

SUMMARY, CONCLUSION AND RECOMMENDATION

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SUMMARY

CHAPTER I. INTRODUCTION

(Background)

- 1.01 The Republic of the Philippines has formulated the Medium Term Philippine Development Plan (MTPDP) for the period 1993 to 1998 to solve various socioeconomic problems as poverty, low income, lack of employment opportunities, etc. One of the main focus of the MTPDP is the intensification of the Comprehensive Agrarian Reform Program (CARP) to implement land distribution of about 2.52 million hectares to landless farmers as beneficiaries and to provide basic rural infrastructure and support services to the CARP areas.
- 1.02 The Philippine Government has selected the Study Area as a priority development project under CARP and has requested technical cooperation from the Government of Japan. In response, the Government of Japan dispatched the Preliminary Study Team in 1993 and an Implementing Arrangement between JICA and the Department of Agrarian Reform for the Feasibility Study on the Development of Viable Agrarian Reform Communities in Southern Palawan was finalized.
- 1.03 The objective of the Study is to undertake a feasibility study on the agricultural development of Tagumpay Settlement Area and its outlying areas in southern Palawan and to effect technology transfer to counterpart personnel.

(Implementation of the Study)

- 1.04 The Study was undertaken in two stages: Work I Stage (consist of the field survey works and the home office work, from 11 January to 22 March and 16 June to 25 July 1994, respectively) and the Work II Stage (also field survey and home office work from 11 August to 9 October and 10 October to 9 December 1994, respectively). The Study Team consisted of the Feasibility Study Team and the Topo-Mapping Team.

CHAPTER 2. BACKGROUND OF THE PROJECT

(Socioeconomic Conditions)

- 2.01 The Philippine economy experienced its worst economic and financial crisis in 1984 and 1985 but started to recover steadily at 3.4% in 1986 to 6.8% in 1988. Per capita GDP is 715 US dollars in 1990. However, national economy again slowed down since 1989. Population is about 60.7 million in 1990 increasing at an average annual rate of 2.35% with 51% living in the rural areas. About 45% of the economically active population are engaged in the agricultural sector. Of the total number of 11.98 million families, some 40.7% live on incomes lower than the poverty threshold and about 71% of these families are from the rural areas. Agricultural sector contributes 23% of GDP in 1992 and export of agricultural products contributes one third of total export value. However, about 600 thousands tons of rice were imported in 1990, notwithstanding attaining self-sufficiency in 1977.
- 2.02 The population of Region IV in 1990, where Palawan province and the Study Area are located is about 8.26 million, the rural population of which is 46% and the economically active population engaged in the agricultural sector, 37%. The average income in 1991 is about 68,960 pesos. The region's GRDP for 1991 is about 14% of the GDP of the Philippines.
- 2.03 Population of the Palawan province is about 528,000, increasing at an annual rate of 3.58% due to immigrants from other provinces of about 3,000 to 4,000 annually. Some 69% of the economically active population are dependent on agriculture, forestry and fishery sector. The average annual income in the province is 41,415 pesos, ranking 30th among the 75 provinces in the country. At present, about 53% of the total families live on incomes below the poverty line.
- 2.04 About 150 thousand hectares of the lands in the province are planted to paddy, maize, coconut, mangoes, cashew nuts, etc. However, paddy production is irregular due to dependency on rainfed farming.

(CARP)

- 2.05 CARP is the agrarian reform system aiming at the distribution of three (3) hectares of land to landless farmers to increase income, to alleviate poverty and to create employment opportunities through agriculture. This Study is one of the resettlement plan being promoted by DAR.
- 2.06 About 2.52 million hectares are planned to be distributed for the period 1993 to 1998. As of July 1994, about 145,417 ha (35% of total scope) has been distributed in Region IV, of which 30,045 ha has been distributed to 10,177 beneficiaries in Palawan from 1972 to 1994 (64% of total scope).
- 2.07 The Study Area is one of DAR's settlement area. Land at Tagumpay Settlement has been distributed and the land occupation per farm is fixed.
- 2.08 The estimated annual family income in the Study Area is about at 14,900 pesos, which is lower than provincial average income of 41,415 pesos and Puerto Princesa city income of 40,284 pesos. One of the reasons for low income is the limited cultivable area and low yield of crops in rainfed condition. The cycle can be speculated with these background, low income - low input - low yield - low income.

CHAPTER 3. THE PROJECT AREA

(Location and Area)

- 3.01 The Study Area is located at 55 km south of Puerto Princesa city and 550 km southwest of Manila with a total area of 1,929 ha, excluding the bombing range of the Philippine Air Force.

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

(Topography)

- 3.02 The topography of the Study Area is rolling and undulating with many small valleys, and with slopes ranging from 0 to more 18%, and altitude between 1.4 to 100 m MSL. 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, into the Sulu Sea.

(Soil and Land Use)

- 3.03 Soils are generally minor alluvial plains and terrace (residual soils) with the dominant soil texture as clayey loam and light clay. Generally, though, the Study Area has no serious negative factors for agricultural development in terms of soil condition.
- 3.04 Arable lands suitable for agriculture have a total of 1,545 ha while non-arable lands cover an area of about 521 ha. Forest and shrubs form about 61%, grasslands and others about 31 percent. Lands utilized for farm cultivation during the dry season is only about four (4) percent.

(Geographical, Geological and Hydrogeological Conditions)

- 3.05 Palawan is divided into the north and south Palawan. The Study Area, located in south Palawan has a basement composed of turbiditic sediments in which an ophiolite suite consisting of ultramafics, gabbro was overthrust. Most of the Study Area is underlain by diluvial deposits, called the Iwahig Formation and are made of poorly unconsolidated old fan and old talus deposits.
- 3.06 The Study Area and the surrounding areas are divided into three (3) categories; central mountain area, diluvial hill area and the alluvial plain area. The northwestern portions of the surrounding areas belong to the central mountain area. The Study Area is mostly occupied by gentle slope diluvial hills. The alluvial plain starts near the national highway extending to the coastal line into the Inagawan river and its tributaries.
- 3.07 The Study Area is divided into two (2) groundwater areas, the shallow and deep well areas. The former consist of recent formation like alluvial plain while the latter consist of Iwahig Formation like the

diluvial deposits. The shallow wells are generally not good since the aquifer is generally found between 15 to 20 m below ground surface.

(Climate Conditions)

3.08 Climate data for the Study Area are available in the nearest observatory in Aborlan. The average mean annual temperature of 27.2 degrees, the mean annual humidity of 87.3% and mean annual cloudiness of 5.1 oktas were observed. The wind direction is southward during the dry season and northwards during the wet season. The mean annual rainfall is 1,587.1 mm (1,454.7 mm is measured between May to December and the remaining 132.4 mm in the remaining period). The area is hardly affected by typhoon. The beginning and ending of the wet season varies every year, hence, rainfed agricultural activity is not stable.

(Hydrological Condition)

3.09 Water level data were collected at the three (3) water level gauging stations installed at the Inagawan river and were used for the hydrological analysis. Rating discharge were used by applying of the rating curve of No. 2 water level gauging station. Using the Tank Model method to calculate river discharge and the other above-mentioned data, the following hydrological data were obtained: ① annual mean runoff of 106 MCM with runoff coefficient of 47%, ② runoff discharge of 17 and 89 MCM during the dry and wet season, respectively, and ③ drought water discharge of 0.314 cu.m/sec with 10 year return period.

(Socioeconomic Conditions)

3.10 As of 1994, about 1,067 ha of government lands were distributed to 332 beneficiaries. The area of farm lot per household is three (3) hectares with about ten (10) percent owning six (6) hectares. All of the beneficiaries became new land owners.

3.11 Though the land has been distributed to the farmers, only a very limited number of farmers plant paddy, maize, etc., under rainfed condition. The result is lower family income of 14,900 pesos on the average.

(Needs of Farmers in the Study Area)

- 3.12 The identified needs of the farmers are irrigation facilities, farm roads and drinking water supply, and these were ranked as first, second and third needs, respectively, by most of the farmers. Other needs identified in the CARP area also identified in the preceding area were: lower price of farm inputs, additional farm extension workers, support to livelihood, etc.

(Present Agricultural Condition)

- 3.13 The total cultivated land during wet season in the Study Area is about 440 ha which consists of 123 ha of paddy field, 296 ha of corn field etc., 23 ha of fruits garden. This acreage fluctuates year by year depending on rainfall. In the dry season only about 80 ha of land are cultivated (equivalent to 4% of the Study Area). Other land is undeveloped, or under shifting farming. Planting season is not fixed due to fluctuations in the beginning and ending of the rainy season and also due to the limited supply of draft animals. The yield of rainfed and upland paddy is very low, only 1.7 and 0.4 ton/ha, respectively. Average yield of corn is only 1.21 ton/ha. Vegetables are usually planted at the backyard, for home consumption.

(Research and Extension)

- 3.14 Research institutions with programs and activities for the farmers, such as, the PAES, the PNAC, Philrice and ATI are available in the province. However, they have no program and activities within the Study Area.

- 3.15 Only one (1) extension worker covers both barangays Inagawan (where the Study Area is located) and Kamuning, and his activity is mainly focused on paddy crops.

(Post Harvest Condition)

- 3.16 The post harvest facilities available in the Study Area are a solar dryer (concrete pavement of 38.4 sq.m) and another one alternatively used as a basketball court, and a warehouse of about 70 sq.m with unfinished roof. Threshing and milling of rice are undertaken at the nearest barangay or through the mobile-type threshers and mills which usually goes to the Study Area at specific schedules.

(Livestock Condition)

3.17 Only small scale livestock and poultry production are conducted at the Study Area, mostly at the farmer's backyard, for home consumption.

(Marketing and Credit)

3.18 Only very minimum amount of agricultural products are sold to the market, mostly in Puerto Princesa city or Aborlan, through the middlemen or brought directly by the farmers themselves.

3.19 Agricultural credit are available through the LBP but needs the guarantee of the cooperative or some bank deposits. Farmers without access to the above, borrow from middlemen, wholesalers, relatives, etc., at higher interest rates.

(Water Resources Conditions)

3.20 The Inagawan river and its tributary, the Pinagsaluran river are the surface water resources available in the Study Area. The Inagawan river has a watershed area of 179.3 sq.m at the river mouth and a length of 46.5 km. The mountain areas of these rivers are covered with dense and wild vegetation. The average runoff of the Inagawan and Pinagsaluran rivers are 106 and 14 MCM, respectively, and are considered sufficient for water resources development. However, about 90% of the water resources are yielded during the rainy season, hence, the need to store excess water for effective utilization during the dry season. The riverbed of the Inagawan river is lower by 20 m than that of the beneficiary area.

3.21 There are nine (9) shallow wells and six (6) springs at the depressions in the Study Area. The yield of water from the wells are approximately 75 cu.m/day, which are insufficient for irrigation purposes. Groundwater in the Study Area considered good quality are recommended, therefore, for domestic water purposes only.

3.22 There are two (2) diversion facilities in the Inagawan river with an annual water permit of 13 MCM. Deducting the river maintenance flow and the annual permit of the existing diversion facilities, the average annual water of the Inagawan and Pinagsaluran rivers are about 92 and 13 MCM, respectively.

(Irrigation Condition)

- 3.23 Puerto Princesa city has the low rate of irrigation development. There are two (2) irrigation systems (270 ha of the Inagawan CIS and a farm land of the Inagawan sub-colony) adjoining the Study Area. However, no irrigation system exists in the Study Area. Rainfed farming is adopted except in small areas where water is available from natural springs.
- 3.24 In the adjoining irrigation areas, wet and dry season paddy are cultivated. There exists an Irrigators Association which collects water charge and maintains facilities.
- 3.25 Based on field results, percolation rates at the paddy fields are 2.5 mm and 3.0 mm per day during the rainy and dry season, respectively. The basic intake rate is from 18 to 96 mm per day.

(Drainage Conditions)

- 3.26 The Study Area is undulated with six (6) water courses, hence drainage condition in the Study Area is good.

(Road Conditions)

- 3.27 DAR has prepared the road network plan for the Tagumpay Settlement area, but only two (2) roads have been constructed at the home lot area. No road has been constructed going to the farmlands.

(Condition of Home Lot Area)

- 3.28 The Tagumpay Settlement home lot area has a total area of 32.0 ha consisting of 17.7 ha housing area, 1.7 ha school space, 5.3 ha public space, and 7.3 ha other areas as roads, etc. The home lot area was divided into 321 house lots and distributed to the beneficiaries (600 sq.m each). However, only 54 houses are occupied by the farmers due to absence of agricultural/rural infrastructures and the lack of income sources in the Study Area.

(Village Water Supply)

- 3.29 The farmer beneficiaries get their potable water from the privately constructed shallow wells and the springs. Some shallow wells usually dries up or have less water during the dry season, forcing

women to haul water located farther away from their home lots. The quantity of water are not sufficient to supply the needs of the residents, most especially during summer. The quality is poor and not suitable for drinking. Water from springs during summer are found to have coliform group bacteria, though these are not present during the wet season. Some of the water sources contain zinc and iron, however, their densities are within the limits of quality standard in the Philippines.

(Village Roads)

- 3.30 The only roads found in the Study Area are the two (2) village roads constructed by the city government along the proposed public space area. Otherwise, only cart trails and foot paths which becomes impassable during the wet season are found in the area. The farmers, thus encounter problems in transporting their agricultural products from the farms to the national roads or to their houses.

(Rural Electrification)

- 3.31 Even with the presence of power transmission line along the national road, no distribution line has been connected to the area, hence, the home areas, except those along the national road, have not yet been energized. Since April 1994, the monthly minimum electric charge per household is 37.5 pesos (or 10kwh per household).

(Other Facilities)

- 3.32 The other facilities found in the Study Area are the two-room newly constructed elementary school without appurtenant facilities, the church constructed at the center of the home lot area, and the small barangay hall which also functions as a meeting place. Since there are no clinic or health station and no public market, the residents of the Study Area avail of the facilities of Aborlan or Puerto Princesa city, which are about 19 and 55 km away, respectively, from the Study Area.

(Farmer's Organization)

- 3.33 In the Study Area, there are six (6) auto savings groups (ASGs) and two (2) cooperatives. The ASGs are self-reliant farmer's organization formed by DAR for savings mobilization to help finance the group's

income generating projects. The cooperatives were organized primarily to mediate financing between the farmers and financing institutions.

(Environmental Condition)

3. 34 Most of the Study Area are covered with dense natural forest. So as not to destroy the natural environment of the province, the government has issued several decrees concerning the preservation of the environment, the most notable of which is the proclamation of the province as game refuge and bird sanctuary and the prohibition of cutting of trees.

3. 35 There exists 30 avian species and 82 families of plants in the Inagawan river basin. Furthermore, it is said that several kinds of small wild animals and fishes were found in the Inagawan river basin.

3. 36 There are some cases of malaria in the neighboring village. In the establishment of the some facilities plan, it should consider suitable countermeasures to reduce and to expose the water surface area to sunshine.

(Problems and Constraints of the Study Area)

3. 37 Meteorological Condition: The beginning and ending period of the wet season varies every year, hence, farming activity which is dependent on the occurrence of rainfall, becomes unstable. The annual amount of rainfall in the Study Area though good enough for farming (about 1,600 mm) is concentrated during the wet season (90 percent). Without irrigation facilities to store water during the wet season, the farmers will not be able to sustain agricultural activity in dry season.

3. 38 Hydrological Conditions: The probable drought discharge of 314 lit/sec with a 10-year return period was estimated at the Inagawan river. Its tributaries have less and/or no water during the dry season due to its limited watershed area. Groundwater from springs are limited, only about 0.2 lit/sec at the maximum, throughout the year, and are not sufficient for agricultural use.

- 3.39 **Topographical and Geological Conditions:** The farm lands at the Study Area were divided and distributed to the farmer beneficiaries without considerations of topography, etc., making it difficult for some farmers to undertake agricultural activity.
- 3.40 The river bed elevations of the Inagawan river and its tributaries, about 20 and 30 m MSL, respectively, are lower than the elevation of the Study Area which are about 40 to 50 m MSL. Irrigation area will therefore be limited with the introduction of gravity irrigation system. To avail of a bigger irrigation area, pumping system will have to be introduced. However, the O&M cost of pump irrigation systems, which are usually shouldered by the beneficiaries are high, thus not highly recommended.
- 3.41 A river bed elevation of about 40 to 50 m MSL in the Inagawan river suitable for gravity system is located only about four (4) km upstream of the Study Area. However, both its river banks have steep slope with dense natural forest, which will make construction of proposed feeder canal difficult to undertake plus the possibility of destruction of a bigger proportion of the environment.
- 3.42 The Study Area has many valleys and steep slopes of more than 18%. This will limit agricultural land development due to the need for soil conservation and the high cost of land development when the area is converted to paddy field. The undulating and rolling topography of the Study Area will make construction of proposed facilities, like the farm-to-market roads, canals etc., costly due to the many structures needed to cross the depression areas.
- 3.43 **Reserved Forest Area Along the Creek and/or Stream:** Under PD 705 of the Forest Code of the Philippines, cutting of trees is prohibited within 20 m strip on both sides of a creek or stream and at the edge of the reserved forest area. Cutting of trees within the home lot area, even needs the permission from the DENR.
- 3.44 **Absence of Farm-to-Market Roads:** Due to the lack of farm-to-market roads in the Study Area, transportation of farm input and output to and from the field, especially during the wet season, is very difficult.

Furthermore, the quality and quantity of farm products are decreased due to the absence of time frame to transport such produce outside of the farm area.

- 3.45 **Absence and/or Lack of Rural Infrastructures:** Most of the available water sources have poor quality and are not fit for drinking. During summer, women and children have to devote more time hauling potable water due to the longer distance of water sources because the nearby wells have dried up and/or have less water. Because of this, they do not have time to improve their living conditions. Facilities such as electricity, village roads, health centers, community hall, etc. are not available within the Study Area.
- 3.46 **Low Educational Level of Farmers:** The farmers in the Study Area have low educational status. This is one of the constraints 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.
- 3.47 **Low Farm Household Income:** Farmers have low income due to the above-mentioned reasons and also to the absence of employment opportunities within or near their residence.
- 3.48 **Malaria Endemic Area:** A number of malaria cases was observed in the Study Area. Countermeasures to minimize the occurrence of breeding places of mosquitoes should be introduced.

(Development Potentials)

- 3.49 **Big Population Density:** With the provision of necessary facilities and utilities, the population of the Study Area is expected to increase to about 6,200. The population density will then be about 125 persons/sq.km. This density is about four (4) times of the average provincial density of 35 persons/sq.km.
- 3.50 **Wide Agricultural Area and Fertile Soil:** When the agricultural development plan is introduced, more than 70% of the Study Area will be developed. The farmers will thus be able to enjoy a stable farm

income from their land after full development. Soils of the Study Area which are classified as clay to clay loam are suitable for farming.

- 3.51 **Sufficient Water During the Wet Season:** The basin of the Inagawan river can provide huge amount of water during the rainy season. The good vegetation of the basin will also provide a dependable flow of water during the dry season.
- 3.52 **Farmer's Willingness:** Farmer's in the Study Area are willing to improve their living conditions. There is the presence of a big human resources potential ready for development.

CHAPTER 4. PLAN FORMULATION AND AGRICULTURAL LAND DEVELOPMENT

(Basic Concept of Development)

- 4.01 In the development of the settlement area, various plans and strategies are proposed. Initially, the targeted income needed to help the farmer's household maintain a satisfactory existence was determined for the Area. The agricultural development plan was therefore formulated to achieve the targeted farm household income.
- 4.02 The agricultural land development plan is proposed to be undertaken in stages, as the investment cost for development of the Study Area will be so 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.

First Stage Development:

To encourage the beneficiaries to settle in the Study Area, it is important to provide the basic facilities and utilities necessary to maintain a sustainable income.

Second Stage Development:

In order to increase income and level up standards of living, the other necessary facilities and utilities proposed shall be provided.

(Development Strategy)

- 4.03 Since the farmer beneficiaries are simple farmers with lower educational background and limited skills, the development strategy should therefore consider the following factors: ① recommend basic and necessary systems and facilities that will help the farmers obtain a stable life; ② introduce systems which are easy to operate and maintain; ③ introduce systems and facilities which will not require big investments; and ④ a part or all of the systems to be introduced in the first stage should still be utilized in the development and implementation of the second stage development plan.
- 4.04 After the farmers have acquired a stable and substantial income which will enable them to pay various charges and fees and after the farmers have acquired the necessary skills and knowledge to improve their farm lot, the second stage development can be proposed to be implemented to enable the farmer beneficiaries to achieve higher income. The implementation time of the second stage development, however, is not fixed. Some of the proposed project components can be implemented by the concerned agencies, groups or farmers themselves, as soon as funds/resources are available and ready.

(Target Income)

- 4.05 Taking into consideration the target farm income in the MTDP for Palawan, farmer's desire to increase income and price escalation in the province, the target farm income set up for the Study Area to alleviate poverty and improve standard of living is set at above 38,000 pesos per year.

(Basic Concept of Land Use Development Plan)

- 4.06 In the development of the land use plan for the Study Area, the concept of maximum environmental conservation and minimum environmental destruction are taken into consideration.
- 4.07 The factors considered in the development of the land use plan are climate, hydrology, rainfall, land slope, land classification, soil, altitude, etc. Based on these factors, the following land use plans are proposed for the Study Area:

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

(Agricultural Development Plan Related to Palawan Province)

4.08 The government has included the Key Area Development Approach in Medium Term Philippine Development Plan (1993-1998). The program for Palawan province is mainly focused on the Key Livestock Development Area (KLDA), to breed and increase livestock production and the Key Commercial Crop Area (KCCA) program, to expand mango and cashew areas by 8,000 ha each.

4.09 The strategy of development for the province and the city have more or less focused on the same commercial crop and livestock production. Puerto Princesa city has been divided into eight (8) clusters and cluster-7 where the Study Area is included has for its development strategy, enhanced rice production and intensified tree crop production.

(Proposed Crops)

4.10 Based on climate conditions, land conditions, availability of irrigation water, farmers technique level, population and consumption projections and production trend, the following crops are proposed to be introduced: paddy, beans, corn, vegetables (tomato, watermelon, taro, eggplant, squash, etc.), cashew and mango. After the farmers have acquired necessary skills and techniques, high value crops may be introduced in the future.

(Proposed Cropping Pattern)

4.11 The ultimate cropping pattern for the Study Area is 200%. However, the cropping intensity initially proposed (first stage development) is 130% due to budgetary limitations of the government, low level of farming techniques and skills, etc.

(Cultivated Area)

4.12 The proposed cultivated area by type of land slope, crops under irrigated and non-irrigated conditions by season are proposed as follows:

	Area (ha)	Season	Crop Type
- Irrigated			
Type I	430	wet season dry season	paddy beans/vegetables
Type II	160	wet/dry season	vegetables/beans/etc.
- Non-Irrigated			
Type I	95	wet season	beans/corn vegetables, etc.
Type II	170	wet season	grains/beans/vegetables
Type III	271	year round	cashew nuts/mango with inter cropping

(Target Yield and Production)

4.13 For the above-mentioned crops, target yield are determined based on the current regional and provincial yields and plans. Proposed yields of paddy, mung beans and corn as major crops to be proposed are 4.0 ton/ha, 0.75 to 1.0 ton, and 2.0 to 2.1 ton/ha, respectively. With the first stage development, the total productions of paddy, mung beans and corn are 1,548 ton, 422 ton and 244 ton, respectively. With the second stage development, the production of these crops are 1,548 ton, 587 ton and 415 ton, respectively.

(Irrigation Plan)

4.14 Paddy as principal food and other crops such as vegetables are proposed to be irrigated. Fruit trees are to be planted in rainfed areas due to restrictions on topography and elevation. The proposed irrigation system will provide main and lateral canals to irrigate an area of 30 to 50 ha block and on-farm facilities for effective utilization of irrigation water.

4.15 The diversion water requirement (DWR) for irrigation is based on the available climate data in Aborlan for 17 years, the NIA guidelines for planning and design, etc. In the case of paddy cultivation in the wet season and upland crop cultivation in the dry season, the annual mean DWR is 1,010 mm, while in the case of upland crop cultivation for both

seasons, 520 mm. The overall irrigation efficiency for paddy and upland crop cultivations are 0.50 and 0.45, respectively.

4. 16 The proposed irrigation area is located below 40.0 m MSL, taking into account intake water level, soil suitability, topography and irrigation system in the area.

(Drainage Plan)

4. 17 The removal of excess irrigation water and rainfall from the soil surface is necessary to prevent crop damage. As much as possible, the existing natural streams and rivers in the Study Area shall be utilized as drainage system. The capacity of the drainage canal is designed by a drainage module of 6.4 lit/sec/ha based on two (2) days drainage period for the daily rainfall (138.6 mm) with a return period of five (5) years.

(Potential Water Resources Sites and Development Type)

4. 18 There are water development sources types such as storage dam, diversion dam and mountain stream diversion types and gravity intake and pumping intake from the viewpoint of intake method.

4. 19 Based on the topo-map with a scale of 1/50,000 and 1/4,000 and field reconnaissance survey, a total of nine (9) potential water resources sites, five (5) sites at the Inagawan main river and four (4) sites at the Pinagsaluran river are preliminary nominated, taking into account the above types and method.

4. 20 The geographical and geological features of the proposed sites are as follows:

Site A and B: Not recommendable because the proposed facility will destroy natural environment and will require high construction cost.

Site C: Due to small dam span and height rate of five (5) and fresh crystalline schism (belongs to Inagawan Metamorphics), the site is suitable, however, the elevation of the river is low. When gravity intake system is introduced, the cost for the construction of the facilities will be higher.

- Site D:** Since small dam span and height rate is small, eight (8), the site is suitable for dam construction. However, the dam facility is not recommended due to the thick overlain of 20 m and low elevation of the river bed for gravity intake.
- Site LD:** The same as Site D. Due to the thick overlain of 25 m and low river bed elevation, dam construction is not recommended.
- Site Eu:** The fill type dam is recommended because of the dam span and height rate is 30. The medium weathered rock foundation of maximum seven (7) m with permeability of $n \times 10^{-4}$ is not a constraint for dam construction.
- Site EL:** The dam is not recommended because the big dam span and height rate of 35 and thick overlay of 20 to 30 m with higher permeability from the river bed to the left abutment.
- Site EuM:** The same as Site Eu, with the dam axis almost the same as Site Eu.
- Site F:** Due to small capacity to store water, the dam could not be recommended.

- 4.21 The embankment material of a fill dam consists of core, random, filter and riprap. The quantity of embankment materials are found to be sufficient while the quality of materials are good near the proposed sites mentioned above. Concrete aggregate can be borrowed from sand and gravel layer in the river bed of the Inagawan and Pinagsaluran rivers after materials are screened.

(Proposed Water Resources and Construction Condition)

- 4.22 The optimum water resources sites for the project were evaluated from various points of view, such as, irrigation area, easiness of construction, environment, economical construction cost including operation and maintenance cost. The water resources development in the Study Area shall be proposed to be undertaken in stages. Site EuM, as mountain stream diversion type with 130% cropping intensity is proposed as first stage development due to its more economical construction cost and immediate effect. The second stage development includes the construction of the reservoir at site Eu with 200% cropping intensity.

CHAPTER 5. THE PROJECT

(Geography, Geology and Embankment Material)

- 5.01 The proposed dam site Eu is located at the tributary of the Pinagsaluran river. The left abutment of the dam site has steep slope, while the other side has somewhat gentler slope. Site Eu is also characterized by sporadically scattered small hills.
- 5.02 The geology of the proposed dam site and reservoir area are composed of the following geological member, the Panas Formation as turbiditic formation, the Inagawan Metamorphics as phillitic schist and amphibolite, the Mt. Beaufort Ultra-mafics, the Stavely Range Gabbro, the Iwahig Formation as diluvial deposits and alluvial deposits.
- 5.03 At the proposed dam site Eu, the thickness of the weak layer, which corresponds to overburden deposit and highly weathered rock zone, are identified up to the depth of five (5) to eight (8) meters at the left abutment and at the mid area of both abutments. On the other hand, at the right abutment, weak layers are identified as thin layers with total thickness of 1.5 m. The thickness of recent river deposit are also inferred as less than five (5) meters. Based on these findings, the geological condition for dam foundation of this site is excellent.
- 5.04 The borrow areas for embankment material are proposed to be taken from a total of five (5) areas; borrow area A as core material, borrow area B and C as random material, borrow area D as filter material and borrow area D as riprap material. The quality and quantity of each material are expected to meet the needs for the Project. Specifically, the materials derived from borrow area A are classified by GC, GM and SC as soil type and have good grain size distribution curve. This materials are presumed to show impermeable characteristic and large shearing strength on the condition that compaction is satisfactory carried out.

(Water Resources Facility Plan)

- 5.05 The main parts of the Philippine Island are enclosed by the Philippine trench, etc. at the east side, and by the Manila trench, etc., at the west

side. The Philippine and Mindanao faults with north-south direction run across the middle portion of the enclosed zone in which earthquakes frequently occurs. Palawan Island is located outside of the earthquake area, hence, it is appropriate to apply the minimum design value of 0.05 g of earthquake force K in the structural design.

- 5.06 The reservoir capacity and area of each potential water resources site were measured based on the topographical map with a scale of 1 to 4,000. Based on the previous studies, the specific sediment volume for the Pinagsaluran river basin is assumed to be 300 cu.m/year/sq.km. The design period of 100 years of sediment accumulation for the reservoir is applied.
- 5.07 The design flood discharges for the water resources facilities were studied based on DPWH's flood formulas, design flood discharge of the NIA's existing diversion dam and discharge estimated by using the Aborlan's daily rainfall. Consequently, the biggest value among the flood discharges estimated by the above three (3) methods is employed as a design flood discharge.
- 5.08 The dam type shall be determined taking into account such various conditions as topography, geology, available construction materials, construction method, environment, safety structure and economy in addition to objective and scale of facility. The result was that the fill type dam is proposed to be employed at the Pinagsaluran river.
- 5.09 Water management and O&M of irrigation facilities including collection of water charge will be undertaken by Irrigator's Association composed of the beneficiary farmers, under the supervision of DAR. However, large repair works and technical supports will be done by concerned government agencies such as NIA.
- 5.10 The watershed will generally be affected by the water resources development proposed in the Study Area (such as, reservoir, etc.). However, since the scale of the proposed facilities are small, the effect on the watershed are very minimal. Furthermore, if suitable countermeasures for land conservation, such as slope protection and vegetation are carried out, the watershed will not be destroyed.

(Irrigation Facility Plan)

- 5.11 Two (2) types of irrigation systems are proposed in the Study Area, the gravity irrigation system and the pump irrigation system. However, due to considerations like easy construction, lesser investment cost, easier operation and lesser maintenance cost, capability of the farmers to manage and operate the system, and others, the gravity irrigation system is proposed for the Study Area.
- 5.12 The irrigation system consists of the main irrigation canal (about 4.21 km long, with open and concrete lining) and five (5) lateral canals (total length of 10.5 km with open and earth canal). Operation and maintenance roads with a width of 4.0 m, and to be paved with gravel, are proposed at one side of the canal. Appurtenant structures, like drainage and road crossings, diversion and turnout, checks, drops, and other on-farm facilities are also proposed to be constructed for better conveyance, operation and control of discharges.

(Drainage Facility Plan)

- 5.13 Two (2) drainage canals with a length of 1.8 km (earth type) are proposed at the depression area utilizing the existing creeks and streams, to improve drainage conditions and to reduce waterlogged area.

(Farm-to-Market Road Facility Plan)

- 5.14 Farm-to-market roads proposed are gravel paved (20 cm thick and 6.0 m wide) with a total length of 11.8 km of main farm-to-market roads and 29.2 km of farm-to-market roads and maximum road slope of less than 8%.

(Rural Infrastructure Facility Plan)

- 5.15 Two (2) new villages are proposed to be developed in the outlying area (at the northwest and north eastern part) since there are no more available area for home lot at the Tagumpay settlement area. The outlying area which is estimated to be about 410 ha and will be distributed to about 140 farmers, will have a home lot area of 16 ha (9.0 ha for home lot areas, 3.1 ha for public space and 3.9 ha for roads and others).

- 5.16 A coarse sand layer as potential aquifer exists underneath, at the depth of 15 m based on the groundwater survey. Based on the obtained hydraulic constant by pumping test, the potential discharge of confined groundwater by single well is estimated roughly to be about 60 to 100 cu.m/day (about 75 cu.m/day in the case of a well diameter of 100 mm with influence area of 300 to 500 m).
- 5.17 The groundwater with an average yield of 75 cu.m/day is proposed to be introduced as a source of domestic water in the Study Area because of the presence of a stable and cleaner water throughout the year without the need for treatment facility. The proposed system will require the installation of a pumping facility which will need electricity to lift up water. The estimated cost to operate and maintain the facility is about 45 pesos/month/household.
- 5.18 The village water supply system consists of the deep well, a delivery tank, pipe line and one communal faucets for every six (6) households. The service area will be divided into five (5) blocks at the Tagumpay area and three (3) blocks at the outlying area.
- 5.19 The village roads consist of 970 m of main village roads (a road width of eight (8) m) and about 7,040 m of village roads (a road width of six (6) m) with a maximum longitudinal slope of 12%. Generally, road is paved with gravel, 20 cm thick, except in sections with more than eight (8) percent longitudinal slope. At the Tagumpay Area, a main village road of 84 m and a village road of 445 m will be paved with concrete which will also be utilized as solar dryer for agricultural products. At the new village only 90 m of village roads will be paved with concrete. No main village road will be proposed at the outlying area because of less traffice.
- 5.20 Some water from the farm lot areas, flowed down into the home lot area and stagnated due to topography, necessitates the construction of village drains to drain water from the home lot areas. For the Tagumpay area, the length of the proposed drains is 1,405 m of unlined canals. As appurtenant structures, road crossing and drops are also proposed.

(Rural Electrification and Others)

5. 21 Rural electrification will be provided through the transmission line of 13.2 kv located along the national road from the Narra thermal plant. At the Tagumpay Area, about 70 wooden poles with four (4) transformers to drop the voltage of 7,620 volt down to 220 an 240 volts are proposed to be installed. About 1.8 km of primary lines and 3.8 km of tertiary lines as distribution lines will be needed for the Tagumpay Area. The same system and procedure will be proposed for the two (2) new villages at the outlying area.
5. 22 Other social facilities such as a public market with four (4) building modules; expansion of the existing elementary school to four (4) classrooms; a health center ; a barangay hall, concrete multi-purpose pavements and recreational facilities like basketball court, etc. are proposed to be constructed in the public space.

(Agricultural Facilities Development Plan)

5. 23 To support the agricultural development and increase farmer's income, post harvest facilities such as solar and mechanical dryers, rice mills, rice threshers, transportation vehicles, etc. are proposed for the Study Area. These facilities will be turned over to the farmer's organization to be organized by DAR-NGO.
5. 24 To increase farmer's income and to supply a supplementary protein, the inland fishery of tilapia, etc. will be encouraged utilizing the proposed storage water facilities.

(Farmer's Organization Plan)

5. 25 The basic objective of the farmer's organization plan is the development of the farmer beneficiaries of the Tagumpay settlement area and its outlying areas into viable, organized, self-reliant and productive communities. Farmer's organization/associations, such as irrigators association (IA), water users association (WUA), and multipurpose cooperative will be organized and/or strengthened to effect the maximum participation of farmer beneficiaries in the operation and maintenance of the project facilities/utilities and to support farmer's activity to increase income.

- 5.26 When the IA, the WUA and the multi-purpose cooperative have become fully operational and have gained the necessary disposition, skills, leadership potentials and funds, they can interface or merge into one single organization/association.
- 5.27 Women as prime users and/or direct beneficiaries because of the roles they play in the rural household will be encouraged to assist in the operation and maintenance of the facilities as members and/or key leaders of the farmer's organization.

(Settlement Plan)

- 5.28 Specifically, two (2) new villages are proposed to be set up for the new farmer beneficiaries at the outlying area. Farm land will be distributed by DAR, the priority of which will be given to former inmates of the penal colony.

(Cost Estimate)

- 5.29 Basic unit prices of major labor and construction materials and of major works are based on the current unit price and unit cost of NIA as of January 1994. Cost estimates are in accordance with government guidelines of NEDA, DPWH, NIA, etc.

(Project Cost)

- 5.30 The total project cost for the first stage development is 415.3 million pesos (foreign currency portion of 249.7 million pesos and local currency portion of 165.6 million pesos) while the second stage development project cost is 1,265.7 million pesos (foreign cost of 618.9 million pesos and local currency cost of 646.8 million pesos).

CHAPTER 6. PROJECT IMPLEMENTATION AND OPERATION

(Executing Body)

- 6.01 The lead executing agency is the DAR. An Executive Coordination Committee (ECC) composed of representatives from DAR central office, the DAR regional office and various agencies at the provincial level (PARO, LGU, NIA, etc.) will be organized to coordinate and facilitate the activities of the various agencies and to guide and direct the project management office (PMO).

- 6.02 The PMO shall be established at the DAR Palawan Provincial Office (DPPO) composed of DAR-PARO as chairman, with the NIA-PIE, the MARO, the LGUs concerned, NGO, etc. as members. The PMO will be assisted by a support staff from existing personnel of DPPO and /or concerned agencies.
- 6.03 The PMO shall be assisted by the consultants to provide proper guidance, technical supervision and monitoring of project activities.

(Project Implementation Schedule)

- 6.04 The project will be implemented in two (2) stages. The first stage development, the purpose of which is the stabilization of settlement of the farmer beneficiaries, consists of a water resources facility available for 130 % cropping intensity, irrigation and drainage system, main farm-to-market roads, village water supply system and a part of post harvest facilities. Such facilities will be completed by the year 1997-98.
- 6.05 The second stage development, which will be started within 20 years after implementation of the first stage development, consists of new water resources facilities available for 200% cropping intensity, lateral farm to market road system, social infrastructures excluding village water supply system and remaining post harvest facilities.

(Operation and Maintenance of the Projects)

- 6.06 Prior to the implementation of the project and/or during construction stage, the farmer's organization shall be organized to prepare them to maintain and operate the facilities to be provided in the Study Area. The IA, the WUA and the multipurpose cooperative are proposed to take care of the O&M of the irrigation system, village water supply system and post harvest facilities, respectively, after completion of the Project. The road component will be turned over to the city government after completion and thereafter, O&M of the road becomes the city government's responsibility.

CHAPTER 7. PROJECT EVALUATION

(Economic Analysis)

- 7.01 An economic analysis was carried out from the viewpoint of national economy with a 50 years project life. Project benefits will compose of

agricultural, livestock, fishery, farm road, quality improvement of paddy, etc.

- 7.02 The Economic Internal Rate of Return (EIRR) was calculated to evaluate the feasibility of the project. The EIRR was calculated at 17.1% taking into consideration the staging of the development. Based on the results, the project is judged to be economically feasible.

(Financial Analysis)

- 7.03 The financial analysis for the typical farms were studied to estimate farm budget from the standpoint of private economy. The results of the study shows that each farm type would eventually get disposable incomes from 8,580 to 20,340 pesos and will be able to pay for O&M cost and debts on loans.

	First Stage (pesos)	Second Stage (pesos)
a) Farm Model 1 (Paddy Upland)		
Net Farm Income	42,330	66,290
O&M Costs	810	810
Debt	5,750	5,750
Living Expenditures	26,800	43,000
Disposable Income	8,970	16,730
b) Farm Model 2 (Upland)		
Net Farm Income	53,830	77,690
O&M Costs	810	810
Debt	5,750	5,750
Living Expenditures	36,140	50,790
Disposable Income	11,130	20,340
c) Farm Model 3 (Upland)		
Net Farm Income		58,710
O&M Costs		810
Debt		5,750
Living Expenditures		41,220
Disposable Income		10,930
d) Farm Model 4 (Fruit Trees)		
Net Farm Income		49,660
O&M Costs		810
Debt		5,750
Living Expenditures		34,520
Disposable Income		8,580

- 7.04 As the result of financial analysis for overall project, Financial Rate of Return was estimated at 18.2%.

(Other Indirect Benefits)

- 7.05 Other than the tangible benefits, indirect benefits will also be expected. Thus, the project can be a model case for other CARP areas

in the country in the development technologies for land use, farm plan, land reclamation plan, settlement plan, support services plan, environmental plan, etc. Particularly, implementation of the village water supply system will reduce heavy work of women and children in fetching drinking water and will contribute to better health and general welfare.

CHAPTER 8. ENVIRONMENTAL ASSESSMENT

(Environmental Assessment)

8.01 The results of the study indicates that the effect of the proposed projects to the environment is very minimal. However, if no countermeasures are undertaken for a long time, uncontrollable conditions will possibly occur in the Study Area and in the surrounding areas in the future.

(Countermeasures on Land/Environmental Conservation)

8.02 The countermeasures such as ① conservation of existing forest; ② prevention of soil erosion due to farm land reclamation and construction works; and ③ water pollution control of the drainage should continuously be considered during and after implementation of the Project.

CHAPTER 9. PRIORITY PROJECT(S)

(Selection of Priority Projects(s))

9.01 Many of the farmer beneficiaries given the lands to farm have not settled in the Study Area because of the lack of social and agricultural facilities to improve their farm and their standard of living. In order to solve these problems, the agricultural land development plan composed mainly of ① agricultural development; ② agricultural infrastructure development; ③ rural infrastructure development and; ④ institutional development are proposed to be established and implemented in the Study Area. Due to financial constraint, however, development plan is proposed to be implemented into stages.

(Criteria for Selection)

9.02 The criteria for the selection of the first priority projects were ① attainment of basic human needs; ② sustainable farm household income development; ③ farmer's desire; ④ easy and cheaper operation

and maintenance; ⑤ work load reduction on women and children; and ⑥ friendly to the environment in a rural area. The components with the higher total points are selected as priority projects.

(Priority Projects)

9.03 Based on the above considerations and criteria, the priority projects selected are: ① water resources facility; ② irrigation and drainage facilities; ③ village water supply; ④ farm-to-market roads and; ⑤ post harvest facilities.

(Project Cost and Scale)

9.04 The total project cost is 415.3 million pesos consisting of construction cost of 288.9 million pesos, association cost of 72.2 million pesos, physical contingency of 25.3 million pesos and price contingency cost of 28.9 million pesos.

9.05 The estimated local cost is about 12.8 million pesos consisting of project management cost of 1.9 million pesos, institutional development cost of 4.6 million pesos and on-farm facilities cost of 6.3 million pesos.

9.06 The specific details and scale of the priority projects are as follows:

1. Water Resources Facility	
- Closure Dam	310,000 cu.m (gross)
2. Irrigation Facility	
- Main Irrigation Canal	4.21 km
- Lateral Canal	10.5 km
3. Drainage Facilities	
- Drainage Canal	1.8 km
4. Farm-to-Market Roads	
- Main Farm-to-market Road	11.8 km
5. Village Water Supply	3 villages
6. Post Harvest Facilities	1 set

(Economic Justification)

9.07 For the economic justification, the EIRR was used and the EIRR calculated was 17.3% with a project life span of 50 years. While Financial Rate of Return for the overall project of the Priority Project was estimated at 18.0%.

CONCLUSION

The development of the settlement area in Southern Palawan focuses on a full scale agricultural land development, i.e., the provision of basic rural and agricultural infrastructures and facilities to help farmer beneficiaries maintain a sustainable income from the lands distributed to them through the CARP. It also calls for the development of the farmer beneficiaries and the formation of farmer's association/groups through the assistance of DAR and other concerned agencies and entities, to effect the maximum participation of the farmer beneficiaries in the operation and maintenance of the project facilities/utilities to be provided.

The development of the settlement area is proposed to be undertaken in stages and priority project has been identified for immediate implementation and quick benefit as first stage development, taking into consideration the financial condition of the government, the educational level and skills of farmers, etc.

The implementation for the second stage development is not fixed. The remaining proposed projects can be implemented as soon as the organizational status have matured and farmer's technology have improved to be able to accept intensive farming and/or when the agency concerned, or organization or entity is ready to implement them.

Based on the feasibility study undertaken, the implementation of the first stage and second stage development projects are technically sound, economically viable and socially acceptable. The project can also be a model case in the development of technologies for CARP government-owned projects and/or ARC projects in the country.

RECOMMENDATION

The priority project mentioned in the report should be urgently implemented because of various problems to be solved in the settlement area under the CARP. Prior to the implementation of the priority projects, the following activities are proposed to be undertaken:

1. The right-of-way for the proposed facilities should have been secured prior to the implementation of the first priority project for the smooth functioning of the construction activities and to avoid unnecessary delay.
2. The organization and training of farmer beneficiaries are very necessary to enable them to participate in the operation and maintenance of the facilities and utilities to be introduced in the Study Area. As per recommendation in the feasibility study, these activities should start prior to the implementation of the project.
3. Some irrigation canals will pass the edge of the Air Force bombing range. There is a need to allocate and/or to secure a priority use of a portion of said land to the DAR to effect immediate implementation of the project. The construction and operation and maintenance of irrigation canals will be hampered by the proximity of the bombing range, most specially if bombing activities are on-going.
4. Prior to the implementation of the project, a more detailed geological investigation of the proposed water resources sites is necessary to confirm further the viability of the sites from the geological and physical point of view.
5. Farmer's training program and extension work should be a continuing activity even after the completion of the project, to provide more skills/knowledge and technology to the farmers to attain the target income.
6. Support services on credit should be strengthened. For example, loans with lower interest rates should be provided to the farmer beneficiaries to assist them in their farming activity.
7. Land conditions should be taken into account when the DAR distributes the lands at the outlying areas to avoid inequality among the farmers.

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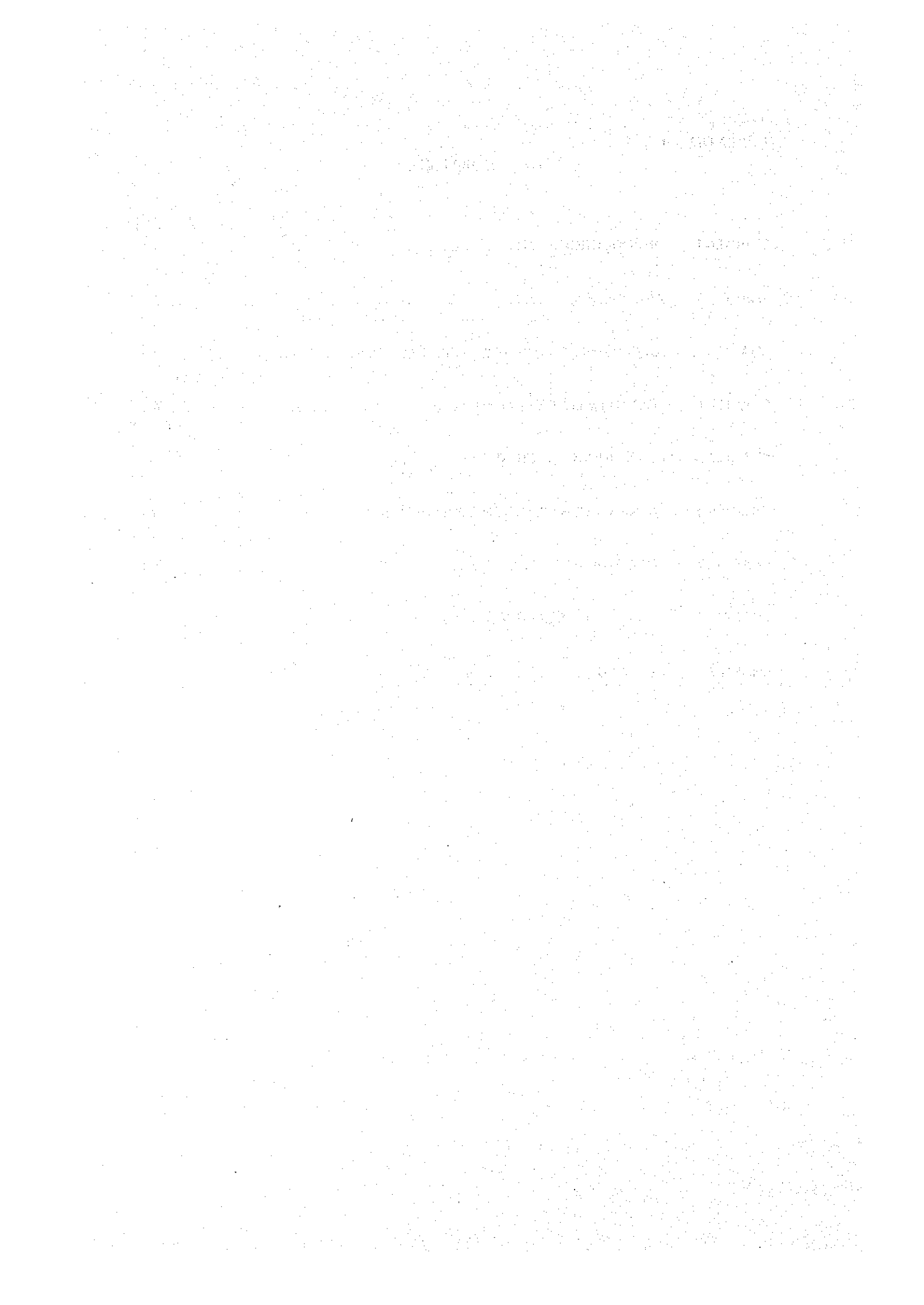
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ABBREVIATION, CONVERSION TABLE AND GLOSSARY

ABBREVIATION

ADB	Asian Development Bank
ATI	Agricultural Training Institute
BPA	Bureau of Power Association
BAS	Bureau of Agricultural Statistics
BAT	Bureau of Air Transportation
BCGS	Bureau of Coast and Geodetic Survey
BDT	Bureau of Domestic Trade
BFT	Bureau of Foreign Trade
BIR	Bureau of Internal Revenue
BL	Bureau of Lands
BMGS	Bureau of Mines and Geosciences
BOI	Board of Investment
BOP	Bureau of Posts
BSWM	Bureau of Soils and Water Management
BSMSI	Bureau of Small and Medium Scale Industries
BSP	Bangko Sentral ng Pilipinas
BUTEL	Bureau of Telecommunication
CARP-IC	Comprehensive Agrarian Reform Program - Irrigation Component
CARP-SIP	Comprehensive Agrarian Reform Program - Small Irrigation Project
CB/CBP	Central Bank of the Philippines
CDA	Cooperative Development Authority
CENRO	Community Environmental and Natural Resources Office - DENR
CFI	Crocodile Farming Institute, JICA
CHD	City Health Department
DA	Department of Agriculture
DAR	Department of Agrarian Reform
DARCO	Department of Agrarian Reform, Central Office
DARPO	Department of Agrarian Reform, Provincial Office
DARRO	Department of Agrarian Reform, Regional Office
DARMO	Department of Agrarian Reform, Municipal Office
DBM	Department of Budget and Management
DECS	Department of Education, Culture and Sports
DENR	Department of Environment and Natural Resources
DFA	Department of Foreign Affairs
DILG	Department of Interior and Local Government

DOF	Department of Finance
DOH	Department of Health
DOLE	Department of Labor and Employment
DOTC	Department of Transportation and Communication
DPWH	Department of Public Works and Highways
DSWD	Department of Social Welfare Development
DTI	Department of Trade and Industry
EMB	Environmental Management Bureau, DENR
FRSO	Fishery Regulatory Service Office
FORI	Forest Research Institute
IBRD	International Bank for Reconstruction and Development
IRRI	International Rice Research Institute
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
JSPS	Japan Society for Promotion of Science
LBP	Land Bank of the Philippines
LWUA	Local Water Works and Utilities Administration
MCSO	Malaria Control Services Office
MWSS	Metropolitan Waterworks and Sewerage System
NACIDA	National Cottage Industries Development Authority
NAMRIA	National Mapping and Resources Information Authority
NDC	National Development Corporation
NCSO	National Census and Statistic Office
NEA	National Electrification Administration
NEDA	National Economic and Development Authority
NEPC	National Environmental Protection Council
NFA	National Food Authority
NHA	National Housing Authority
NIA	National Irrigation Administration
NIST	National Institute of Science and Technology
NLUC	National Land Use Committee
NMYC	National Manpower and Youth Council
NNC	National Nutrition Council
NPC	National Power Corporation
NPCC	National Pollution Control Commission
NRCP	National Research Council of the Philippines

NWRB	National Water Resources Board
OEA	Office of Energy Affairs
OECE	Overseas Economic Cooperation Fund
PAES	Palawan Agricultural Experimental Station
PAF	Philippine Air Force
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PNAC	Philippine National Agricultural College
PCA	Philippine Coconut Authority
PCARRD	Philippine Council for Agricultural Resources Research and Development
PCCI	Philippine Chamber of Commerce and Industry
PCIERD	Philippine Council for Industry and Energy Research Development
PCGG	Presidential Commission on Good Government
PCGR	Presidential Commission on Government Reorganization
PCSDS	Palawan Council for Sustainable Development Staff (formally PIADPO)
PDC	Provincial Development Council
PEO	Provincial Engineering Office
PIADPO	Palawan Integrated Area Development Project Office
PHILRICE	Philippines Rice Institute
PHILVOCS	Philippine Institute of Volcanology and Seismology
PALECO	Palawan Electrification Corporation
PENRO	Palawan Environmental and Natural Resources Office, DENR
PNB	Philippine National Bank
PNOC	Philippine National Oil Corporation
PPA	Philippine Ports Authority
PPH	Palawan Provincial Hospital
RDC	Regional Development Council
RWDC	Rural Waterworks Development Corporation
SPIADP	Second Palawan Integrated Area Development Project
SSS	Social Security System
TBAC	Technical Board for Agricultural Credit
UP	University of the Philippines

CONVERSION TABLE

LENGTH

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

AREA

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

WEIGHT

mm.gr	: milligram(s)
gr	: gram(s)
kg	: kilogram(s)
ton	: ton(s)
ounce	: ounce(s) = 28.350 gr

CAPACITY

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

DISCHARGE

lps	: liter per second
cms	: cubic meter per second (or cu.m/sec)
cu · fsec	: cubic foot per second
lpd	: liter per day

VELOCITY

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

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

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

KW	: kilowatt(s)
MW	: megawatt(s)
WH	: watt(s) hour
KWH	: kilowatt(s) hour
EL	: elevation
MSL	: mean sea level
FWL	: full water level
HWL	: high water level
LWL	: low water level
ET	: evapotranspiration
mm/day	: millimeter(s) per day
ETcrop	: evapotranspiration of crop
N	: nitrogen
P	: phosphate
K	: potassium
LV	: local variety
LIV	: local improved variety
HYV	: high yielding variety
O&M	: operation and maintenance
EIRR	: economic internal rate of return
MT	: metric ton(s)
B/S	: benefit - cost ratio
FY	: fiscal year (1st of January to end of December)
Peso	: peso(s), unit of local currency peso = US\$ 0.03891 (as of September 27, 1994)
US\$: dollar(s) = 25.70 pesos (as of September 27, 1994)

GLOSSARIES

Study Area	: Area of about 2,000 ha consisting of the Tagumpay and its outlying areas
Province	: Political subdivision of the country comprising municipality(s) and city(s)
Municipality	: Political subdivision of a province comprising barangay
Barangay	: Political subdivision of a municipality comprising sitio
Sitio	: Minimum unit of political subdivision
Poblacion	: Political center of a town
Monsoon	: Predict wind that blows from the sea to the continent and opposite in Winter
Trade Wind	: One of three Philippines air currents, comprising from a generally easterly direction reaching the island during the period from February to April
IR	: High yielding variety of palay which bears variety from IRRI
Palay	: Paddy, unhusked rice, sometimes called rough rice (<i>Oryza Sativa</i>)
Cogon	: Coarse grass which usually covers idle land or abandoned clearing (<i>Imperata cylindrica</i>)
Ganta	: Common unit of volume for rice equivalent to 2.24 kg of milled rice
Nipa	: Heavy leafed type of palm used in hatching huts
Share tenant	: A practice where operators rent the land they work and pay as rent a share of a cash or crops grown
Carabao	: The animal that most farmers use for plowing and other farming works. It is about the size of an ox and is similar to the water buffalo in other countries.
Fiesta	: Spanish term for feast, celebrated pompously once a year to honor the patron saint.
Kaingin	: Deforestation by shifting cultivation with slashing and burning forest/brush
Survival Rate	: The number who graduate/the number who enroll

CHAPTER 1. INTRODUCTION

CHAPTER 1. INTRODUCTION

1.1 Background of the Study

In the Philippines, the agricultural sector still plays very important role in the national economy, as it occupies about 45% of total employment, about 23% of Gross Domestic Product (GDP) and more than one third of export revenues.

The Republic of Philippines has formulated the Medium-Term Philippine Development Plan (referred to as "MTPDP") for the period 1993 to 1998 to solve various existing socioeconomic problems such as poverty, poor employment opportunities, low income, etc. As to the agricultural sector, the program aims to increase government investment of basic infrastructures and services in the rural areas, to adopt a land use policy consistent with the objectives of agrarian reform program, to continue to strengthen agricultural research and development, to improve productivity, etc.

In the MTPDP, the Comprehensive Agrarian Reform Program (referred to as CARP) is expected to implement the land distribution of 2.52 million hectares to the landless farmers as beneficiaries, which consist of paddy and corn fields of about 252 thousand hectares, public lands of about 181 thousand hectares, resettlement and plantation areas of about 85 thousand hectares and personally owned farm lands of about 1,999 thousand hectares.

The Philippine Government had selected the Study Area as the priority development project area under CARP, and requested technical cooperation from the Government of Japan to implement the project. In response to the request of the Government of the Republic of the Philippines, the Government of Japan dispatched the Preliminary Study Team headed by Mr. Masaru SASAKI, to the Philippines through the Japan International Cooperation Agency (referred to as "JICA") in 1993, and finally concluded the Implementing Arrangement between JICA and the Department of Agrarian Reform (referred to as "DAR") for the Feasibility Study on the Development of Viable Agrarian Reform Communities in Southern Palawan (referred to as "the Study"), on March 24, 1993.

The Study aims to formulate a feasibility study on the agricultural development plan for the Tagumpay Settlement area and its outlying areas, in southern Palawan, and to carry out technical transfer to the Philippines' counterpart personnel in the course of the Study.

1.2 Implementation of the Study

The Study was executed in two (2) stages; namely, Work I Study Stage and Work II Study Stage. Both study stages also consisted of two (2) work activity, such as, field survey and home office work. The field survey work for Work I Study Stage was conducted for a period of 45 days from January 11 to March 22, 1994 in the Philippines, to gather basic data and information. The home office work for Work I Study Stage was carried out for a period of 43 days, from June 16 to July 25, 1994 in Japan, mainly to formulate the basic concept for the agricultural development plan based on the results of the field survey works.

The field survey for Work II Study Stage was undertaken for a period of 60 days from August 11 to October 9, 1994, in the Philippines to establish / determine the preliminary agricultural land development plan. The finalization of the agricultural land development plan was undertaken during the Work II Study Stage in Japan, for a period of 60 days from October 10 to December 9, 1994.

The Study Team consisted of two (2) teams, the feasibility study team and the topo-mapping team. The topo-mapping team was dispatched for a period of 45 days in Work-I Study Stage, conducting field survey works including aerial photo and ground survey by the global positioning system. Topographic mapping works was undertaken during the home office work of Work I Study Stage. At the beginning of the field survey activities of Work II Study Stage, the detailed topographic map with a scale of 1/4,000 was completed. On the other hand, the feasibility study team worked throughout the duration of the Study period.

During the Study period, the Team submitted various reports to DAR, such as the (a) Inception Report at the commencement of the Study, (b) Progress Report (1) at the end of the field survey period of Work I Study Stage, (c) Interim Report at the commencement of the field survey of Work II Study

Stage, (d) Progress Report (2) at the end of the field survey of Work II Study Stage and, (e) Draft Final Report at the end of the home office work of Work II Study Stage. The findings and results of the field survey activities and discussions and comments given by DAR and other concerned agencies were incorporated in this Draft Final Report.

During the Study period, the following persons were involved in the conduct of the Study.

<u>Name</u>	<u>Position</u>
<u>JICA Study Team (for Feasibility Study)</u>	
1. Mr. Masahiro IIDA	Team Leader/Area Development/Agricultural Land Development
2. Mr. Yoshiteru TSUNODA	Asst. Team Leader/Irrigation & Drainage/Water Resources Development
3. Mr. Tomiyuki KAWABE	Hydrology and Water Quality
4. Mr. Kazuyoshi OHSAWA	Geography, Geology and Groundwater
5. Mr. Ikuzo IWAMOTO	Environmental/Agricultural Land Conservation
6. Mr. Keiji IIZUKA	Agriculture/Soil
7. Mr. Kensuke IRIYA	Project Evaluation/Agro-economy
8. Mr. Nobuhiro NAGANO	Infrastructure Plan/Operation and Maintenance
9. Ms. Anicia C. PAPA	Farmer's Assistance Services
<u>JICA Study Team (for Topographic Mapping)</u>	
1. Mr. Tetsuya OHTUKI	Topo Mapping/General
2. Mr. Kenji YOKOTA	GPS Survey/Leveling/Field Survey Counterpart
<u>Counterpart Personnel of the Philippine Government</u>	
1. Mr. Jose Noel D. OLANO	Chief Counterpart/Undersecretary, FOSS, DAR
2. Mr. Jose Mari B. PONCE	Asst. Chief Counterpart/Director, PDMS, DAR
3. Mr. Homer P. TOBIAS	Asst. Chief Counterpart/PARO, DAR, Palawan
<u>DAR-CO</u>	
4. Ms. Ma. Celerina G. AFABLE	Chief, PDD, PDMS, DAR
5. Ms. Erlinda F. DOLATRE	PDO III, PDMS, DAR
6. Mr. Jose D. Cruz	PDMS, DAR

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DAR-RO

8. Mr. Rene COLOCAR CARPO, DAR

9. Ms. Rosanna GARCIA
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DARPO

10. Mr. Leandro A. CAYMO CARPO, DAR, Palawan

11. Ms. Elma S. BINASAHAN SuARPO, DAR, Palawan

12. Mr. Arnel M. ALZAGA SARPO, DAR, Palawan

13. Ms. Arsenia S. MAGNO: Engineer II, DAR, Palawan

14. Mr. Normando R. CRESINO Agrarian Reform Program Officer, DAR, Palawan

15. Ms. Ma. Elena A. EDORA HRMO II, DAR, Palawan

16. Ms. Regina R. PENAMORA Engineer II, DAR, Palawan

17. Ms. Rosenda O. DAPAT SARPT, DAR, Palawan

18. Mr. Rogelio D. MADARCOS SARPO, DAR, Palawan

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19. Mr. Masahiro YAGI Colombo Plan Expert, DAR