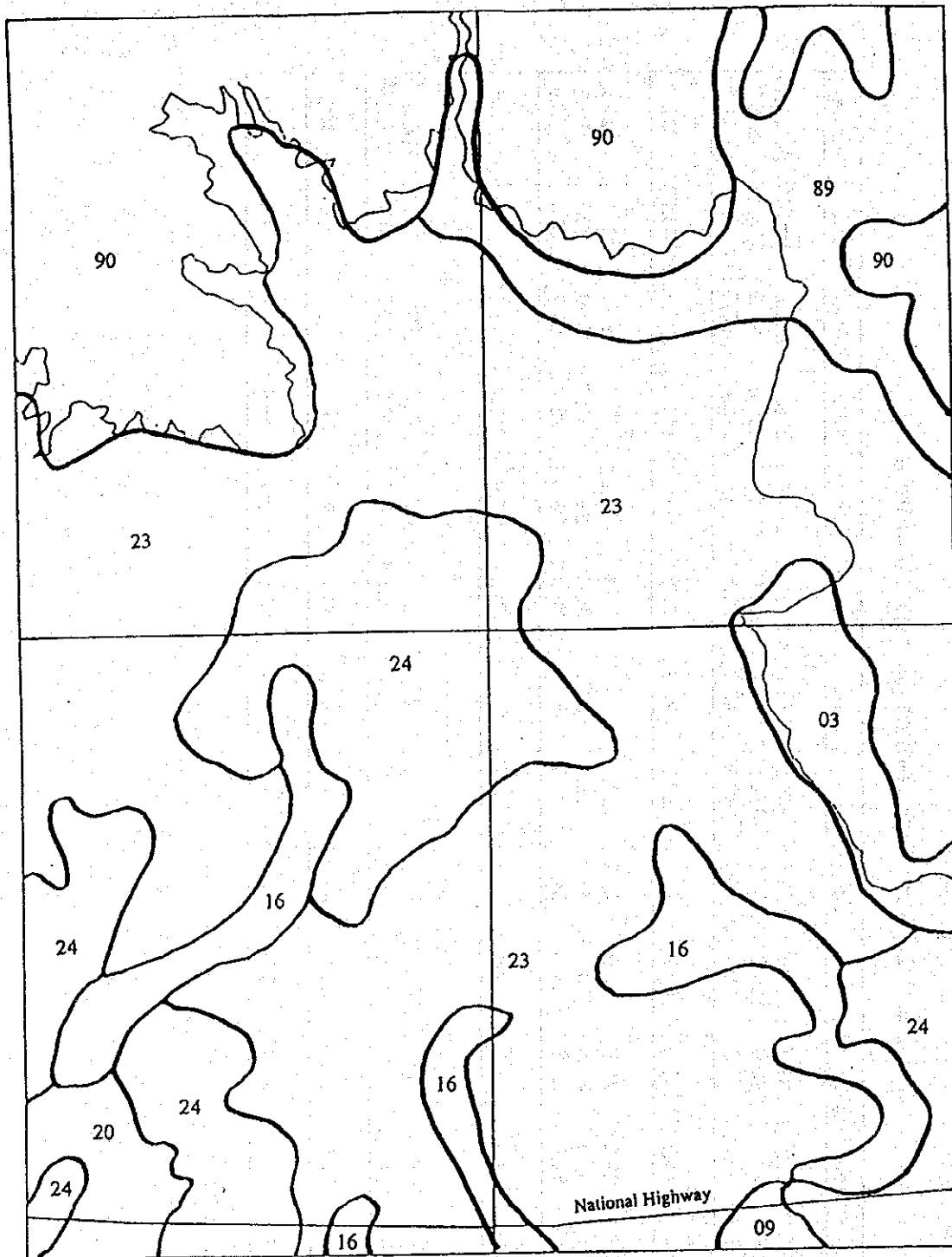
Based on the Topo-map with a scale of 1/4,000

Table 3.1.2 Summary of Climatological Conditions

Item	Jun.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
M. Rainfall													
Mean (mm)	37.1	15.5	34.8	45.0	126.3	164.2	187.2	173.2	180.6	212.1	282.5	128.6	1,587.1
Max. (mm)	152.3	70.1	295.0	129.2	387.5	374.9	296.4	328.6	322.2	349.5	477.1	576.7	576.7
Min. (mm)	2.2	0.0	0.0	5.4	4.7	43.2	49.0	60.5	69.8	112.0	99.6	14.2	0.0
D. Rainfall													
Max.	76.7	25.0	111.4	55.2	91.2	80.2	120.9	77.2	90.2	125.5	208.2	232.7	232.7
Temperature													
Mean (°C)	26.2	26.2	26.8	27.9	28.2	27.7	27.2	27.3	27.4	27.3	27.1	26.6	27.2
Max.	30.5	30.8	31.7	32.6	32.3	31.4	31.1	31.2	31.5	31.2	31.0	30.5	31.3
Min.	21.8	21.6	21.8	23.1	24.1	23.9	23.2	23.3	23.2	23.4	23.2	22.7	22.9
Cloudiness (okta)	4.9	4.6	3.6	3.8	4.6	5.9	6.0	6.1	5.9	5.7	5.3	4.8	5.1
Wind Speed													
Direction	NE	NE	NE	NE	SE	SE	S	S	SW	NE	NE	NE	NE
Speed (m/sec)	1.2	1.2	1.4	1.1	0.6	0.6	0.6	0.8	0.7	0.9	0.9	1.3	0.9
R. Humidity (%)	88.6	87.6	84.4	82.4	84.1	87.6	89.3	89.2	88.7	88.2	89.1	88.5	87.3
Pan Evap. (mm/day)	4.3	5.1	5.9	5.8	4.7	3.4	3.3	3.4	3.5	3.4	3.3	3.7	4.2

Source : 1997 to 1993, Aborlan, PAGASA

Figure 3. 1. 1 Land Management Unit Map in the Study Area

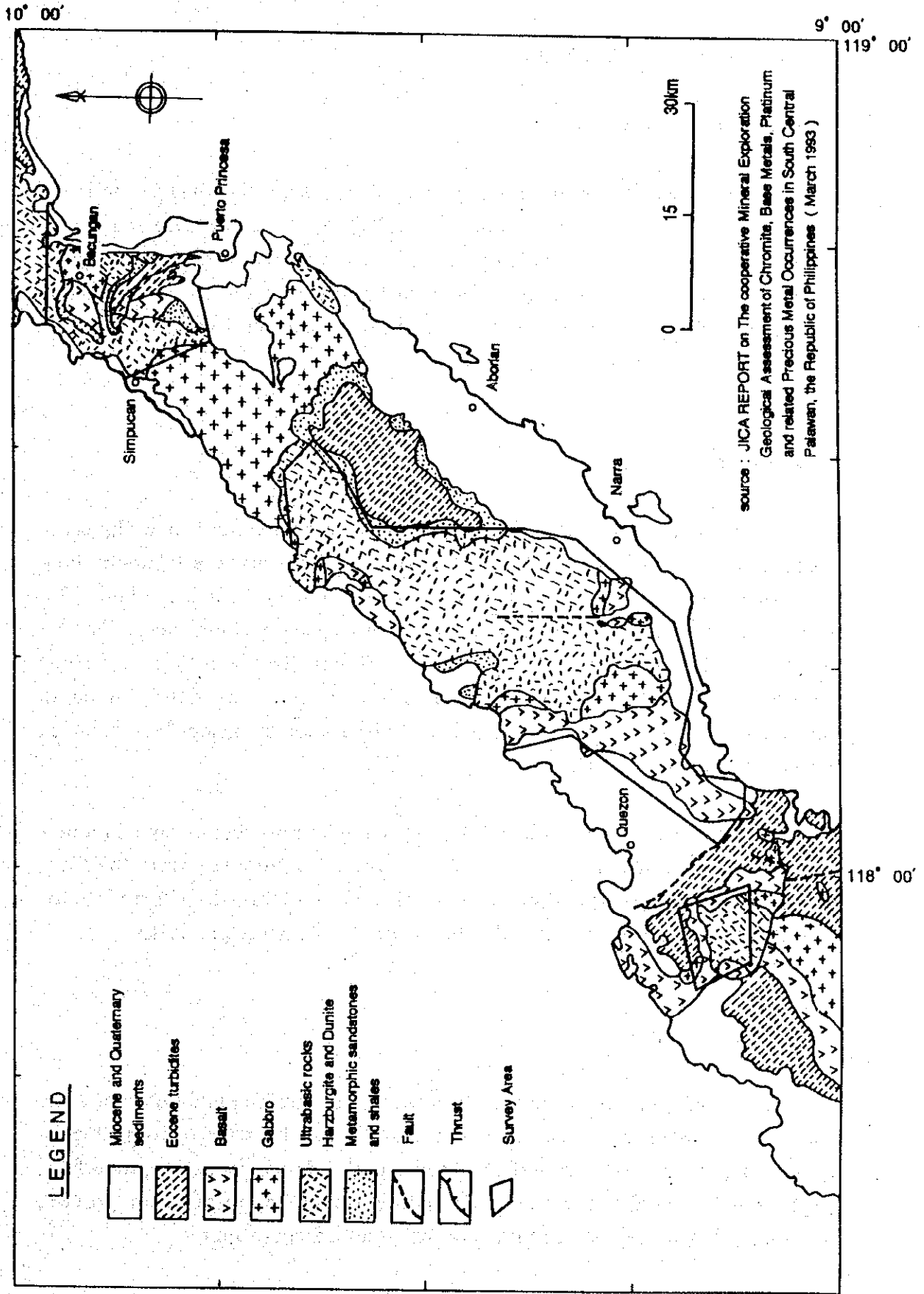


Source: 1/50,000 map, BSWM, 1988

LEGEND

- 03 :Broad Landform Types Coastal
(Beach ridges and Swales)
- 09 :Broad Alluvial Plains
(Broad Plains)
- 16 :Minor Alluvial Plains
(Infilled valley/localized valley)
- 20 :Minor Alluvial Plains
(Broad alluvial valley)
- 23 :Terrace(Residual Soils)
(Sloping to undulating)
- 24 :Terrace(Residual Soils)
(Undulating to rolling)
- 89 :Hills(Volcanic)
(Ultrabasic hills, low relief)
- 90 :Hills(Volcanic)
(Ultrabasic hills, high relief)

Figure 3.1.2 Geological Map of South Central Palawan



3.2 Socioeconomic Conditions

3.2.1 Population and Farm Households

The ownership of the Area was transferred from the DOJ to the DAR in 1990 as a CARP area. Until 1990, about 1,023 ha of lands were distributed to 332 beneficiaries. However only one third of the households and 459 persons have so far settled in the Tagumpay Area because of the lack of rural and agricultural infrastructures. An average of 2.1 persons are available for farm work per farm household.

3.2.2 Land Tenure Status

The beneficiaries of CARP at the Settlement Area are the new landowners. The area of farm lot per family at the Tagumpay Settlement vary from two (2) to six (6) ha in size including the 600 sq.m of home lot. About 10% of the farmers own six (6) ha, mainly located along the national road. For the outlying area which is not yet occupied, the DAR will distribute three (3) ha per family including the home lot of about 600 sq.m. The Study Area is characterized as a government owned land distributed to farmer/beneficiaries without any amortization.

Apart from the farm lots, 32 ha as home lot area were provided along the national road which are about two (2) to five (5) km away from the farm lands. Some farmers, therefore, built small houses within their farm lots for better access to their farm lots and for convenience of farming activities.

3.2.3 Living Conditions

At present, only a small area is planted to rainfed paddy and corn etc. because of the absence of irrigation facilities. The idle lands lie not only during the dry season but also during the wet season. Farmers incomes are, therefore, dependent on wage income from other farms, construction works, transportation of charcoal, driving, etc., more than farm income.

Due to lack of social infrastructure such as roads, drinking water supply system etc., people in the area, encounter difficulties particularly during the wet season, are in a very difficult situation. For example, women and children are compelled to haul drinking water from the springs and shallow wells, distant from their houses, every day. However, the water quality are not so good, hence, considered one factor causing diarrhea and typhoid fever in the area. Electric lines are available along the national road but the households in the area are not energized yet, which is another factor limiting economic activities. There are several sari-sari stores along the national road dealing with daily needs, foods, etc.

3.2.4 Economic Conditions of Farm Household

Though the settlers own farm lands, cultivation of crops is limited because of the dependency of farmers on rainfall. Rainfed farming is practiced resulting to very low crop yields due to lack and/or absence of inputs and others. Production is mainly for home consumption. The annual family income in the area was estimated at 14,900 pesos by the Study Team, equivalent to 37% of the Puerto Princesa city average income and 39% of the target farm income indicated in the Medium-Term Development Plan of Palawan (1994-2000). At present family income in the area are dependent on the so called off farm income. The scale of income, is however, affected by the number of available labor in the family and not by the farm sizes.

Marketing of paddy is done by transporting the produce from the farm lot to the collecting point along the national road, a distance of two (2) to five (5) km, by cart pulled by a carabao. But the farmers who do not own carabao have to hire a carabao with cart and pay about five (5) pesos per bag (50 kg).

Generally, farmers do not have capital to procure fertilizer/pesticides etc. Members of the cooperative are provided loans under the conditions of guarantee by the cooperative. As of 1993, the total amount of the short term credits provided to 28 farmers in the Study Area amounted to 243,000 pesos, averaging 8,700 pesos per farm. But the farmers who do not meet the required conditions of the bank cannot be provided with credit services. Farmers resort to borrowing from private persons, neighbors, dealers, middlemen, at higher interest rates.

3.2.5 Farmer's Desires

a) Results of the Inquiry Survey Analysis

An inquiry survey was carried out in the Study Area to know the present conditions and to determine needs of farmers. Fifty (50) farmers were selected at random and interviewed. The results of the survey are summarized as follows;

- the first occupant interviewed, settled in 1950 while the latest in 1993, the majority settled in 1980;
- the average family size is 5.4; the average age of farmers interviewed was 45 years old while the oldest and youngest were 72 and 24 years old, respectively;
- most of the farmers completed only primary school, thus the educational status of the settlers are generally low;
- the average farm household income is 14,900 pesos per year, mainly from off-farm income and from farm works in other farms;
- insect damage to crops are reported;
- the annual household expenditure ranged from 10,000 to 55,000 pesos, distributed mainly between 12,000 to 20,000 pesos;
- most of the farmers want to plant paddy under the irrigated condition, cashew nut and mangoes are the most attractive fruit trees for farmers;
- most of farmers want to earn 3,000 pesos per month (36,000 pesos per year per family) followed by 5,000 pesos (60,000 pesos per year);
- farmers borrow money not only from bank but also from relatives, cooperatives and traders;
- of the total holding, only 24% are planted during the wet season due to the absence of irrigation facilities;
- there is no definite planting time for paddy since it is dependent on the occurrence of rainfall and availability of seed, labor, carabao, fertilizers;
- the average paddy yields are 1.71 ton/ha for lowland paddy and 0.4 ton/ha for upland paddy. This is lower than the lowland and upland paddy yield of 1.95 ton/ha and 0.84 ton/ha, respectively, in the Province of Palawan;

- selling price of paddy is affected by moisture content of grains, which varies from 2.5 to 6.0 pesos/kg;
- compound fertilizers such as 14-14-14 are commonly used;
- dosage of fertilizers are smaller than that recommended by the BSWM;
- only 28% of farmers interviewed own carabaos;
- the most dominant diseases are malaria, flu, cough, in that order, however, diarrhea and typhoid fever are also common;
- the most serious constraints/problems are absence of irrigation facility and carabaos, low income, low employment opportunity;
- electricity is available along the national road but 60% of farmers interviewed use kerosene lamp;
- both firewood and charcoal are commonly used for cooking;
- the major source of drinking water is the shallow well, with a distance of about 1,000 m at the maximum and 137 m on the average from the houses. Farm household spend an average of 36 hours per month in fetching water for domestic use.

Present conditions of the Study Area can be summarized as ① although the lands have already been distributed to the farmers, the rural and agricultural infrastructures have not been fully developed; ② farmer cannot start full cultivation; ③ living standard of the farmers are so low that farmers even borrow money for the purchase of farm inputs ; ④ there is lack of carabao for cultivation and transportation.

b) Needs of Farmers

Not only the farmland reclamation but also rural infrastructures have not been implemented. Based on the inquiry survey, the following farmer's desires identified as priority for implementation are as follows;

First	① Irrigation facility	② Farm road	③ Livelihood program
Second	① Farm road	② Irrigation facility	③ Clinic facility
Third	① Drinking water	② Farm road	③ Clinic facility

Most of the farm households in the Study Area lack the necessary income for their daily sustenance and agricultural production activity, thus the

strong request for government support in terms of finance and livelihood itself. Farmers also indicated the need for more extension services, which was also cited by farmers at the preceding area of Dumanguena settlement.

Taking into consideration the present conditions of the Study Area and farmer's desires, the project components such as ① irrigation facilities, ② farm roads, and ③ drinking water supply facilities shall be proposed to be given higher priority in the implementation of the Project. Parallel to the implementation of the above three (3) items, support programs, such as ① strengthening of extension services on cropping techniques, ② farming methods for the slope lands, ③ strengthening of cooperative activities, ④ setting up of the irrigators association, and ⑤ agricultural credit services at lower interest rates shall also be considered in the implementation, to help improve the standards of living of the farmers.

3.3 Agricultural Conditions

3.3.1 Present Agriculture

The present agricultural activities in the Study Area are extensively carried out on a small scale, namely shifting agriculture, and mainly depends on natural rainfall. Because of this situation, farming in the Study Area is unstable.

The present cultivated area of about 440 ha at the Tagumpay settlement area during the wet season, consists of 123 ha of paddy including upland rice, 296 ha of corn etc., 23 ha of fruit trees such as coconut and cashew nut, etc. During the wet season, paddy, upland rice, corn and cassava are planted in rainfed condition. The area of paddy field is limited at the low elevation areas along the national road, near the Isog river and the Isaub river, where water is available. An area on the terrace, in which coconut and cashew nut are planted, is small. The coconut trees still being young, no harvest are available at present. The following present cropping systems are dominant in the said limited area. (refer to Table 3.1.1)

Rainy Season Crop	Dry Season Crop
Paddy	Fallow
Paddy	Legumes (Mung, Peanut)
Cashew (inter-cropped with Upland Rice)	Root Crops (Cassava)
Upland Rice	Fallow
Corn	Legumes (Mung, Peanut)
Corn	Fallow

Double cropping is practiced in some areas where water is available during the dry season. But the double cropping areas are very limited. Planting season is also not fixed because of the limited supply of draft animals and seed and the farmers' dependency on rainfall.

The yield of rainfed and upland paddy are very low, only about 1.7 and 0.4 ton/ha, respectively. Average yield of corn is only 1.21 ton/ha, lower than the provincial average of 1.83 ton/ha, for the last nine (9) years, 1983 to 1991. Vegetables are usually planted at the backyard for home consumption.

3.3.2 Research and Extension

There are provincial and city government agricultural offices and four (4) research institutions in the province. These institutions are the PAES, the PNAC, Philrice and the ATI. These institutions have programs and activities for the farmers, however, none of them has been conducted in the Study Area.

The extension office for agriculture which covers the Study Area is situated in barangay Inagawan. Only one extension worker covers both barangays Inagawan and Kamuning, and his activity is focused on paddy cultivation. There are no other extension worker for vegetables, fruits or animal husbandry. The presence of only one extension worker may be insufficient for the transfer of proper agricultural techniques in the Study Area.

3.3.3 Post-Harvest Conditions

In the Study Area, there is only one (1) concrete solar dryer with an area of 38.4 sq.m in the home lot. Beside the solar dryer, a warehouse of about 70 sq.m with unfinished roof exists. There is another solar dryer located in the Study Area usually used as a basketball court. Except for these facilities, there are no other post-harvest facilities in the Study Area.

The harvested paddy is usually threshed in the field by portable type threshers, and winnowed by wind. After this, paddy is dried on the concrete or asphalt paved road located at the south eastern edge of the Study Area, or at the drying facility far from the field. Losses occur during the process of transporting from the field to the drying areas (roads/drying facility). Paddy is milled by machines owned by farmers outside the Area or by the nearest rice mill at barangay Kamuning.

3.3.4 Food Balance

According to the settlement plan, the Study Area will have about 2,500 population. Based on the annual rice consumption per capita (110.6kg), the Study Area will need 282 tons of rice, or about 434 tons of paddy for self consumption. However, in the Study Area, there are only about 50 ha of paddy field in the dry season. According to the results of field survey conducted by the DAR in 1992, there were 123 ha of paddy field including upland paddy. Even if the DAR's data is used for estimation of production, the deficiency of rice for home consumption will probably occur.

3.3.5 Livestock Conditions

Small-scale livestock and poultry raising are conducted at the farmer's backyard. There are no commercialized livestock farming activities at present. Some farmers raise livestockes such as pigs and chicken, and there are auto saving groups whose income-generating projects are to raise pigs. Carabaos are used not only for plowing but also for transporting produce and others and are valuable draft power for the farmers. Farmers without carabaos are compelled

to borrow and/or hire from other farmers. Chickens and pigs are considered easy to raise in the backyard but raising these livestock is not large in scale.

Taking into consideration the present condition, increase of carabao and raising of pigs and chicken will be proposed to secure draft animals and increase income source from animals. In the MTPDP, the Palawan province is specified as a Key Livestock Development Area (KLDA).

3.3.6 Marketing and Credit

Agricultural production in the Study Area depends on the availability of rainfall, and only small areas are cultivated for paddy and other crops. Consequently, only small amount of products is presently marketed due to low productivity or small production. The followings are the marketing channel of the selected crops;

- Paddy : Farmer - Middleman / Traders
 - Corn : Brought by farmers themselves to Aborlan, Puerto Princesa city
 - Cashew Nut : Brought by farmers themselves to Aborlan and Puerto Princesa city and/or collected by middleman
 - Banana : Mostly for home consumption
- Agricultural inputs:
Purchased by farmers themselves at Puerto Princesa city and Aborlan

Paddy is sold to the middlemen/traders (not to NFA) for the reasons of ①NFA's criteria are very strict on moisture content of grains, ②Payment by NFA takes several days, and ③Procurement by NFA takes a long time.

Agricultural credits such as production loan are available to farmers through the LBP. Since the farmers do not have sufficient capital to buy agricultural inputs, crop productivity is therefore affected due to the shortage of dosage of fertilizers and agri-chemicals. The following types of loans and credits are extended to the farmers:

Type	Objectives	Repayment Period	Interest
Short-term loan	Crop production/livestock	120 to 180 days	12 + 2%
Medium/long-term loan	Agri-machinery warehouse, drier etc.	3 to 10 years	14 + 2%

Farmers in the Study Area who are members of the cooperative and/or those with bank deposits can apply for loan. Repayment by farmers is reported to be good. The repayment is usually made in-kind, i. e. paddy, during the harvest season.

3.4 Water Resources Conditions

3.4.1 Potential Water Resources

a) Surface Water

The two (2) rivers, the Inagawan main watercourse and its tributary, the Pinagsaluran river are the only surface water sources for the proposed beneficiary area. These rivers with a watershed of 179.3 sq.km and a river length of 46.5 km, joins at about 13 km from the river mouth and flows into the Sulu sea through the alluvial fan and plain areas.

The Inagawan main watercourse flows down gently at the northern part of the Study Area originating from Anepahan Peak and has a watershed area of about 120 sq.km with a riverbed slope of 1 to 200 (about 50 to 60 m riverbed width with about 20 m MSL of riverbed elevation). On the other hand, the Pinagsaluran river, has a watershed area of 16.5 sq. km with a riverbed slope of 1/100 (about 15 to 16 m riverbed width), and a river length of 8.7 km, originating from the mountain with a top elevation of 800 m MSL and flows down into the confluence of the Inagawan river to the northern part of the Study Area.

The average annual runoff of the Inagawan and Pinagsaluran river are estimated to be 106 and 14 MCM respectively. However, about 90% of the water resources from the basin is yielded during the rainy season from May to December, thereby the need to store excess water for effective utilization of the water resources.

The mountainous areas of these rivers are covered with dense and wild vegetation which is reserved as forest area. The water quality of these river are generally good except for drinking purpose though it contains no particular injurious materials, except low iron, some coliform group bacteria and other bacteria with pH 7.6 to 7.8.

The riverbed elevation of the Inagawan river is lower than that of the proposed beneficiary area, about 20 m lower at the north edge of the Study Area. This will in effect be a big constraint in the introduction of gravity intake system to irrigate the Study Area.

b) Groundwater

There are nine (9) shallow wells and six (6) springs at the depressions in the Tagumpay Settlement area. These water sources may have originated from the Inagawan river possibly due to seepage of water. The water quality containing some coliform group bacteria is the same as that of the surface water during the dry season because the waste water after taking bath and washing is mixed due to poor fencing facility for the spring.

Three (3) springs were observed to yield only 1 to 13 lit/min but continues to flow even during the dry season. Based on the results of the groundwater survey, the yield of well was approximately 100 cu.m/day/sq.km, i.e, the estimated potential groundwater is 0.7 MCM/year, if the project area is 2,000 ha. Even if all water are drawn by pump, only about an area of 75 ha could be irrigated. Therefore, groundwater is recommended to be used for domestic water purposes only.

3.4.2 Water Right

a) Water Right of Existing Irrigation Systems

There are two (2) diversion facilities at the Inagawan river. One is the NIA diversion dam, about 10 km from the river mouth, for the Inagawan CIS and the other one, the intake facility for Inagawan Sub-colony, about 12 km from the river mouth. The water rights of these irrigation systems are 330 lit/sec (0.86 MCM/month) for the former CIS and 110 lit/sec (0.26 MCM/month) for the later system. The water right of these irrigation systems shall be considered in the estimation of available water resources at the Inagawan river.

b) River Maintenance Flow

From the view point of the environment, certain water flow of the river are required to be considered in the water resources development, for such purposes as habitation of fish and shells, animal and vegetation near the river, stabilization of groundwater and navigation of boat, to maintain river function. Five (5) percent of drought river discharge is generally adopted for the river

maintenance flow in the Philippines, although maintenance flow differ depending on each river condition. Based on five (5) percent of drought discharge, 0.327 cu.m/sec with ten (10) years return period estimated in the runoff analysis, the river maintenance flow of 14.7 lit/sec/100 sq.km is calculated at the No.3 gauging station with a watershed area of 110.7 sq.km. However, based on the runoff data of the Inagawan river measured by PIADP (April 1985, watershed 118.8 sq.km, drought discharge 0.254 cu.m/sec), the maintenance discharge was estimated at 11 lit/sec/100 sq.km. Therefore, the design maintenance discharge of 15 lit/sec/100 sq.km will be adopted.

3.4.3 Available Water Resources

As mentioned above, the two (2) rivers, the Inagawan river and the Pinagsaluran river are the only potential water resources for the Study Area. The available water of the two (2) rivers subtracting the water requirement for the existing water right and the river maintenance flow from the river runoff are 91.7 and 13.4 MCM, respectively (annual average), considered sufficient water volume for the Study Area. However, about 90% of the available water is yielded during the rainy season, from May to December. The low water discharge of the Inagawan river is 0.57 cu.m/sec on the average, for 17 years, which is less beyond the existing water right of 0.43 cu.m/sec.

3.5 Agricultural Infrastructure Conditions

3.5.1 Irrigation Condition

a) Present Situation

The Study Area which is mostly covered with natural forest, bush and grass land, has only about 80 ha of cultivated area planted of which 48 ha of paddy during dry season. In the Study Area, no irrigation system is available. Rainfed farming is adopted except in the said paddy areas where water is available from the three (3) natural springs with 1 to 13 lit/min yield.

b) Percolation and Basic Intake Rates

For the purpose of determining the field percolation rate in the paddy land and intake rate in the upland, field tests were carried out during the dry and rainy season. Based on the results of test, 2.5 and 3.0 mm/day were identified as percolation rates for paddy land in the dry and rainy seasons, respectively. On the other hand, test results indicated basic intake rates of 3.3 mm/day in the rainy season, and 18.4 to 20.4 mm/day for clayey loam and 96.3 mm/day for sandy loam in the dry season. Therefore, with regard to the intake rate, surface irrigation method which is applicable for less than 50 mm/day percolation rate will be adopted in the clayey lands, but for the sandy lands, the application of sprinkler irrigation method, etc. will be considered, as the rate is more than 75 mm per day.

3.5.2 Drainage Condition

Four (4) major water courses of streams and creeks with direction of south-east, with a total length of about 35 km, excluding the Inagawan and Pinagsaluran rivers, run across the area. These water courses have water flow in the rainy season although no and/or lesser flow can be observed in the dry season.

Smooth passage of vehicle becomes difficult during and/or after the rain in the Study Area due to its soil property, but two (2) or three (3) days after the rain stop, these conditions are improved. This fact shows that the existing

rivers and creeks function sufficiently as drainage system in the Study Area. Therefore, these streams and creeks can be used as part of the drainage system in the Study Area.

3.5.3 Road Condition

The two (2) newly constructed roads of about 700 m within the home lot area are the only passable roads by vehicles. Other roads (cart trails) are available for passage of tractors and animals but are without any pavement.

The DAR prepared the road system plan in such a way that one is able to enter directly into his own land without crossing the other settler's lands. Therefore, the effective utilization of the DAR's road system plan is required to be taken into consideration in the farm-to-market road system plan.

3.6 Rural Infrastructure Conditions

3.6.1 Settlement Condition

The home lot area of 32.0 ha at the Tagumpay area consists of the housing area of 17.7 ha, the school area of 1.7 ha, the public space of 5.3 ha and other areas such as roads, etc. of about 7.3 ha. The DAR prepared 321 home lots (600 sq.m each) for the beneficiaries. However, only 123 home lots have actually been occupied by the beneficiaries. Of this number, only about 54 houses have been constructed in the Study Area by the farmers, as of August, 1994. The remaining 69 home lots were abandoned due to the absence of agricultural/rural infrastructures in the area. In the outlying area, the lands has not been distributed to the farmer beneficiaries. The DAR plans to distribute the lands after completion of the study.

3.6.2 Village Water Supply

a) Shallow Wells

The beneficiaries living in the Tagumpay home lot area get their drinking and potable water from nine (9) shallow wells located within/near the home lot area. These shallow wells with depths ranging from 20 to 60 feet were privately constructed. Some of these wells, however, dries up during the dry season. Also, the quality of water is poor and not suitable for drinking. Women in the Study Area, therefore, have to haul water once or twice a day from a well located far from their houses. Some of the water contains zinc and iron, however, their densities are within the allowable limit of water quality standard in the Philippines. (refer to Appendix I.2)

b) Springs

There are six (6) springs located at the depressions within the Tagumpay area. The maximum yield of spring is very limited, only up to 0.2 lit/sec. Quality of water from springs are usually not good during the day time, because some people wash and bath by the spring water, including animals. To get clear water the residents have to get it early in the morning when human activities are still very limited.

Coliform group bacteria (CGB) were found in water from springs because these water have a tendency to stagnate during the dry season. However, CGB are not present during the wet season. Although zinc and iron were also detected, the density of the element is within the allowable limit of the quality standard of drinking water in the Philippines. (refer to Appendix I.2)

3.6.3 Village Roads

The main road in the Study Area is connected to the markets and the center of Puerto Princesa city by the national road which runs along the southeast boundary of the Study Area. However, within the home lot area, along the proposed public space two (2) village roads have been newly constructed by the City government as per the request of beneficiaries in September, 1994. In the other areas, no roads have been constructed. (refer to Appendix I.3)

3.6.4 Rural Electrification

The power transmission line along the national road can serve electricity to the beneficiaries, since the Narra thermal plant has still the capacity to energize the beneficiaries' houses. However, no distribution line have been connected to the home lot area. Since April of 1994, the electric charge is 3.75 pesos per kwh with the minimum monthly charge of 37.5 pesos or 10 kwh per household. (refer to Appendix I.4)

3.6.5 Other Facilities

There is a elementary school with two rooms constructed on June 1993 without any appurtenant facilities. About 53 (27 males and 26 females) pupils enroll in the school. The pupils normally go to school and back to their houses by walking. No higher grade school is found within the area. A church was constructed at the center of the home lot area. On Sunday afternoon, village people gather and pray at the church. A small barangay hall was also constructed which is also utilized as meeting area. Other facilities such as

clinic, health station, public market, etc. are not yet available in the Study Area. When a farmer and/or his family get sick, they have to go to the clinic and/or a hospital in Puerto Princesa or Aborlan. (refer to Appendix I.5)

3.7 Farmer's Organization

Two (2) types of farmers organization exists in the Study Area, namely, the auto savings group and the cooperative group. The six (6) auto saving groups (ASGs) were introduced by the DAR at the Tagumpay Settlement area in 1992 to encourage the farmer beneficiaries to save as a group. The savings of these group were used as capital for their intended income generating activities such as retail store, lending activities, livestock dispersal/raising and/or gardening. The ASGs are also taught and trained by the DAR on the basic rudiments of group cooperation and participation to help them become good members and effective leaders. Simple skills and techniques on entrepreneurial activity are taught and learned.

The six (6) ASGs in the Study Area collect 1.5 to 5.0 pesos per week from the members to sustain their income generating projects. The savings groups have a total of 144 members and a savings of more than 60,000 pesos. (refer to Appendix J.1)

There is one multipurpose cooperative in the Study Area with a total membership of 27. This cooperative was organized to mediate financing between the farmers/members and the bank (particularly, the LBP) for farm loan purposes. Another cooperative is organizing only recently by the DAR, the members of which come from the existing auto saving groups and/or cooperative. This cooperative is still in its formation stage. It is envisioned that at least 60% of the farmer beneficiaries will eventually become members of this cooperative. The two (2) cooperatives, however, presently do not deal with the marketing of agricultural products. (refer to Appendix J.1)

3.8 Environmental Conditions

3.8.1 Background

The central area of the island is covered with tropical forest. Coral reef grows along the coastal line. So as not to destroy the natural environment of Palawan, the Philippine government has issued several decrees concerning the preservation of the natural environment of the province.

Presidential Decree No. 219 issued on July 2, 1967, specifying the entire province of Palawan with a total area 1,475 sq. km was proclaimed as game refuge and bird sanctuary. The Government of Philippines implemented the PIADP in 1983, which included the environmental assessment for the project. The project carried out investigation studies on environmental conservation and also provided guidelines to be considered in the future development of Palawan. Another strategy implemented by the government is the prohibition of cutting trees without the permission of the DENR, and at the same time, the government completely prohibited the cutting of mangrove forest. (Republic Act No.7611, July, 1991)

3.8.2 Animals and Plants

a) Animals (Avian, Wild Beast, Fish)

30 avian species have been confirmed in the Inagawan river basin. Based on the interview of local people in the Study Area, and direct survey at CFI, the wild beasts found in the basin are ① wild monkey, ② wild pig, ③ monitor lizard, and ④ bear cat. The presence of bear cats is confirmed directly with its presence at the CFI. However, it is not certain whether some are living in the Study Area. The Inagawan river is divided into two parts based on water characteristics. One part is the estuary where the effect of tidal current is visible. The other part is the upper and middle stream where only fresh water flows. The family of fish at the Inagawan river are classified as fresh water fishes (mud fish, etc.) and sea water fishes (mullet, etc.). Tilapia is recommended for fish-culture in fresh water lakes and reservoirs, which is helpful as food and mosquito control. (refer to Appendix M.1)

b) Plants

Although part of the Study Area was reclaimed as farm land, a wider area still remains as grassland and second forest area. PIADP carried out an investigation of floral resources in Palawan, and the result of the survey, confirmed that 82 families of plants are available in the basin. At present, the area is protected under P.D No.705 (Forestry Reform Code) issued for the protection, rehabilitation, and development of forest land in the Palawan province.(refer to Appendix M.1)

3.8.3 Sea Shore Environmental Conditions

The Study Area is not inclusive of mangrove area, however, a wide mangrove area lies along the sea shore near the Study Area. As to sea shore environment condition, there exists drainage channels in the Study Area, finally connected to the mangrove area. As for implementation of agricultural development project with irrigation and drainage system, the quantity and quality of pesticide and fertilizer would have to be regulated in reference to environmental conservation.

3.8.4 Condition of Malaria Cases

According to the information of MCSO in Puerto Princesa city, the polluted area of malaria is limited to the mountain area. The number of patients affected by malaria are two (2) and six (6) in 1992 and 1993, respectively, in barangay Inagawan.

MCSO officials concerned, recommended that though there are very rare outbreaks of malaria in the plain area, the construction of canal network would need countermeasures such as ① to expose the water surface of canals under the sunshine, ② to prevent the growing of water weeds in the canals and other facilities, ③ to propagate fish in the ponds and reservoir, etc., which feeds on the larvae of mosquito, ④ to design a faster velocity of water in the canals, ⑤ to encourage people to use mosquito-net when sleeping, and ⑥ to keep their carabaos within ten (10) meters from the house to serve as a buffer between mankind and mosquitoes.

3. 8. 5 Soil Erosion

There is no evidence of big scale land sliding and surface soil erosion (Gully Erosion) in the Study Area. However, if the grassland and waste land will prevail without any change for a long time, soil fertility will be decreased gradually. Thus, land reclamation plan should be put forward as soon as possible in consideration of surface soil erosion.

3. 8. 6 Health and Sanitation Condition

The management of sanitation is controlled by the Puerto Princesa city health office. There are two (2) types of service systems for public sanitation, namely, the Traveling Health Counsel and Traveling Clinic. The medical health workers of the city conduct inspections on the health and sanitation conditions of the people in the city. However, due to lack of medical workers, materials and budget, sufficient inspections are not carried out. Fortunately, the Study Area is located outside the malaria pollution area. However, it seems to be incredible that there are no malaria cases in the Study Area.

3.9 Problems, Constraints and Potentials of the Study Area

3.9.1 Problems and Constraints

a) Meteorological Conditions

In the Study Area, the wet season basically starts in May and ends in December. However, the beginning and ending times are not fixed, and the duration of about seven (7) months of the wet season varies year by year. An annual rainfall of about 1,600 mm is enough for farming, however, the amount of rainfall during the dry season from January to April is too little, about less than 130 mm. About 90% of the annual rainfall is concentrated during the wet season.

b) Hydrological Conditions

The probable drought discharge of 314 lit/sec with a 10-year return period is estimated at the Inagawan river, and is below the amount of water permit of CIS at the downstream. Its tributaries have little and/or no water during the dry season due to its small watershed area. Groundwater from springs is quite limited, only about 0.2 lit/sec at the maximum throughout the year. This water source, however, is not enough for agricultural use due to its limited quantity. In the Study Area, coliform group bacteria were detected in existing water ponds originating from the springs and in waters from shallow wells during the dry season.

c) Topographical and Geological Conditions

The river bed elevations of the Inagawan river and its tributaries located at the north edge of the Study Area which is about 20 and 30 m MSL, respectively, are lower than the elevation of the Area which is about 40 to 50 m MSL. The irrigable area, therefore, will be limited, when the gravity irrigation system is introduced in the Area. The pumping irrigation system, however, would require higher operation and maintenance cost for farmers since the cost of electricity for the pumping system will have to be shouldered by the beneficiaries.

A river bed elevation of about 40 to 50 m MSL suitable for gravity irrigation system is not available near the Study Area. The river has a gentle bed slope of 1/200 at the middle portion, and this river bed elevation is located four (4) km upstream from the edge of the Area. However, both river banks of the river have steep slope, hence, there will be difficulty in the construction of the proposed feeder canal to convey irrigation water to the Area. Also, both banks of the river are covered with dense natural forest. Facilities including temporary roads to be proposed will destroy the existing environment.

There exists many valleys with steep slope of more than 18% in the Study Area. These valleys will limit agricultural land development due to soil conservation and higher land development cost when the area is converted to paddy field. Since the area is undulating and rolling, specifically, at the southeastern part of the Area, the construction of the proposed facilities such as, farm-to-market roads, canals, etc. would become costly because of the many structures, etc. which will be needed to cross the depressed area.

The lands at the Tagumpay Settlement area were distributed to the farmer beneficiaries without any consideration of topographic conditions such as creek/stream, steep slope area, high elevated land, etc. Also the road alignment on the distribution map have not considered topographic conditions.

d) Reserved Forest Area along the Creek and/or Stream

Under P.D. 705, of the Forest Reform Code of the Philippines, cutting of trees is prohibited within 20 m strip on both sides along a creek and/or stream, and at the edge of the reserved forest area. Cutting of trees which are located within the home lot areas even needs the permission of the DENR.

e) Poor Rural Infrastructure Facilities

During summer, women and children in the Study Area have to devote more time to haul potable water due to the longer distance of water sources, because nearby wells have dried up and the quality of the water is poor. Hence, they do not have the time to improve their living conditions, etc. There are no rural facilities such as electricity, village roads, community hall, barangay health center, etc. There is no clinic center nor medical personnel available in the Study Area.

f) Low Education Level of Farmers and Low Income

The farmers in the Study Area have low educational status. This is one of the constraint in the introduction of systems and facilities which would require higher skills/technique levels. A system which is easy to operate and manage should be considered for the farmers. The farmers support services such as education and training should therefore be carried out prior to and during the implementation of the development program.

Due to the above mentioned reasons, the farmers present can not gain higher income. Furthermore, employment opportunities near their houses are not available and/or are very scarce.

g) Malaria Cases

A small number of malaria cases were observed near the Study Area. To minimize the occurrence of breeding places of mosquito larvae, suitable countermeasures will be introduced, such as inland fishery in ponds, cutting and cleaning of grasses, etc.

3.9.2 Development Potentials

a) High Population Density

After all the farmer beneficiaries will have settled in the Tagumpay area, the population is expected to reach to about 2,500, which is equivalent to 500 households. The population density will therefore be 125 person/sq.km. The density is about four (4) times of the provincial average density of 35 person/sq.km.

b) Wide Agricultural Area and Fertile Soil

When the agricultural land development is introduced, about 70% of the Study Area will be developed. The farmer beneficiaries will be able to enjoy a stable farm income from their farm land after full development. The soils of the Area are classified into clay to clay loam which are suitable for farming.

c) Sufficient Water during the Wet Season

The basin of the Inagawan river can collect huge amount of water during the rainy season. The good vegetation of the area will also provide a dependable flow of water during the dry season.

d) Farmer's Willingness

Farmers in the Study Area and the other migrant farmers who belong to the young and middle age classes are very willing to improve their present conditions. There is the presence of a big human resources potential ready for development.

**CHAPTER 4. PLAN FORMULATION OF AGRICULTURAL LAND
DEVELOPMENT**

CHAPTER 4. PLAN FORMULATION OF AGRICULTURAL LAND DEVELOPMENT

4.1 Development Strategy

4.1.1 Strategy of Development

The DAR has launched a development strategy by establishing the Agrarian Reform Communities (ARCs) to help, develop and improve the farmer beneficiaries and the affected landowners. In the ARC development program, the DAR focuses its attention on land tenure improvement and provision of the necessary support services to improve agricultural production. It is in the ARCs that the DAR will show how an integrated development effort will lead to improve quality of life.

However, many of the farmers, who were given the land to till, cannot farm their lands due to the absence of irrigation, farm-to-market roads, post harvest facilities, etc. Since they do not get income from their lands, some leave their lands temporarily and/or sell to others. This is against the CARP objectives of providing land to the landless farmers.

The Tagumpay Settlement area was identified and prioritized among the various ARC projects of the DAR. However, this Area has not yet been developed as the necessary infrastructure facilities to develop the farm are not yet in place plus the fact that the farmers do not have the resources and/or capital to do so. In this area, to settle the beneficiaries and maintain their life, it is very important to earn sustainable income. In the development of the settlement area, various plans and strategies are proposed. Initially, the targeted income needed to maintain the farm household is determined. The agricultural development plan is therefore formulated to achieve the targeted farm incomes.

However, to develop an area like the Study Area, where everything has to start from zero, investment cost is huge. Under the existing financial affairs of the present government, it would be very difficult to invest and concentrate a big amount for so small an area. To lighten the financial burden, the stage development is recommended.

4.1.2 Development Tactics

a) First Stage Development

Since the beneficiaries are simple farmers with lower educational level and with very limited skills, the initial facilities proposed to be put up in the Study Area should be simple, easy to operate and maintain and should entail lesser investment cost. The development strategy during the initial development stage should therefore consider the following: ① recommend basic and necessary systems and facilities that will help the farmers obtain a stable life, ② introduce systems and facilities which are easy to operate and maintain, ③ introduce systems and facilities which will not require a big investment, and ④ a part or all of the systems and facilities could still be utilized in the development and implementation of the future plan.

With the staging of development, the government can lessen the amount of initial investment. Furthermore, operation and maintenance system of the facilities can be undertaken by the farmers themselves, i.e. the proposed facilities are easy to operate and maintain. Farmer's support services should be provided to help the farmer improve himself, his knowledge and skills with the assistance of the government agencies concerned and NGOs. Necessary support services, such as, extension works, training, research, organization of farmers should be included in the program of helping farmer achieve his goal of improving the qualify his life.

Under the above strategy, a stable farming during the wet season and an introduction of dry season farming in a part of the area would continuously be necessary to maintain a stable life at the initial stage. Since the wet season farming would not need much water, the scale of the proposed facilities will be minimized. The farmer can produce a stable product without requiring much water during the wet season to enable him to earn a stable farm income. The irrigation facility proposed should satisfy the NIA criteria of the cropping intensity of not less than 130%. The rotation cropping system recommended for the dry season cropping will not be fixed in certain irrigation areas. The annual shifting of the proposed irrigation area would be introduced to achieve an equitable income to farmers who would avail of the irrigation facilities.

b) Second Stage Development

After increasing and stabilizing farm household income, and substantially earning incomes which will enable farmers to pay various charges and fees, and after the farmers have acquired the necessary knowledge and skill to improve their farm lot, the second stage development can be recommended to be implemented to enable the farmers to achieve higher standard of living. During this stage, the full double cropping system will be executed so that stable farm management can be maintained by the farmers. To achieve the goal, not only proposed facilities but also farmer's support services should be carried out by the governmental agencies and NGOs concerned. The implementation time of the second stage development is not fixed. Since there are many project components proposed for the second stage development, these can be implemented by the concerned agencies, groups or farmer's organization as soon as funds are available and or organizations/groups are ready to implement them, even by component.

c) Components by Development Stage

As mentioned before, it is proposed that the development plan will be implemented by two (2) stages. After totally analyzing the proposed components based on the development strategies, the components were classified into two (2) development stages, such as, the first stage development, as the priority development project described in Chapter 9 and second stage developments. (for more details refer to Chapter 9)

4.2 Target Farm Household Income

Results of the inquiry survey show that the present farm household income in the Study Area was estimated at 14,900 pesos per year. This income is, however, lower than the poverty threshold income of the country which is 44,100 pesos per year per family. Other income data shown below also indicate the seemingly very low income in the Study Area.

	Average Annual Income
Philippines	65,186 pesos/family
Region IV	68,960 pesos/family
Palawan province	41,415 pesos/family
Puerto Princesa city	40,284 pesos/family
Study Area	14,900 pesos/family

As to the expected monthly income desired by farmers, the amount of 3,000 pesos, equivalent to 36,000 pesos per year, was indicated by most of farmer-respondents. Meanwhile, the target farm income indicated in the Palawan Medium-Term Development Plan for 1994 to 2000 is set at 37,978 pesos per year.

With development, the land use of the individual farms will vary depending on the land conditions. Since crops suitable for specific land conditions will be introduced, farm incomes will also change. In slope lands, ratio of planted area will be limited. Crop diversification will thus be intensified with the introduction of high-value crops, not only fruit trees but also vegetables, to attain the targeted income.

The development plan for the Study Area is proposed to be undertaken in stages. Thus, for the first stage, full cultivation during the wet season and a part of the dry season are planned to be introduced. Double cropping will be introduced, as second stage development, only after the farmers have gained the proper technology and its organizational status have matured and stabilized.

The target farm income is set at above 38,000 pesos per year taking into account the Palawan Medium-Term Development Plan, the annual average income of the province and Puerto Princesa city and the indicated income desire of farmers.

4.3 Land Use Development Plan

4.3.1 Basic Concept of Land Use Development

Palawan Island, which is still covered by natural forest and has rich natural resources, not only plants but also animals, etc., is one of the most valuable island in the Philippines. Since the Study Area is surrounded by the hinterland covered by the said natural environment, a disorderly development activity without consideration of the present situation may destroy these natural habitats. A land use development plan taking into consideration environmental conservation is, therefore, necessary.

In any kind of development plan, where human being lives in the area, there is a tendency for the natural environment to be affected. The development plan of the study aims to settle the beneficiaries in the Study Area. Influence to environment to some extent are therefore expected to occur. However, the degree of influence should take into consideration the coexistence condition between natural environment and human being, that is, environmental destruction should be kept at the minimum level. The basic concept in the development plan have taken into consideration this concept.

4.3.2 Basic Factors Related to the Development Plan

Other than climate and hydrological factors, the following aspects were considered and analyzed in the formulation of the land use development plan: rainfall, typhoon and etc., land slope, land classification, soil, altitude, etc.

a) Climate and Hydrological Conditions

The Study Area belongs to semitropical zone with small seasonal differences. Rainfall is very minimal during the dry season, from January to April. Specifically, in February and March, lands in the area dries up. This is one of the constraints in the introduction of crops in the area. However, since the area is located outside the typhoon belt, any kind of fruits can be planted, if the soil is suitable. A big amount of flood discharge is observed in the Inagawan river during the wet season. The hydrological condition, therefore,

will not be a constraint in the development of the area, if the discharge could be stored. However, due to the low water level of the water sources in the river, the facility to store and to serve water for the area, would require, higher cost.

b) Land Slope

Land slope is one of the factors to determine land use. The Study Area has an undulating and rolling topography and is categorized as flat to steep slope area with a slope of more than 18%. The Area has many valleys with steep side slope, and these areas are very evident at the north-western area. The steep slope areas are covered with natural forest. The development of these areas will therefore affect the natural environment, if no countermeasures are proposed to prevent soil erosion. The dense natural forest, located on the steeper and elevated areas should be preserved by prohibiting the cutting of trees as this is used as a dike to prevent erosion.

The land area by slope class which ranges from flat to more than 30% slope was measured using the detailed topo map with a scale of 1/4,000. The description of the basic concept of agricultural land development by slope class are presented below.

- Class-1: (flat to 3% , area of 639 ha, 33% of the total area) Because this area is nearly flat, any kind of agricultural land development can be carried out, if no other constraint exist. The land is most suitable for paddy field development.
- Class-2: (3 to 8%, 394 ha, 20%)
The slope of this area is gentle, and thus most suitable for upland field development. Paddy field development is not encouraged since it would entail higher cost.
- Class-3: (8 to 15%, 428 ha, 22%)
Due to its gentle slope, fruit orchard with inter-cropping of upland crops between trees is most suitable but with considerations on soil conservation.
- Class-4: (15 to 18%, 193 ha, 10%)
Due to its steep slope, soil conservation is considered as the priority activity. Barren and grass lands shall be reforested. The existing forest area can be utilized as an area for supplying raw materials for agro-forestry with the condition that reforestation shall be undertaken after the cutting of trees.

Class-5: (18 to 30 %, 120 ha, 6%)

The proposed land use shall be limited to reserved forest with natural conservation due to its steep slope.

Class-6: (more than 30%, 155 ha, 8%)

The steep slope area is suitable only as forest area.

Land with gentle slope with an area of 1,426 ha (class-1 to class-3, land slope of less than 15%) where soil erosion would hardly occur is suitable for agricultural development. These occupies about 76% of the total Study Area. On the other hand, area with steep slope and where soil erosion easily occurs with the constant cutting of trees, occupies about ten (10) percent. The area with a slope of more than 18% (class-5 and class-6) should be reserved as environmental conservation area to prevent soil erosion and to maintain the soil.

c) Altitude

The acreage of the flat area with a land slope of less than eight (8) percent is clearly decreased at the point of elevation of 40 to 50 m. Since the river bed elevations of the Inagawan river and its tributary at the northern edge of the Study Area are 20 and 30 m, respectively, it is necessary to raise water level when gravity irrigation system will be introduced. In planning irrigation system without raising intake water level, pump irrigation system can be proposed to irrigate an elevated area higher than the intake water level.

For areas with elevation of more than 50 m, the pump facility would be introduced to irrigate the area as one of alternative plan. Big amount of operation and maintenance cost which is usually shouldered by the farmers, however, would be required. It would be very difficult for the irrigators association to be organized to operate, repair and maintain the pump equipment, as it will require specific skills which the farmers do not have at the present time since farmers have low skill and education level. Hence, pump irrigation system would not be recommended at present. In the future, when the farmer's knowledge level would have been upgraded to introduce high value crops, pump irrigation system may be introduced. At present, therefore, those areas are classified as non-irrigated area. The proposed land use for the area would entail the planting of fruit trees with inter-cropping and preservation of forest areas.

Considering the above points, the proposed elevation of the potential irrigable area would be less than 40 or 50 m MSL. The acreages of these areas inclusive of right-of-way for the proposed facilities and exclusive of home lot area and AFBR are 1,273 ha and 1,534 ha, respectively.

In addition to the condition of land slope like land class-1 to class-3, the suitable agricultural land area already mentioned are 1,079 ha (56%) and 1,304 ha (68%) under the conditions of EL 40 and 50 m, respectively.

d) Soil Condition

The area with an elevation of less than 20 m MSL at the confluence of both rivers of Inagawan and Pinagsaluran is classified as slope class-1. Since this area of about 40 ha has thin top soil layer and might be the flooded by the rivers, crop cultivation will not be introduced. The area would instead be proposed as an area for fruit trees. At present, some of the areas are planted with young coconut trees. In other areas of the Study Area, no remarkable constraint on soil is observed.

e) Land Classification

Land classification mapping was conducted in the Study Area. The land classification scheme was patterned after the land classification specification of the U.S Bureau of Reclamation with some specifications modified to suit local conditions. The land classes were delineated so as to reflect the productive potential of the land according to soil, surface configuration and drainage limitation. The arable land is divided into two (2) categories, namely: rice land and diversified crop land. Further subdivisions with 14 categories were also made according to the degree of limiting factors such as soil, topography, etc. Based on the results of land classification, the hilly area of about 20 ha, located almost at the center of the Area, with thin top soil layer, limits agricultural land development. The potential area of paddy land is about 1,300 ha and the diversified crop area, about 240 ha. The non-arable land of about 520 ha includes the steep slope area, the watering area of rivers and streams and the home lot area.

f) Present Land Use and Vegetation of the Outlying Area

In areas with comparatively high altitude, the natural forest is dominant and land slope is steep. In these areas, tree cutting should be banned because soil erosion might occur. The area with an elevation of about 60 m or more, connected to the hinterland is covered by dense forest. The area should be allocated as reserved forest area.

g) Irrigable Area

Judging from the location of the area, present farmer's education and technical level of farming, the cultivation of high value crops could not be introduced. Also, the kind and price of farm products within the area may limit the introduction of highly equipped irrigation system, like sprinkler system to supply water to the field, due to economic justification. The gravity irrigation system, therefore, shall be recommended. With the proposed irrigation system, the service area to be covered will be about 590 ha, all belonging to the slope class-1 and class-2, due to the intake water level of 40 m MSL and the alignment of the proposed irrigation canals.

4.3.3 Proposed Land Use Plan

The following land use plan would be proposed based on the above basic concept of land development.

Land Use	Area	Ratio
Agricultural Land	(ha)	(%)
- Irrigation area	1,341 (590)	70 (31%)
- Non-Irrigation area	(751)	(39%)
Right-of-way	150	8
Home Lot Area	48	2
Reserved Forest, etc.	390	20
Total	1,929	100

A home lot area, about 16 ha, for the new beneficiaries in the outlying area is proposed to be developed in two (2) places outside of the Tagumpay area. In the reserved forest area, the necessary area for water resource facility is inclusive. The right-of-way is assumed at 10% of the project area based on Tagumpay Settlement area plan.

4.4 Agricultural Development Plan

4.4.1 Agricultural Development Plan related to Palawan Province

In the MTPDP, the government introduced the Key Production Area approach. According to the above plan, Key Livestock Development Area (KLDA) and Key Commercial Crop Area (KCCA) are applied in Palawan province. As for the KLDA in Palawan province, it aims to breed and increase livestock production in the very near future. As for the KCCA in Palawan province, it aims to expand mango and cashew orchard by 8,000 ha each.

In the provincial "Medium Term Development Plan 1994-2000", paddy and corn fields for grains production and cashew, mango, coconut, banana, coffee, cacao and pineapple orchards for commercial crops production will be expanded. For livestock, it plans to increase the number of cattle, carabao, goat, swine and poultry population.

Based on the Puerto Princesa City Land Use Plan (Jan. 1994), the whole city area is divided into eight (8) clusters, and development potentials are set for each cluster. For Cluster-7, where the Study Area is included, the development potential strategies are enhanced rice production and intensified tree crop production (mango, cashew, jackfruit, guyabano, etc.). The Study Area is classified as a suitable area for agricultural development.

4.4.2 Proposed Crops

The determination of the proposed crops were studied based on the climate conditions, land slope, availability of irrigation water, farmers technique level, population and consumption projection and production trend. The proposed crops are as follows;

Paddy:

To acquire and maintain self-sufficiency in rice, paddy will be planted during the wet season in irrigated areas. Cultivation can easily be introduced to the farmers, because farming techniques are already established.

Beans:

Beans like mung bean and peanut can contribute to the maintenance of soil fertility through the rhizobium action. In recent years, mung bean production has increased. Duration of mung bean cultivation is short and harvest is moderate even on poor soil, thus, very suitable for double cropping. Mung bean can be stored at longer duration after drying.

Corn:

Corn is the largest planted crop in Palawan province, most especially at the southern part of the island. The farm techniques for corn is already established, and it would be easy for the farmers to accept the technology. The extension worker is also familiar with corn technology. Furthermore, in the provincial and city development plans, corn production is encouraged. The demand for corn is increasing as animal feeds.

Tomato:

The production of tomato in Palawan province has increased from 10 to 20% annually in the recent years. Consumption of said product is also expected to increase in the future. Cultivation of tomato during the dry season is recommended because of lower disease probability.

Watermelon:

It is possible to grow watermelon throughout the year. Production has been increased in recent years and the demand is constant.

Taro (Gabi):

Cultivation is suitable during the wet season because it can grow under high humid condition and is shade tolerant. At Region IV level, the price has a tendency to rise.

Eggplant:

This crop is a perennial crop but economic plantation period is one (1) year. It can be cultivated throughout the year. Production has been increased in the recent years with an increase in demand.

Squash:

Cultivation during the wet season is possible. The price in Region IV is increasing. In Aborlan and Narra, squash is planted, hence, there will be less problem to the extension of farming techniques.

Cashew:

It is one of the special products of Palawan province. In the national, provincial and city plans, cashew production is encouraged. If quality is improved, the fruit can become one of the most promising commercial crop and exporting product of the province.

Mango:

Mango production is also included in the national, provincial and city plans. The price of mango has a tendency to increase. There are already nursery distribution programs of the city and the agricultural experimental station located in the city. It is therefore easy for the farmers to adopt the program and technology for mango production.

In the future, after the farmers have obtained the required farming techniques, it will be possible to introduce other cash crops, such as the leafy vegetables, that need higher technology.

4.4.3 Proposed Cropping Pattern

a) Proposed Cropping Pattern

Proposed cropping pattern is determined, considering farming techniques, water requirement and climate conditions. The farmer's technique level is not so high, hence, intensive cropping pattern could not be introduced at present. The crops that the farmers are familiar with and eager to plant, would be introduced preferentially in the first stage development. The proposed cropping patterns recommended are based on four (4) main crops, such as paddy, grains, vegetables and bean. (refer to Figures 4.4.1 and 4.4.2)

The period between the harvest time of the first crop and the planting time of the second crop would be kept at one (1) month in principal. Due to water availability and growing period of the crop grown in the dry season, the period of less than 30 days would be proposed. In case of less than 30 days, labor and water shortage would not occur during the busy months of a harvest time of crop and planting time of another crop, because of the small cropping area of the upland crops as compared to that of paddy.

For areas with a slope of zero to three (3) percent, paddy will be introduced only during the wet season, because the supply of rice is already sufficient in Palawan province in the recent years and water resources limitation. For upland areas with a slope of three (3) to eight (8) percent, vegetables and beans are proposed during the wet season. For areas with slope of eight (8) to 15 %, cashew and mango are proposed considering soil conservation. In fruit garden, inter-cropping shall be introduced. (refer to Appendix D.3)

b) Farm Labor Requirement

As a result of the labor balance study, the month of June requires the most labor demand, with 23,808 man-day. Based on the number of farm household in the beneficiary area and available labor force per household, the total available labor force is calculated at about 29,000 man-day, exceeding the necessary labor requirement of 23,808 man-day. (refer to Appendix D.3)

4.4.4 Agricultural Production

a) Cultivable Areas

Based on the topo-map, the potential arable land in the Study Area is measured at 1,461 ha with slope ranging from zero to 15%. Of these area, about 639 ha has slope ranging from zero to three (3) percent. Taking into account the irrigation facility plan and other topographical conditions, etc., 430 ha area with elevation below 40 m are suitable for irrigated paddy during the wet season (refer to as Type A). As dry season crops, 215 ha of beans, 129 ha of corn, 86 ha of vegetables like tomato and watermelon, etc. are proposed with the aim to increase farm income through higher land productivity. For the area of 160 ha, which is below 40 m elevation and with slope ranging from three (3) to eight (8) percent and where irrigation water is available, double cropping of vegetables and beans are planned. (refer to as Type B) (refer to Figure 4.4.1 and 4.4.2)

For the area of 265 ha with elevation above 40 m, with slope ranging from zero to eight (8) percent and without irrigation facility, upland farming is

proposed even during the wet season (Type A', B'). Grains of 95 ha, beans of 50 ha, vegetables and root crops of 130 ha are proposed in the area.

The area with slope ranging from eight (8) to 15 % is about 270 ha. Even if some of the areas are below 40 m elevation, they are excluded from the irrigation service areas (Type C,C'). From the viewpoint of land conservation, cashew and mango orchard with some inter-cropping are planned for this area.

b) Target Yield and Production

For the above-mentioned crops, target yields were determined based on the national and provincial plans, the yield trend of Region IV and Palawan province. Production is also calculated based on the yield and the area. (refer to Table 4.4.1)

4.4.5 Marketing and Credit

After introduction of agricultural infrastructure development and institutional development through intensive extension and training, agricultural production could considerably increase. Consequently, the products, except for home consumption, which can be sold, will increase.

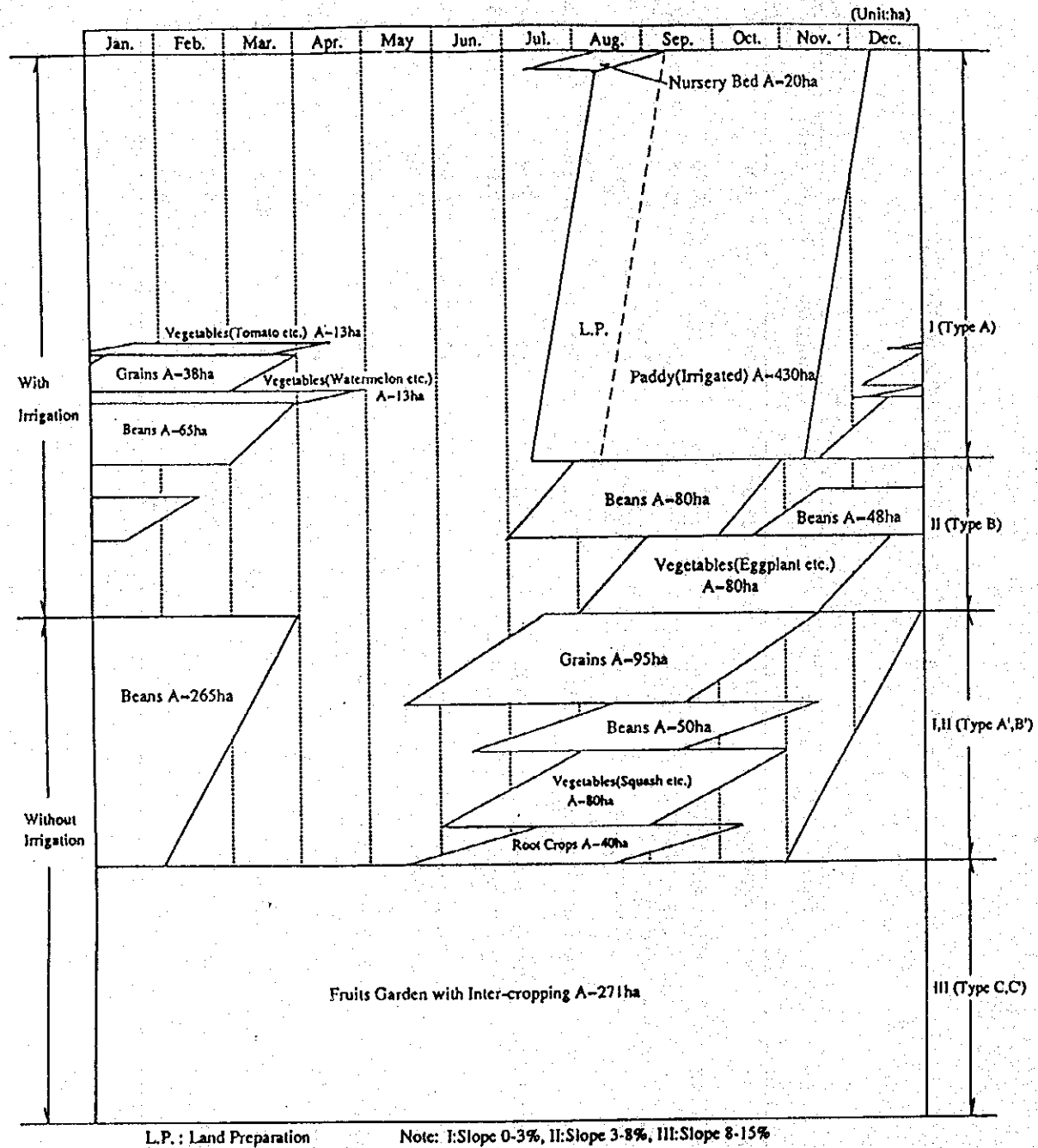
For products sold in the market in Puerto Princesa city, transportation is necessary. To increase the net farm income from agricultural products, it is important to save on necessary management cost such as transportation cost which is highly charge by the middlemen, etc. at present. Transportation of products, therefore, should be done by farmers themselves through the cooperative, to save costs.

Most of the farmers in the Study Area do not have enough capital to buy agricultural inputs. To improve financial status of farmers, availability of credit through the cooperatives should be strengthened.

Table 4. 4.1 Proposed Yield and Production

Crops	Season	Cropping Intensity 130 %			Cropping Intensity 130 %		
		Target Yield (t/ha)	Area Planted (ha)	Production (ton)	Target Yield (t/ha)	Area Planted (ha)	Production (ton)
Paddy	wet (irrigated)	4.00	387.0	1548	4.00	387.0	1548
Beans (mung beans)	wet (irrigated)	1.00	72.0	72	1.00	72.0	72
	wet (not irrigated)	0.75	45.0	34	0.75	45.0	34
	dry (irrigated)	1.00	101.3	101	1.00	265.5	266
	dry (not irrigated)	0.90	238.5	215	0.90	238.5	215
Squash	wet (not irrigated)	19.00	72.0	1368	19.00	72.0	1368
grain (corn)	wet (not irrigated)	2.00	85.5	171	2.00	85.5	171
	dry (irrigated)	2.10	34.8	73	2.10	116.1	244
Eggplant	wet (irrigated)	10.00	72.0	720	10.00	72.0	720
	dry (irrigated)	-	-	-	14.00	72.0	1008
Taro (gabi)	wet (not irrigated)	3.50	36.0	126	3.50	36.0	126
Tomato	dry (irrigated)	10.00	11.6	116	10.00	38.7	387
Watermelon	dry (irrigated)	25.00	11.6	290	25.00	38.7	968
Cashew nut	not irrigated	6.90	170.0	1173	6.90	170.0	1173
Mangoes	not irrigated	0.90	73.9	67	0.90	73.9	67

Figure 4.4.1 Proposed Cropping Pattern - First Stage Development
 (130% Crop Intensity)

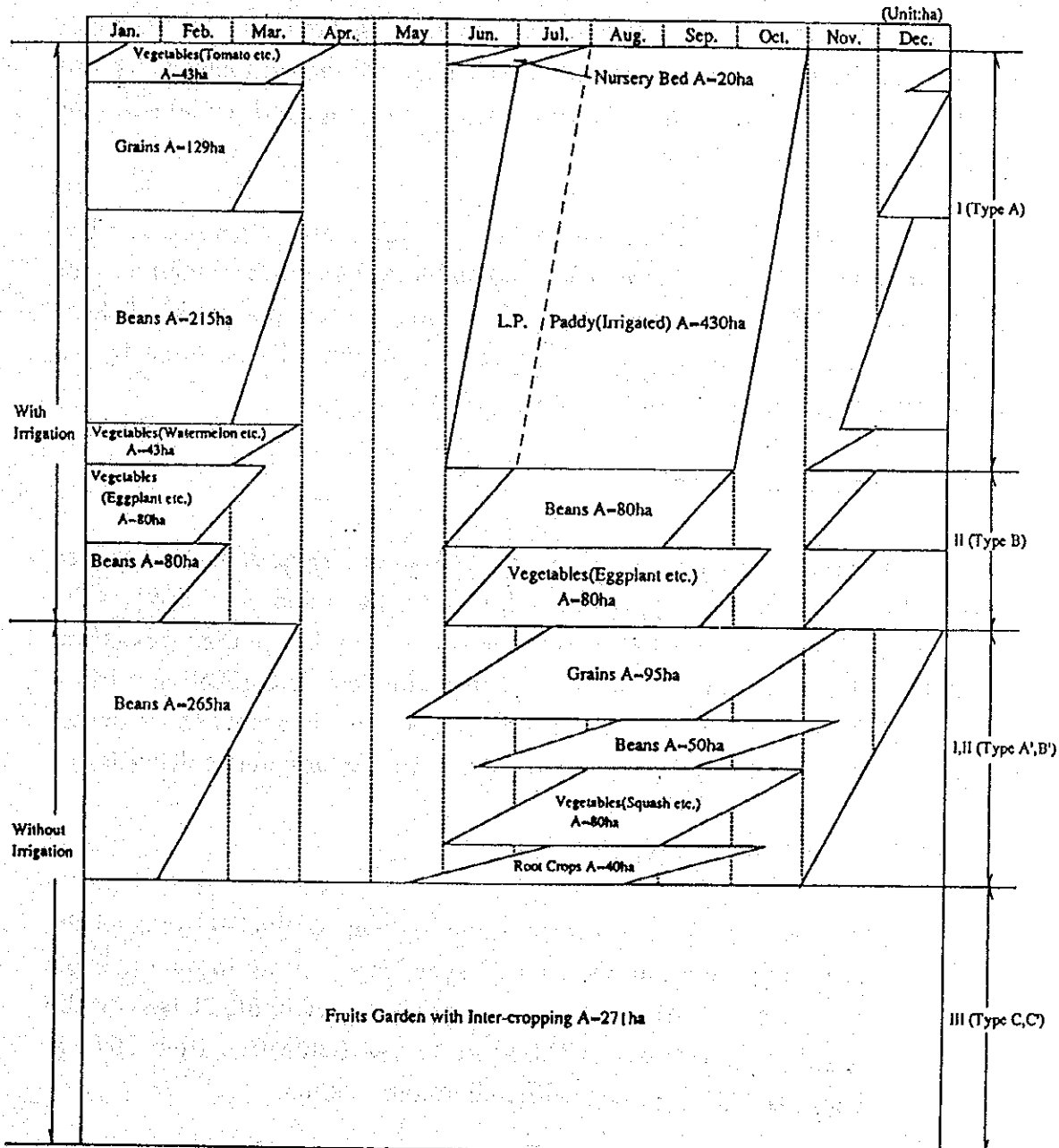


L.P. : Land Preparation

Note: I: Slope 0-3%, II: Slope 3-8%, III: Slope 8-15%

The figure is gross area.

**Figure 4.4.2 Proposed Cropping Pattern - Second Stage Development
(200% Crop Intensity)**



L.P. : Land Preparation

Note: I:Slope 0-3%, II:Slope 3-8%, III:Slope 8-15%
The figure is gross area.