*The Study on Comprehensive Disaster Prevention around Mayon Volcano*

# SUPPORTING REPORT (2)

## *(Part II: Feasibility Study)*

## XXIII : Supporting Projects and Programs

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**SUPPORTING PROJECTS AND PROGRAMS**

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# SUPPORTING PROJECT AND PROGRAMS

## 1. LIVELIHOOD DEVELOPMENT PROGRAM AND PROJECTS FOR RESETTLERS

In total, eight typical supporting projects and programs are proposed to be implemented abreast or as a package with the five anchor priority projects. The supporting projects and programs proposed in this Study consist of the eight projects and programs and they can be categorized into three groups: (a) livelihood development for resettlers, (b) area economic development, and (c) institutional strengthening as follows:

### 1.1 Organization and Strengthening of Multi-purpose Cooperatives with Micro-lending Component

(1) Objective

The program aims to uplift the living standard of the resettled families through organizing multi-purpose cooperatives. The cooperative members will be given trainings on community organization, team building principles and practices, and project management.

(2) Project Description

Four hundred beneficiaries (200 each from the 2 sites) will be formed into cooperatives. They would be given organization and project management trainings, which will strengthen the cooperatives. The skills training using available community resources will also be given so that these materials can be productively utilized for their income generating projects. The program also hopes to give financial assistance in the form of loans to the members of the cooperative which they can use as seed capital for their livelihood projects.

(3) Beneficiaries

Target beneficiaries are cooperative members at Banquerohan and Anislag resettlement sites. There will be 400 direct beneficiaries (200 members in each site) at the start of the program.

(4) Expected Benefits/Outputs

1) The participants will be equipped with the basic knowledge and skills necessary to undertake standard cooperative activities.
2) The second phase will help the participants identify the resources available and will be provided with the necessary skills training.
3) The micro-lending finance will provide the participants seed capital for their own livelihoods.

(5) Conditions for the Project

1) Participants should be identified resettlers living in the two resettlement sites: Banquerohan (Legazpi City) and Anislag (Daraga Municiplaity).
2) The beneficiaries of the micro-lending scheme will have to be qualified members of the cooperative who have undergone all the pre-membership requirements of the CDA and all the trainings given.

(6) Project Linkages/Other Sector Linkages

1) DSWD – List of identified eligible resettlers for training
2) Cooperative Development Authority (CDA) – Procedure of cooperative establishment

(7) Estimated Investment Requirement (in 1999 prices)

| | | | |
|---|---|---|---|
| 1) | Trainings – 3 modules | : | PHP950,000 |
| 2) | Equipment for skills training | : | 50,000 |
| 3) | Micro-lending finance scheme | : | 1,000,000 |
| 4) | Administration cost | : | 600,000 |
| 5) | Total | : | 2,600,000 |

(8) Implementing Agency & Relevant Agencies

1) As implementing body, a cooperative is to be formed by the interest resettlers. LGU will act a leading agency and others as cooperating ones which include CDA, DSWD, DTI, TLRC, LBP, etc.

(9) Private Sector Participation

1) Bicol Small Business Institute Foundation, Inc. (BSBI)

## 1.2 Agro-industry Development Project

(1) Abaca Production and Handicraft Development

1) Rationale

The Bicol Region has been the center of abaca production and handicraft industry for many years until the advent of plastics and synthetic fibers. Cheaper and more durable plastics and synthetic materials flooded the market and the abaca started its decline from the 1970s. Because of this the price of abaca fiber plummeted and many abaca farms were abandoned and not taken cared of, causing a variety of diseases to destroy many farms.

After 20 years of synthetic material dominance in the world market, concerns for the destruction of the environment and concerns for the health are making many people avoid artificial materials and they are turning back to the use of more natural items. The demand for things made of natural fibers has risen in the recent years.

While the demand for abaca fiber-made materials may have risen, getting back the former share of the industry may be difficult for Bicol for the following reasons:

a. The skilled people during the height of the industry are either gone or very old now.
b. There is stiff competition with other countries, especially those less advanced than the Philippines, whose labor costs are cheaper, and also have their own raw material like jute, sisal, ramie, cotton, etc. Many Eastern countries provide substantial subsidies for handicraft manufacturers in their countries.
c. Handicraft items are being less and less regarded today as items for sale only to tourists but are now being incorporated into the items used for daily life. Constant research has to be done to be able to remain competitive.
d. Handicraft items like bags, slippers, etc., have become part of the fashion industry. They change constantly and manufacturers always have to be one year ahead. One item may sell like hotcakes today but be completely ignored the following year.

Abaca fiber has very peculiar characteristics different from other fibers. It will be very competitive compared with other materials or items a long as these characteristics are put into best use.

Abaca fiber is in fact becoming an industry with a great potential for growth in Bicol, and to provide ample employment for many poor people. But for the opportunity to become a reality, there is a need to provide support to the handicraft makers, not only in terms of financial capitalization, but also in terms

of constant market information and research on fashion trends, designs, new materials, and coloring.

There is therefore a need to establish a center where:

a. People can train and work at the same time,
b. Industry information can be compiled,
c. Research about new styles and material combinations can be done, and
d. Interested buyers or customers can always visit.

2) Objectives

a. Primary Objective:

The project is intended to provide the resettlers a livelihood to improve their living standard. It is designed to produce handicrafts using local quality abaca materials to provide stability for the agro-based industry to be set up. This handicraft production will provide the resettlers additional household income.

b. Secondary Objective:

The secondary objective is to develop a handicraft center that could serve as a training and research venue for the public.

3) Project Background

a. Production

Abaca or Manila hemp, as it is known in international trade is endemic in the region. About 84% of the world's supply of abaca come from the Philippines. Most of these come from the Bicol Region, and other provinces in the Visayas and Mindanao. On the annual average, Albay produces more than 980,000kg of abaca, planted to about 4,500 hectares of land.

Abaca is planted in cool and shady areas, like under existing coconut plantations. The distance between coconut trees should not be closer than 10 meters. Care should be taken that the areas planted are not waterlogged during the rainy season. Most abaca farmers do not use synthetic fertilizers, thereby, maintaining the natural soil ecosystem and minimizing pollution of the ground water.

In the Study Area, farmers are actively involved in abaca-based livelihood activities. Harvesting, hauling, and stripping are male-dominated activities,

while planting, sorting, and drying are shared by both men and women. Women handle most of the marketing transactions.

The native varieties of abaca produce 1,800kg of fiber per hectare per harvest. Harvesting in abaca plantations is done three times a year. The farm gate price of this fiber is PHP40 per kilogram. The market price of fine texture abaca is PHP100 per kilogram. Costs of plantation establishment, maintenance, processing and other materials used for a one hectare plantation amount to PHP35,000 on the first year. The estimated net income is realized at its second year of operation.

b. Processing

After harvesting, fiber extraction takes place. The processes involved are tuxying, pre-stripping, test run, and stripping. Stripping can be done in two ways, the traditional method (hand stripping), or semi-mechanized (spindle-stripping). The spindle machine can strip faster with fewer pulls, thus, producing more tuxies. It is processed into fibercrafts, cordage, textiles/ fabrics, nonwovens and disposable, pulp and specialty papers like currency notes, cigarette paper, meat and sausage casings, teabags, stencil paper, hi-tech capacitor and other specialty papers.

Drying and sorting takes place after stripping. The fibers are sun-dried or air-dried for one day in open areas. The fibers are sorted and twined. Abaca fibers can be made into sinamay, bags, placemats, slippers, hammocks, hand made paper, and other handicrafts.

4) Handicrafts

Bags, hammock, slippers, placemats are some of the handicrafts made from abaca. The production of these handicrafts has been financial rewarding. These handicrafts items are favorite give-aways and gifts to friends and visitors/tourists, hence local demand is always there. Abaca handicrafts are exported to countries like Japan, USA and the United Kingdom.

Prices of these handicrafts vary according to size and style. Production of bags can generate an estimated annual net income of PHP297,000 equivalent to about PHP24,773 a month for the sale of 12,960 pieces of bags pegged at PHP60/bag. On the other hand, hammock making can generate a net income equivalent to about PHP13,770 a month.

5) Demand and Markets

As recent concerns for environment and the rising demand for natural fibers have increased the demand for natural fiber handicraft, abaca has nowadays vast economic potentials. Fibers extracted from abaca stalks are the strongest among natural fibers and can be substitutes to synthetic-based nylon, plastics, and other non-biodegradable materials. The major buyers of abaca fibers are local processors and manufacturers of pulp, cordage, and fibercrafts. They get more than 60% of the total volume of fibers produced in the Philippines. Small abaca craft makers sell their products to wholesale buyers, while those with bigger capital bring them to market centers for higher selling price.

6) Project Components

a. Conditions of the Project

- A tie up with Bicol University or farmer cooperators may be necessary for the establishment of about 20-ha abaca plantation farm to supply the center with raw materials.
- Personnel to temporarily run the center for the initial two years should be detailed from the LGU, DTI, TESDA, and FIDA.
- A building of about 1,000$m^2$ with offices, weaving and training room, storage room, laboratory room , and hand made paper de-pulping and working rooms is required. A productivity center and equipment are needed for handicrafts production.
- The project should be a joint undertaking between the LGU, FIDA, DTI, and the cooperative. The initial expenses for running the center should be shouldered by the concerned government.

b. Main Activities of the Project

The project will link with the Department of Agriculture (DA) through the Fiber Development Authority (FIDA), Department of Science and Technology (DOST), Department of Trade and Industry (DTI), and Technical Education and Skills Development Authority (TESDA) in the establishment of the Training Center.

The main activities of the project are:

- Providing employment to relocation center residents through sub-contracting work either done at the center or done at their own houses.
- Marketing

- Research Tie Up with Bicol University or DOST
- Training Programs

c. Productivity Center for Abaca Handicrafts and Handmade Paper

The center will be a mini-factory which will link with exporters who would buy the products produced at the center and provide continuous information for product development. At the same time, the center will be a training area for weaving, dyeing, and handicraft making not only for the relocated families but also for other areas of the Albay Province.

Raw Materials and Products

In addition to the souvenir handicrafts made of abaca fibers, its fibers will be processed to make hand made paper. Abaca is one of the most commonly used base materials for producing handmade paper. In case of shortage in raw materials, this handmade paper could be sourced from salago, pina, agricultural wastes like banana stalks, rice straws, bagasse, corn husk, indigenous plants like cogon grass, water lily, talahib, nipa, bamboo, and mulberry barks, and semi-processed materials like pulp and used paper. Handmade paper is converted into bags, picture frames, stationeries, fans, wall decors, wall frames, and other finished products.

Expected Benefits/Outputs

Harvesting of abaca plant is between 3 to 5 years. Initial harvest will give the farmer an estimated net income of PHP30,000 for a one hectare farm. Handicrafts made of abaca will be exported to abroad.

Paper making out of abaca can generate and annual revenue of PHP673,920 with an annual production cost of PHP225,470, deriving a monthly net income of approximately PHP37,000.

7) Cost and Return Analysis of Abaca Utilization

a. Handmade Paper from Abaca

| Items | Value (in Pesos) | Total Value (in pesos) |
|---|---|---|
| 1. Annual Revenue | | **673,920.00** |
| Sale of 3,120 (8" x 14") pcs./month x P18/pc x 12 month | | |
| 2. Annual Production Cost | | **225469.88** |
| - 312kg of fiber x P120/kg | 6,240.00 | |
| - Water P715/mo x 12 months | 8,580.00 | |
| - Electricity P400/mo x 12 months | 4,800.00 | |
| - Fuel (LPG) at P680/mo x 12 | 8,160.00 | |
| - Laborers P13,520/mo x 12 | 162,240.00 | |
| - Gauze mask P100/mo x 12 | 1,200.00 | |
| - Chemicals P623.74/mo x 12 | 7,484.88 | |
| - 2 pcs. Formica sheet (4' x 8') | 450.00 | |
| - 2 pcs. Plywood (4' x 8' ) @ P250 | 500.00 | |
| - 5 pcs. Cooking containers @ P500 | 2,500.00 | |
| - 5 pcs. Wire screen (0.16mm mesh @ P500 | 2,500.00 | |
| - 10 pcs. Basin @ P150 | 1,500.00 | |
| - 10 pcs./mold & deckle @ P350 | 3,500.00 | |
| - 750 sacks cheese cloth @ P7/pc | 5,250.00 | |
| - 5 pcs. Roller @ P150 | 750.00 | |
| - 15 pcs. Sponge @ P5 | 75.00 | |
| - 1 unit weigh scale (10kg) | 500.00 | |
| - 5 pcs. Cutter @ P200.00 | 1,000.00 | |
| - 1 pc. Measuring spoon | 40.00 | |
| - 15 pcs. kettle (5L) @ P150 | 2,250.00 | |
| - 5 pcs. Pail (30L) @ 300 | 1,500.00 | |
| - 110 doz. Clips @ P5 | 550.00 | |
| - 100m. nylon rope @ P20 | 2,000.00 | |
| - 10 pcs. Rubber gloves @ P75.00 | 750.00 | |
| - Depreciation (10% of fixed investment) | 1,150.00 | |
| 3. Fixed Investment | | **11,500.00** |
| - 1 unit disintegrator | 4,000.00 | |
| - 10 pcs. Tables @ 750 | 7,500.00 | |
| 4. Net Return | | **448,450.12** |
| Annual revenue | 673,920.00 | |
| Less: Annual Production Cost | 225,469.88 | |
| 5. Return on Fixed investment | | **38.99** |
| Net Return | 448,450.12 | |
| Fixed Investment | 11,500.00 | |
| 6. Return on total investment | | **1.89** |
| Net return | 448,450.12 | |
| Fixed investment + production cost | 236,969.88 | |

Source: FIDA/DA

b. Bag Making

| Items | Value (in Pesos) | Total Value (in Pesos) |
|---|---|---|
| 1. Annual revenue | | **777,600** |
| - 12,960 bags at P60/bag | | |
| 2. Annual production cost | | **480,320** |
| - Labor (P10/bag) | 129,600 | |
| - Materials (P27/bag) | 349,920 | |
| - Depreciation Cost | 800 | |
| 3. Fixed Investment | | **8,000** |
| - Sewing machine (10 years life span) | | |
| 4. Net Income | | **297,280** |
| - Annual revenue | 777,600 | |
| - Less : Annual production cost | 780,320 | |
| 5. Return on investment | | **0.619** |
| - Net Income | 297,280 | |
| - Production Cost | 480,320 | |

c. Hammock Making

| Items | Value (in Pesos) | Total Value (in Pesos) |
|---|---|---|
| 1. Annual revenue | | **501,840** |
| - 6,120 pcs at P82/Hammock | | |
| 2. Annual production cost | | **336,600** |
| - Labor cost/hammock (P25/pc) | 153,000 | |
| - Material Inputs | 183,600 | |
| 3. Net Income | | **165,240** |
| - Annual revenue | 501,840 | |
| - Less : Annual production cost | 336,600 | |
| 4. Return on investment | | **0.49** |

d. Benefit-Cost Analysis of One-hectare Abaca Farm

(Unit : PHP)

| Item | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total |
|---|---|---|---|---|---|---|
| 1. Estimated Fiber Yield * | - | 855 | 1,639 | 2,375 | 2,969 | 7,838 |
| Price – P40/kg | | 34,200 | 65,560 | 95,000 | 118,760 | 313,520 |
| 2. Production Cost | 24,725 | 26,975 | 35,990 | 46,435 | 59,903.25 | 181,918.25 |
| 3. Net Income | (24,725) | 7,225 | 29,570 | 48,565 | 58,856.75 | 131,601.75 |

Assumptions:
1) Price per Kilogram – P40/kg.
2) Production cost (inputs) to increase at 15% every other year
3) Source of materials for replanting on the 4th year within the area
4) Potential Yield Per Hectare

| Year | Ave. Harvestable Stalks | | Ave. Wt. Of | Ave. Fiber | Yield (kg) |
|---|---|---|---|---|---|
| 1 | 0 | - | 0 | 0 | 0 |
| 2 | 1 | 2,500 | 18 | 1.9 | 855 |
| 3 | 1.5 | 3,750 | 23 | 1.9 | 1,639 |
| 4 | 2 | 5,000 | 25 | 1.9 | 2,375 |
| 5 | 2.5 | 6,250 | 25 | 1.9 | 2,969 |

Source: FIDA/DA

The estimated cost of production & maintenance of 1ha abaca farm is given in Table XXIII 1.1.

(2) Pili Nut Processing

1) Objectives

a. Primary Objective

The project aims to provide employment opportunities to the residents of the resettlement sites. They would be assured of a stable additional household income. The productivity center will provide the much-needed space and shelter for production of pili finished products.

b. Secondary Objective

The project aims at developing a model factory with standardized packaging and preparation methods which can be adopted by the industry, and also serve as a training venue for the region.

2) Project Background

a. Production

Pili is an indigenous tree with varied uses, especially its nut. Commercial production and processing of pilinut kernel for food is done only in the Philippines. Pili tree grows abundantly in the Bicol Region.

The pili tree can thrive over a wide range of soil types and climatic conditions. The tree grows best in areas with rainfall evenly distributed throughout the year. It grows best in sandy loam soil high in organic matter at fairly low elevations ranging from sea level to 400m above sea level. Pili could be planted either by using seeds for seedlings or by grafting. Seeds germinate 30-45 days from sowing.

Grafting is preferred by some over seedlings because it ensures the production of quality fruits in lesser time, but grafted seedlings produce smaller trees. The pili tree bears fruits six to seven years from seedlings and three to four years from grafting. Harvest season begins in May and ends in September with July as the peak month. The fruits are harvested when their pulps are purplish black. Some pili trees planted from seedlings may not bear fruits on the sixth year. These are probably male trees. They could be used to produce various woodcrafts.

In the plantation, weeding and fertilization are done by women, while in land preparation, men do the planting and hauling. Harvesting, processing, and marketing of pilinut products are usually done by women. It also involves children who assist in the processing, while not in school. A farmer will need PHP10,300 as initial capital for pili plantation establishment if he chooses to use grafted seedlings.

Government Intervention

With the realization of the implementation of the GATT, the government realized that it needs to develop products that the Philippines has a competitive edge in the world market today. Pili nut has been identified as a commodity that the country can have a competitive edge in. For the past five years, the Department of Agriculture (DA) and Bicol University College of Agriculture and Forestry have been producing and distributing pili nut seedlings for planting all over the region. An estimated 600,000 seedlings have been distributed so far, and there is a continuing effort to continue the project.

b. Processing

Albay is well known for its delicious and nutritious pilinut delicacies. Processing of pilinut kernel for delicacies provide additional income to farmers, as well as provide much needed livelihood to processors.

Pili confectioners are included in the list of promising industries in the Philippines. Delicacies from pili are exported to the United States, Canada, Australia, and Guam. A total of US$1,182 was exported in 1991-1992, but more was reported beginning 1993, for the demand has grown steadily over the years.

Pili nut kernels are made into mazapan, turones, pastillas, suspiros, molido, pili spread, pili nut brittle, crispy pili and sugarcoated pili. These products are a favorite “pasalubong (souvenir)” by local and foreign tourists. The prices of these delicacies vary according to the processed food. Pili delicacies are produced/processed form the kernels. Whole pili kernels with intact seed coat are roasted and packed. They are sold either by plastic bags or by plastic jars.

The spilit kernels are mixed in thick syrup until covered with white sugar coating. They are then glazed or coated with sesame seeds. When cooked, these are packed and labelled/sold like crispy pili, carmelitos, conserva, and sugarcoat pili.

c. Resources for Livelihood Development

Pili is a very good crop for multi-farming. It is compatible with coconut and other fruit trees if proper distancing is maintained. The establishment of a pili plantation not only provides livelihood opportunities to farmers and entrepreneurs but also fast track the re-greening program of the government. The tree is an attractive, sturdy, and highly resistant shelter belt against winds that makes it a good reforestation specie.

The processing of pili poses no problem to the environment. The water used in depulping can be used for watering plants while the extracted pulp can be used as animal feeds and the excess pulp is food material for compost. The pulp is used as a nutritive delicacy, eaten as vegetable or sweetened as dessert, while the shells are made into fashionable handicraft items. The seed coat is used for animal feed while the trunk can be made into woodcraft. The branches and twigs are excellent for charcoal and fuel wood, the resin has many industrial uses and the kernel is prepared into various confectioneries and snack food.

Pili production, processing and utilization of tree parts and fruits provide significant employment to farmers, fruit gatherers, processors and handicraft makers. Pili provides food, livelihood, and income to both poor and rich people.

d. Marketing and Prices

Income derived from pili depends on the products sold and marketing scheme employed. Grafted seedlings sell at PHP40 per piece while seedlings sell at PHP7 per piece. Farmers can venture in planting stock production and derive income early enough to further production either in fruits or processed products.

Farmers and traders sell pili in unshelled or depulped form in sacks. Some sell in raw or kernel forms. There are two marketing practices employed by the buyers; pick-up and delivery. Wholesalers use a passenger jeepney in picking up or buying pilinuts from farmers.

Raw and unshelled pilinuts are bought by kilogram or by piece while shelled kernels are bought by kilogram or by the “ganta”. During peal season, raw or depulped pilinuts cost PHP20 to 25 per hundred, at farm level. Traders or processors buy them at PHP20 to 21 per hundred. During lean months, raw or depulped pilinuts are bought at PHP35 to 45 per hundred at farm level and

sold at PHP50 to 70 in the market. Kernels are bought at PHP 170 to 200kg on peak months and at PHP250 to 300 on lean months.

3) Project Components

a. Conditions of the Project

- Land area is needed for plantation.
  - In the buffer zone proposed to be installed surrounding the sabo facilities, pili trees will be planted for both the environmental conservation of the area and agro-forestry development of the community.
- Skills training and seed capital for livelihood are required.
- Productivity center with processing equipment is needed.

b. Productivity Center for Pilinut Processing

The project will link with the Department of Agriculture (DA), Department of Science and Technology (DOST), Department of Trade and Industry (DTI), and Technical Education and Skills Development Authority (TESDA) in the establishment of a Training Center.

The center will be a mini-factory which will link with exporters who would buy the products produced at the center and provide continuous information for product development. At the same time, the center will be a training area for pili tree production and nut processing not only for the relocated families but also for other areas of the Albay Province.

c. Expected Benefits/Outputs

Harvesting of pilinuts is realized on the 6th to 8th year. Harvests of 1 hectare pili plantations will give an estimated annual net income of PHP50,000. Processing of pili into various handicrafts and food will give substantial and stable income to the whole members of the family.

4) Cost and Return Analysis

a. Pilinut Molido – Special (1 kilo Pilinut Utilization)

| Item | Value (in Peso) | Total Value (in Peso) |
|---|---|---|
| 1. Revenue (150 pcs. x P2.20 each) | | **330.00** |
| 2. Production Cost | | **280.00** |
| - Pilinut kernel (1kg) | 185.00 | |
| - Milk | 40.00 | |
| - Sugar | 9.00 | |
| - Cellophane | 6.00 | |
| - Fuel | 10.00 | |
| - Labor | 30.00 | |
| 3. Net Income | | **50.00** |

Source: Department of Agriculture (DA)

b. Benefit-Cost Analysis for One-hectare Pili Plantation using Grafted Seedlings

(Unit : PHP)

| Items | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 |
|---|---|---|---|---|---|---|
| 1. Revenue | | | | | | |
| - Production (# of nuts) | | | 78,000 | 97,500 | 121,875 | 234,000 |
| - Price (P0.25/pc) | | | 19,500 | 24,375 | 30,469 | 58,500 |
| 2. Production Cost | 10,302 | 975 | 2,759 | 2,883 | 3,360 | 4,744 |
| - Planting Stock – 163 pcs x P40/pc | 6,520 | | | | | |
| - Trucking/Hauling | 300 | | | | | |
| - Clearing & Weeding (4 mandays) | 600 | | | | | |
| - Staking & Hole digging (4 days) | 600 | | | | | |
| - Outplanting (5 days) | 750 | | | | | |
| - Replanting (0.5 day) | 75 | | | | | |
| - Ring weeding w/cultivation (2 days) | 300 | | | | | |
| - Pruning (0.5 day) | 75 | 75 | 75 | | | |
| - Fertilization (4 days) | 600 | 600 | 600 | 600 | 600 | 600 |
| Materials : | | | | | | |
| - Stakes (P 0.50/pc.) | 81.50 | | | | | |
| - Bolos | 100 | | 100 | | 100 | |
| - Fertilizers (10 sacks organic) | 300 | 300 | 300 | 300 | 300 | 300 |
| - Plastic straw (P25/roll) | | | 390 | 488 | 609 | 762 |
| - Harvesting – 3 days | | | 450 | 450 | 450 | 600 |
| - Bagging – 1 manday/20 sacks | | | 234 | 291 | 364 | 702 |
| - Hauling transport (15/sack) | | | 585 | 729 | 912 | 1,755 |
| 3. Net Income | (11,202) | (1,275) | 16,741 | 21,493 | 27,108 | 53,756 |

Assumptions:
1) Spacing – 8m x 8m or 156 grafted seedlings
2) Mortality – 5% or 7 grafted seedlings for replanting
3) Cost of grafted seedlings – P40/pc
4) Wage/day – P150
5) First harvest – 3rd year
6) Harvest/tree – 500 nuts/tree (25% increase in harvest/tree/year)
7) 2,000 nuts/sack
8) Bagging – 20 sacks/day

Source: Department of Agriculture (DA)

The benefit-cost analysis for 1ha pili plantation is shown in Table XXIII 1.2. Data on pili population, production and value are given in Tables XXIII 1.3 and XXIII 1.4.

(3) Coco Coir Production

1) Objectives

a. The project aims to generate employment opportunities for the resettled people by developing labour-intensive industry in or around the resettlement sites by making the most use of the indigenous local products or coconut husks.
b. To develop a model training facility in coconut coir manufacturing which can be duplicated in other parts of the region

2) Project Background

The Philippines is the biggest producer of coconut in the world today. It is the biggest exporter of copra and copra oil in the world with a total share of 68% of the products exported to Europe and North America (PCA, Annual Report, 1997). Unlike India and Sri Lanka, however, the Philippines do not have a developed coconut fiber industry to match its coconut production. It is estimated that the country produces about 11 billion coconut husks and only approximately 30% are being used as fuel for copra making. Almost all the rest of the coconut husks are burned.

In the context of regional development and poverty alleviation, the development of the coconut fiber industry is very important for the following reasons: With 648,739 hectares devoted to coconut plantation and with 253,226 farmers, the coconut industry covers practically 72% of the regional cultivated areas of 895,087 hectares. It therefore dominates the agriculture industry in the region (Regional Council Report, Feb. 1997). The coconut farmers comprises the biggest poverty group in the Bicol Region with about 70% of the families falling below the poverty line (Poverty Survey, NEDA, 1989). The country has an edge in the coconut industry because of the existing plantations.

Coconut husks, the main raw material for the project are only regarded as wastes and burned. Because of its large volume, the effect on the economy on its transition from waste to a raw material for an industry would be big. There is a growing interest and demand in the world for natural fibers for environmental concerns. Coconut fiber is the cheapest natural fiber in the world today. The greatest volume of farm waste in Bicol Region including the Study Area consists of coconut husks. Almost 2.4 billion of husks per year are gathered from the

674,400ha of coconut land in the region. In Albay Province, 95,800ha (49%) out of the total area is devoted to coconut in 1996, and more than 45,000 farmers are engaged in coconut production.

Using coconut husks for coconut fiber production is ecologically advantageous as it would minimize accumulation of farm wastes, reduce harmful burning of husks and floating debris in coastal areas, as well as, reduce the clogging effects on drainage systems.

3) Production

a. Raw Materials:

Bicol Region produces 1.4 billion coconut husk wastes which are just generally burned. Bicol Region is one of the biggest producers of coconuts in the country today. For every 7 coconut husks, one kilo of coconut fiber and 2 kilos of cocopeat can be produced. Albay alone have an available 211 Million coconut husks even after producing copra. The available supply can produce 30,000 tons of coconut fiber and 60,000 tons of cocopeat. The project only produces a total of 2,000 tons of fiber and about 4,000 tons of cocopeat. Enough for the vicinity of 2nd and 3rd districts to supply. Bicol Region produces 1.4 billion coconut husk wastes which are just generally burned.

b. Processing

Coir is obtained from the husk of the coconut. The husks contain about 30% fiber and 70% coir dust. Of the extractable fiber, 40% is bristle fiber and 60% are mattress fiber. Fibers and coir dust from the coconut husks can be made into: brushes, ropes, twines, yarns, carpets, rugs, doormats, plant pads, growing medium for plants, soil mulches, conditioner, fertilizers, bed mattresses, upholstery cushions, car seat stuffing, caulking materials for boats, insulation materials, particle boards, pelletized fuel, and geo-textile nets. These ventures can provide farmers with additional income aside from copra and lumber production.

Coconut fibers, owing to their durable quality, are sold to furniture manufacturers for use as cushion materials. They are also used for making carpets and doormats among handicraft makers. Furthermore, coconut fibers can be sold to boatmakers for use in boat construction, especially in plugging joints and in between woods to prevent leakage. Stitching factories buy raw coco-fibers as stitching materials for bed mattresses.

c. Resources for Livelihood Development

Coconut fibers are cheap and environmentally friendly materials for controlling riverbank erosion. Being porous in nature, it allows free exchange of water between rivers and adjacent field, recharging ground water, long lasting drainage and flood control measure. Furthermore, since cocopeat (coconut coir dust) are food materials for seedbeds for vegetables and tree seedlings, they could reduce dependence on expensive chemical fertilizers.

However, caution should be observed since large volumes of fresh coconut husk usually release brownish tannin or dissolved organic substances especially in stagnant water. Soaking of husks while inside fences in rivers can control this. Coir dusts could cause health problems among workers. Workers should then use face masks while working.

d. Marketing and Prices

Concerns for the environment has led many countries to shift from synthetic materials to natural materials. The following are the recent developments which make coconut coir in demand in the world market.

4) Erosion Control

Intensive construction activities in the world have given rise to more areas being opened for construction, especially in the uplands. This causes erosion problems and a more recent technology, called Bio-Engineering has become popular and heavily uses coconut fiber products to control erosion and enhance vegetative growth protection for eroded areas.

In North America alone, it is estimated that the erosion control industry is about US$2.5 billion a year. Current estimates put about 7% of the amount, or around US$175 million has been allocated for coconut or jute erosion control materials. The actual demand, however, is about 20% or US$500 million. The traditional supplier, India and Sri Lanka could no longer supply the demand so the market still relies on synthetic fibers (International Erosion Control Assoc. Report, 1997).

5) Building Materials/Furniture and Beds

Synthetic and asbestos insulation materials have mostly been gradually decreased recently because of health and environmental concerns. Many European countries, particularly Netherlands and Germany have started to adopt coconut fiber as an

alternative. Rubberized or needle-punched coconut fiber materials are being used, although a little bit more expensive than rock wool and other materials.

Europe now currently imports about 73,000 tons of various coconut fiber products from India and Sri Lanka and valued at about US$120 million (Coconut Coir Board Annual Report, Sri Lanka 1996). It is estimated however that the actual figures are only 15% of the demand.

6) Cocopeat for Horticulture, Agriculture, and Gardening

The best development in the coconut fiber industry is the discovery of coconut fiber dust as very good soil conditioner, even better than peat moss. The trading for cocopeat therefore rose from almost none in the 1970's to almost 150,000 tons in 1996 (Coconut Coir Board Annual Report, Sri Lanka). The current demand for the product, because of the decline in peat moss supply, is about three times of what is being traded today.

In spite of its vast resources, there is practically no coconut fiber industry in this country.

Local market demand for fiber is high in November and December. Abroad, coco-fibers are sold to car seat manufacturers, bio-engineering companies and erosion control companies that use coco-fibers to make geo-textile nets for coastal use, area rehabilitation, and erosion control.

European countries and Japan make use of coconut coir dust (cocopeat) in cutflower production. By year 1998, the total exports reached more than US$217 million, with Japan, USA, and Singapore cornering the large market.

7) Project Components

a. Conditions of the Project

A productivity center with the manufacturing facilities and equipment, together with the basic infrastructure development, coupled with skills training is very important.

b. Productivity Center for Coco Coir Production

The project will link with the Department of Agriculture (DA) through the Philippine Coconut Authority (PCA), Department of Science and Technology (DOST), Department of Trade and Industry (DTI), and Technical Education and Skills Development Authority (TESDA) in the establishment of the Training Center. The center will be a mini-factory

which will link with exporters who would buy the products produced at the Center and provide continuous information for product development. At the same time, the center will be a training area for pili tree production and nut processing not only for the relocated families but also for other areas of the Albay Province.

8) Expected Benefits/Outputs

The cost of producing fiber and coir dust from coconut husks is about PHP13,400 per year. However, it can give as much net income as PHP10,000. This product can further be processed into ropes, twines, and geo-textile nets.

9) Cost and Return Analysis

a. Cost of Coconut Husk Processing by Mechanical Method

| Items | Value (in Pesos) | Total Value (in Pesos) |
|---|---|---|
| 1. Required Investment | | **995,000** |
| - Decorticating machine | 245,000 | |
| - Truck | 300,000 | |
| - Operating & storage sheds | 150,000 | |
| - Baling machine | 150,000 | |
| - Compacting machine | 150,000 | |
| 2. Production (for 8,000 coconut husk/day @ P0.5/husk) | | **18,425** |
| - Decorticated fiber output 1,600kg/day at P5/kg | 8,000 | |
| - Coconut coir dust output 375 sacks /day at P15/sack | 5,625 | |
| - Estimated total production/overhead/operational cost per day | 4,800 | |

## b. Cost and Return Analysis for Fiber and Coir Dust Production

| Items | Value (in Pesos) | Total Value (in Pesos) |
|---|---|---|
| 1. Annual Revenue | | **23,400** |
| - Production/year | | |
| Fiber : 9kg/day x 312 days x P5/kg | 14,040 | |
| Coir dust : 2 sacks/day x 312 days x P15/sack | 9,360 | |
| 2. Annual production cost | | **13,400** |
| - Materials | | |
| 50 husks/day x P0.05/husk x 312 | 780 | |
| Wooden Mallet | 100 | |
| Weighing scale | 150 | |
| Sacks | 500 | |
| Shovel | 120 | |
| Knife | 50 | |
| - Labor (1 person) | | |
| Fiber : P2.50/kg x 9kg/day x 312 | 7,020 | |
| Coir dust : P7.50/sack x 2 sacks x 312 | 4,680 | |
| 3. Net Income | | **10,000** |
| 4. Return on total investment | | **0.75** |

Assumptions:
1) One person can manually pound 50 coconut husks/day.
2) Fifty coconut husks can produce 9kg of fiber and 2 sacks of coir dust.
3) Selling price of fiber is P5/kg and coir dust is P15/sack.
4) Number of working days is 312.

## c. Cost and Return Analysis for Ropes and Twines

| Items | Value (in Pesos) | Total Value (in Pesos) |
|---|---|---|
| 1. Annual revenue | | 81,120 |
| - 1,300 meters/day x P0.20/m x 312 (each family earns P40,560) | | |
| 2. Annual production cost | | 55,500 |
| - Materials | | |
| Fiber : 9kg/day x P5/kg x 312 | 14,040 | |
| Knife, 2 pcs x P50/pc | 100 | |
| - Labor | | |
| 1,300m/day x P0.10/m x 312 (one family = P20,280) | 40,560 | |
| - Depreciation | 800 | |
| 3. Net Income | | 25,620 |
| 4. Fixed Investment | | 2,400 |
| - Two portable twinning equipment | | |
| 5. Return on fixed investment | | 10.68 |
| 6. Return on total investment | | 0.44 |

Assumptions:
1) Nine kg of fiber can produce 1,300m of two-ply twine coco fibers
2) Selling price of 1m coco fiber is P0.20.
3) Two families of a team of three can produce 1,300mof teo-ply twine a day or 650mper family.
4) Each family operates one pair of portable twinning equipment.
5) Number of working days is 312.

d. Cost and Return Analysis for Geo-textile Nets

| Items | Value (in Pesos) | Total Values (in Pesos) |
|---|---|---|
| 1. Annual revenue | | 429,000 |
| - Production per year<br>55sq.mnet/day x P25sq.m x 312 | | |
| 2. Annual Production Cost | | 327,306 |
| - Materials<br>80m(two-ply twine) /sq m x 55sq m x P0.20/meter<br>x 312 | 274,560 | |
| - Knife, 2 pcs @ P50/pc | 100 | |
| - Labor<br>P3/sq m x 55sq m x 312 | 51,480 | |
| - Depreciation<br>Weaving loom (P2,500/3 years)<br>Shed (P1,000/3 years) | 1,166 | |
| 3. Net Income | | 101,694 |
| - Annual revenue | 429,000 | |
| - Less : Production cost | 327,306 | |
| 4. Fixed investment | | 3,500 |
| - Weaving Loom | 2,500 | |
| - Shed | 1,000 | |
| 5. Return on fixed investment | | 29.06 |
| - Net Income | 101,694 | |
| - Fixed investment | 3,500 | |
| 6. Return on total investment | | 0.31 |
| - Net income | 101,694 | |
| - Fixed investment + production cost | 330,806 | |

Assumptions:
1) Eighty meters of cocofibers (two-ply twine or rope) can be women into one square meter of geo-textile net.
2) A team of two weavers can weave 55 square meters of geo-textile net a day (Dimension : 1mx 55m) or a total of 17,160 nets/year.
3) One square meter of geo-textile net is sold at P25sq.m.
4) Number of working days = 312.

## 1.3 Hollow Blocks Production

(1) Objective

The project is intended to provide employment to the unemployed resettlers and accomplish the following:

1) To provide for an immediate response to the financial requirements of the cooperative initiated livelihood projects and enhance their capabilities through income generating projects,
2) To create/sustained livelihood activities that will help in augmenting the family income and attain better quality of life, and
3) To increase the beneficiaries sense of self-worth and improve their status in the community.

(2) Rationale

Poverty alleviation in terms of job creation is one of the primary concerns of the government. However, lack of funds to meet such demand is a strong deterrent factor for people who wish to engage in livelihood activities for income generation.

The introduction of more programs that would yield modest income for the Mayon Volcano victims who were already resettled and/or to be relocated to the resettlement sites was part of the government strategy for economic development. One of the projects that could benefit these families is the “hollow blocks making”. The sand to be used for this making will be excavated inside the sabo facilities proposed in JICA Master Plan. The hollow blocks making will be then operated under a recycling scheme so as to ensure sound and sustainable O&M of the sabo facilities.

Manufacturing of hollow blocks is one of the profitable ventures in the country today. Initially, the project would service the resettlement site development projects with hundreds of houses and public facilities to be constructed. Eventually, it can cater to the requirements of development sites and nearby areas as well, with greater demand due to the increasing number of housing and industrial development projects. The investment would create employment opportunities for more than 1,000 beneficiary households.

A livelihood Productivity Center will also be put up in the project areas. The production will be undertaken continuously considering the requirement of other areas and the resettlers themselves for the continuous improvement of their dwelling units. Sample of products will be displayed in the Livelihood Productivity Center for access to other entrepreneurs.

(3) Target Beneficiaries

Members of the cooperative who are unemployed resettlers, and those residing in the neighboring barangays are the target beneficiaries. The cooperative will screen their beneficiaries based on the following qualifications.

1) Bonafide residents (or resettlers) in the resettlement sites
2) Willing to be relocated in the project area
3) Attended training conducted by the competent authorities/TESDA or with existing skills on hollow blocks making.

(4) Management Aspect

1) The cooperative will elect set of officers and Board of Directors.
2) The management of the Center will be undertaken by the cooperative.
3) Project implementation will be governed by policies/rules to be defined by the cooperative. Operation will be subjected to audit according to the rules of the cooperative.

(5) Market Aspect

The project will initially cater to around 1,000 houses and several public facilities to be constructed in both Banquerohan and Anislag resettlement development sites. Demand will continuously rise as a result of other housing projects that will be put up in nearby areas. The dwelling units at Phase I was designed with an area/space for expansion as derived by the occupant. Thus, this would create additional demand for the product.

Manufacturing Process: Hollow Blocks making process is as follows:

1) Prepare materials needed;
2) Mixed cement and sand with the use of shovel. Be sure that the mixing is thorough;
3) Pour water on the mixed cement and sand and stir it as sticky as possible to make it durable;
4) Pour mixed cement and sand in a mould and polish it to level;
5) Remove it from the mould by turning it upside down;
6) Place the wet hollow blocks in a shady place. After 24 hours, sprinkle it with water once a day for 5 days (This is called the “curing process”). This would help the hollow blocks stronger and durable. If there is no available shade, put a plastic and cover it for 5 days;
7) After 5 days, get it from the shade let it dry for 28 days; and
8) Comprehensive testing of the hollow blocks has a pressure of 500 PSI or pound square inch. Testing is crucial before selling it to contractors.

(6) Materials and Tools Needed

1) Cubic feet, measuring box (To be used for measuring the sand. This could be purchased from the foundry shop and/or hollow blocks manufacturer).
2) Galvanized mould measuring 4” x 8” x 16”
3) Tin pail (10 liters)
4) Shovel
5) Wheel barrow
6) Hollow blocks stand

(7) Budgetary Requirement

| | Quantity | Unit Price | Total |
|---|---|---|---|
| **Material** | | | |
| Measuring box | 10 pcs. | 250.00 | P2,500.00 |
| Galvanized mould (4" x 8" x 16") | 10 pcs. | 1,000.00 | 10,000.00 |
| Tin Pail (10 liters capacity) | 10 pcs. | 85.00 | 850.00 |
| Subtotal | | | P13,350.00 |
| **Tools** | | | |
| Shovel | 10 pcs. | 200.00 | 2,000.00 |
| Wheel barrow | 10 pcs. | 750.00 | 7,500.00 |
| Hollow blocks stand | 10 pcs. | 500.00 | 5,000.00 |
| Subtotal | | | P14,500.00 |
| **Supplies** | | | |
| Cement | 22,500 bags | 120.00 | P 2,700,000.00 |
| Sand (cubic meter) | 146/cu.m | 300/cu.m | 21,900.00 |
| Subtotal | | | P 2,721,900.00 |
| TOTAL | | | P 2,749,750.00 |
| 10% contingency | | | 274,975.00 |
| | | | **P 3,024,725.00** |
| **Personal Services** | | | |
| Honorarium for Project Officer | | | P 34,000.00 |
| Administrative Supplies | | | 8,800.00 |
| Transportation | | | 15,000.00 |
| Equipment/Typewriter | | | 31,500.00 |
| Subtotal | | | 89,300.00 |
| **GRAND TOTAL** | | | **P 3,114,025.00** |

(8) Participating Agencies

1) Cooperative Development Authority

- Provides funds for the capital of hollow blocks production;
- Promote the training program for the aforesaid project;
- Coordinates with the barangay officials/TESDA in the recruitment of manpower; and
- Linkages with other agencies and stimulates all possible types of assistance necessary for successful implementation of the program.

2) Technical Skills and Development Authority (TESDA)

- Purchases of materials in coordination with Cooperative Officer;
- Coordinates with city government to adopt measures necessary to ensure success of the program;
- Provides technical supervision on project implementation ; and
- Conducts evaluation of the program jointly with the cooperative.

3) Cooperative

- Manages the production;
- Screens applicants referred by CDA and TESDA
- Supervises the project
- Monitors the project
- Administers the entire selling of the products to contractors; and
- Records all incoming and outgoing communications relative to the production.

4) National Housing Authority

- Provides venue;
- Provides technical assistance in the preparation of proposal; and
- Provides technical assistance in project management.

(9) Supervision Scheme

To facilitate monitoring and supervision of the project and to establish accurate data, formal arrangement with the proponents shall be conducted by the Project Officer.

Project monitoring shall be done on a bi-weekly basis on the following aspects:

1) Keeps track of the project status/business flow as to:

- Employment generated
- Income earned (labor/entrepreneur)
- Volume of production
- Sales volume

2) Identification of problem areas

(10) Project Justification

Resettlement greatly affects the socio-economic situation of the families. They are dislocated from their jobs and their houses destroyed.

In the light of these situations, an economic intervention that is deliberate and developmental should be instituted. The Cooperative Development Authority, National Housing Authority and the Council will provide its economic intervention through a comprehensive and integrated delivery of a livelihood program that involves skills training with value formation and capital assistance. The need for providing capital assistance to the cooperative that will respond to the demand/needs to start the business.

To ensure recovery of the loan, a deed of undertaking will be signed by the Cooperative of Directors. The project is self-liquidating and self-propelling.

## 2. AREA ECONOMIC DEVELOPMENT PROJECTS

### 2.1 Aggregate Production Plant Project

(1) Objectives

Aggregate production plant project is one of the proposed projects for regional economic development to enhance and sustain disaster prevention capacity. The objectives of the Project are:

- To contribute to the development of regional economy through production and marketing the aggregates and
- To utilize the dredged materials for the maintenance of the proposed sand pocket as the goods for marketing so that a cost turns to be a benefit.

(2) Quality of Aggregate Materials

The physical properties of dredged materials are listed below together with those of others in Bicol Region

**Quality of Aggregate materials**

| Area | Materials | Fine Aggregate | | Course Aggregate | | |
|---|---|---|---|---|---|---|
| | | Specific Gravity | Absorp-tion (%) | Specific Gravity | Absorp-tion (%) | Abrasion Loss (%) |
| Albay (Around Mayon) | Volcanic | 2.30 | 4.00 | 2.25 | 4.92 | 50.64 |
| Albay (Other Area) | Non-Volcanic | 2.54 | 0.01 | 3.02 | 1.72 | 30.67 |
| Camarines Sur | Non-Volcanic | 2.55 | 4.04 | 2.48 | 2.10 | 31.70 |
| Camarines Norte | Non-Volcanic | 2.55 | 4.04 | 2.41 | 5.86 | 47.00 |
| Sorsogon | Limestone | - | 37.00 | 2.10 | - | - |
| Masbate | Limestone | - | 23.00 | - | - | - |

Note: Fine aggregate: less than 9.5m, Coarse aggregate: 9.5mm – 150mm

Source: "Report on Natural Occurring Materials Sources CY 1991, Region V, Bicol Region" DPWH, Bureau of Research and Standards (BRS)

The quality of the proposed dredged materials is not excellent but acceptable as aggregate for construction works.

(3) Present Aggregate Production

1) Present Annual Exploited Volume

There are several small to middle scale enterprises who quarry sand and gravel from the deposit sites of mud and debris flow. Their quarrying sites are located near the provincial road. Excavation and hauling are mostly manual and transportation by ordinary truck. There are only one middle scale quarrying company in Legazpi city. Its production capacity is 150 t/h. Present annual exploited volumes by grade are shown below.

**Present Annual Exploited Volume from the Slope of Mayon Valcano**

| River Basin | Sand (-9.5mm) ($m^3$) | Gravel (75-150mm) ($m^3$) | Boulder (150mm -) ($m^3$) | Mixed S&G ($m^3$) | Total ($m^3$) | (%) |
|---|---|---|---|---|---|---|
| 1. Yawa | 23,059 | 300 | 100 | 1,808 | 25,267 | 12 |
| 2. Pawa-Burabod | 1,047 | 630 | 499 | 4,301 | 6,477 | 3 |
| 3. Anoling, Budiao | 2,308 | 783 | 1,033 | 9,092 | 13,216 | 6 |
| 4 .Quirangay | 467 | 133 | 117 | 2,867 | 3,584 | 2 |
| 5. Ogsong, nasisi | 78,468 | 14,023 | 7,398 | 10,476 | 110,365 | 51 |
| 6. Buang | 267 | 342 | 367 | 653 | 1,629 | 1 |
| 7. Quinali (B) | 0 | 0 | 17 | 10,032 | 10,049 | 5 |
| 8. San Vicente | 2,717 | 1,250 | 800 | 2,617 | 7,384 | 3 |
| 9. Arimbay | 517 | 283 | 67 | 2,083 | 2,950 | 1 |
| 10. Padang | 6,150 | 1,283 | 1,967 | 5,500 | 14,900 | 7 |
| 11. Basud | 4,500 | 5,583 | 2,050 | 500 | 12,633 | 6 |
| 12 .Bulawan | 4,275 | 1,992 | 867 | 350 | 7,484 | 3 |
| Total | 123,773 | 26,604 | 15,280 | 50,279 | 215,936 | 100 |

Note: Date is averaged number from 1996 to 1998.

Source: Environment & Natural Resources Office, Albay (ENRO)

The sand and gravel thus produced have been used in the construction works in and around the Study Area as aggregates although some have been transported up to Naga City. The demands in and around the Study Area are expected to be far beyond the supply.

2) Mining Concession

Environment and Natural Resources Office, Albay (ENRO), has controlled mining concession. One who exploits the aggregate is to pay tax in proportion to the exploited amount in accordance with the list shown below.

**Tax Rates Imposed on Exploitation**

| Kinds of Materials | Size of material (mm) | Tax for Extraction (peso/$m^3$) |
|---|---|---|
| - Sand | less than 9.5 | 8 |
| - Gravel | 9.5 – 150.0 | 19 |
| - Boulder | more than 150.0 | 12 |
| - Mixed sand and gravel | mix of sand and gravel | 6 |
| - Pebble (limestone, used for wall facing) | ±30mm | 50 |

(4) Demand Forecasting

1) Annual demand forecasting by Project

a. LGU Level Project

The municipalities of Tabaco, Malilipot and Sto. Domingo have the following development plans:

Tabaco : Tabaco Reclamation and Development Project
Malilipot : Malilipot Local Government Unit Complex
Sto. Domingo : Basud River Flood Control Project (Operation & Management)

The aggregate demands for the projects are assumed as follows:

**Aggregate Demand of LGU Level Project**

| Municipality | Item | Implementation Period (year) | Quantity ($m^3$) |
|---|---|---|---|
| 1. Tabaco | Reclamation | 10 | 8,800,000 |
| 2. Malilipot | Reclamation | 5 | 12,000 |
| 3. Sto. domingo | Reclamation | 5 | 440,000 |
| Total | - | - | 9,252,000 |

b. Provincial Level Project

NEDA has the "Master Plan for the Legazpi-Iriga-Naga-Daet Growth Corridor Project/Program". Infrastructure components of the projects are contemplated below.

**Provincial Level Project**

| Project Title | Implementation Period (year) | Aggregate Quantity ($m^3$) | Cost Amount (PHP) |
|---|---|---|---|
| 1. Improvement of Legazpi Port | Phase I (10 year) | 13,440 | 84 Million |
| 2. Completion of Quirino Highway | Phase I (10 year) | 78,575 | 210 Million |
| 3. Construction of Sipocot Transport Terminal | Phase II (20 year) | 7,200 | 45 Million |
| 4. Construction of Ligao Transport Terminal | Phase II (20 year) | 6,080 | 38 Million |
| 5. Improvement of Roads in urban Growth Centers and Tourism Areas | Phase II (20 year) | 296,340 | 790 Million |
| 6. Improvement of Tabaco Port | Phase II (20 year) | 8,000 | 50 Million |
| 7. Bicol River Flow Control and Development Project | Phase II (20 year) | 1,000,000 | 5 Billion |
| Total | | 1,409,635 | 6.217 Billion |

The aggregate demand is not identified yet.

c. DPWH Road Network Plan

DPWH has road development plan in the Bicol region. The estimated demand for sand and gravel for the plan is assumed as follows.

**Future National Road Network Plan in Bicol Area**

| New Road and Road Extension (km) | Concrete (30%) | Asphalt (20%) | Gravel (20%) | Total |
|---|---|---|---|---|
| Bicol Area | 163.58 | 39.87 | 70.81 | 274.26 |
| Sand and Gravel Volume ($m^3$) | Concrete | Asphalt | Gravel | Total |
| Bicol Area | 367,237 | 56,456 | 100,267 | 523,960 |

Note: Estimated Project Period = 10 years
Source: DPWH Region V and JICA Team

d. Sabo Works around Mayon Volcano proposed in the JICA Study

The proposed sabo projects are the substantial consumer of sand and gravel as follows:

**Aggregate Volume for the Sabo Works around Mayon**

| River Basin | Sabo Dam | | Dike | | Total Aggregate Volume to be needed ($m^3$) |
|---|---|---|---|---|---|
| | Length (m) | Volume ($m^3$) | Length (m) | Volume ($m^3$) | |
| Pawa-Burabod | 450 | 30,420 | 600 (A)<br>4,075 (B)<br>375 (C) | 18,456<br>214,508<br>22,496 | 285,880 |
| Anoling, Budiao | 650 | 43,940 | 1,725 (A)<br>1,800 (B) | 53,061<br>94,752 | 191,753 |
| Quirangay | 350 | 23,660 | 950 (A)<br>700 (B) | 29,222<br>36,848 | 89,730 |
| Masarawag | 100 | 6,760 | 1,250 (A)<br>2,050 (B)<br>1,050 (C) | 38,450<br>107,912<br>62,990 | 216,112 |
| Buang | 0 | 0 | 1,150 (B) | 60,536 | 60,536 |
| San Vicente | 700 | 47,320 | 1,950 (A)<br>4,250 (B) | 59,982<br>223,720 | 331,022 |
| Padang | 350 | 23,660 | 3,950 (A)<br>600 (B) | 121,502<br>31,584 | 176,746 |
| Buang | 0 | 0 | 1,150 (B) | 609,536 | 60,536 |
| Basud | 350 | 23,660 | 2,500 (A)<br>500 (B)<br>2,000 (C) | 76,900<br>26,320<br>119,980 | 246,860 |
| Bulawan | 0 | 0 | 1,350 (B)<br>3,050 (C) | 71,064<br>182,970 | 254,034 |
| Total | 2,950 | 199,420 | 35,875 | 1,653,253 | 1,852,673 |

The unit sand and gravel volumes of each dike and sabo dam are assumed as follows:

Type A : 30.76$m^3$/m
Type A : 30.76$m^3$/m
Type A : 30.76$m^3$/m
Sabo Dam : 67.60$m^3$/m

2) Total Annual Demand Forecast

The total aggregate demand in the Study Area is forecasted to be around 1.19million $m^3$ per year as follows:

**Estimated of Total Annual Demand**

| Item | (A)<br>Aggregate Volume<br>($1000m^3$) | (B)<br>Project Period<br>(year) | (A)/(B)<br>Annual Demand<br>($1000m^3$) |
|---|---|---|---|
| - LGU Level Project | 9,252 | 5 - 10 | 925 |
| - Provincial Level Project | 1,410 | 10 | 141 |
| - DPWH Road Network Plan | 524 | 20 | 26 |
| - Sabo Works around Mayon | 1,853 | 20 | 93 |
| Total | 13,039 | | 1,185 |

(5) Aggregate Supply Capacity

1) Sand and Gravel Deposit

The promising rivers for aggregate exploitation are:

- Yawa, Pawa-Burabod, Anoling, Budiao, Quirangay, masarawag, Ogsong, Nasisi, Buang, Quinali(B), San Vicente, Bulawan, Basud, Padang – 14 rivers

2) Annual Amount of Materials to be Dredged

DPWH is to carry out dredging in the proposed sand pockets to maintain the function of the facility. The following dredged material proposed in the Study is advantageous to utilize for aggregate.

**Annual Amount of Sand and Gravel to be Dredged from Sand Pocket**

**(for Space Maintenance)**

| Sand Pocket | A<br><br>Sand Pocket Capacity<br>($m^3$) | B<br>Sediment Flow Deposit in 30 years<br>($m^3$) | (B – A)<br>Total Excess Material Volume<br>($m^3$) | (B – A)/39<br>Annual Dredged Volume<br>($m^3$) |
|---|---|---|---|---|
| 1. Pawa-Burabod | 14,960,000 | 6,257,400 | -8,702,600 | - |
| 2. Anoling, Budiao | 13,600,000 | 17,999,100 | 4,399,100 | 146,637 |
| 3. Padang | 13,500,000 | 6,322,08 | -7,177,920 | - |
| 4. Basud | 8,000,000 | 5,936,880 | -2,063,120 | - |
| 5. San Vicente | 12,015,200 | 9,175,110 | -2,840,090 | - |
| 6. Masarawag | 4,320,000 | 10,611,990 | 6,291,990 | 209,733 |
| 7. Quirangay | 1,710,000 | 4,668,300 | 2,958,300 | 98,610 |
| Total | 68,105,200 | 60,970,860 | 13,649,390 | 454,980 |

**Annual Dredged Sand and Gravel from Sand Pocket**

**(for Channel Maintenance)**

| Sand Pocket | Width of Channeling Work (m) | Length of Channeling Work (m) | Annual Dredged Material Volume by Channeling Work ($m^3$) |
|---|---|---|---|
| 1. Pawa-Burabod | 55 | 120 | 13,000 |
| 2. Anoling, Budiao | 120 | 120 | - |
| 3. Padang | 50 | 140 | 12,000 |
| 4. Basud | 100 | 160 | 27,000 |
| 5. San Vicente | 400 | 160 | 107,000 |
| 6. Masarawag | 30 | 90 | - |
| 7. Quirangay | 30, 80 | 100 | - |
| Total | | | 159,000 |

The maintenance works of the proposed sabo facilities would produce aggregates of 614,000$m^3$ per annum. This assumed production (614,000$m^3$) and the existing exploitation volume of 216,000$m^3$ total 830,000$m^3$ per annum, which would not reach the forecasted demand of 1,185,000$m^3$.

(6) Aggregate Production Plan

1) Basic principles for the aggregate plant planning

The objectives of this plan is enunciated in the first paragraph of this chapter. The following are the basic principle to formulate the aggregate plant development plan in conformity with said objectives;

- The proposed plan should be feasible as a business, accordingly the targeted market should be sure as much as possible. In this connection, the demand emanated by the proposed sabo project of the Yawa river should be focussed.
- The proposed plan should not affect the existing quarrying enterprise significantly and the production capacity should be so designated as to enable to coexist with those existing.
- The proposed plan should contribute to the sustainability of the proposed sabo project. Accordingly the plan should envisage the dredged materials for the maintenance works of the proposed sand pocket.
- In order to make the business sustainable the acquisition of raw material should be stable with appropriate price.
- To make the business profitable, the effectiveness of the proposed plant should be considered. In this connection, the rates of operation should be deliberated.

- To make the business profitable, the operation cost should be minimized. In this connection the minimization of transportation cost should be due regarded.

2) Production Capacity

The demand that has not been foreseen by the existing enterprises might be ones of the proposed sabo projects. And there are only very low possibilities to incur conflicts with them as far as the proposed aggregate plan envisions the demand related to the proposed sabo projects.

The sand pockets proposed in the Yawa river is supposed to yield the aggregate demand of 478,000$m^3$ within the proposed implementation period of 2.5 years. The average annual demand is estimated to be 191,000$m^3$. Meanwhile the dredged materials in the proposed Yawa river sabo projects is estimated to be 160,000$m^3$ per annum with the dredging in the proposed Pawa-Burabod sand pocket of 13,000$m^3$ and Anoling-Budiao sand pocket of 147,000$m^3$. The estimated inflow to the proposed Pawa-Burabod sand pocket is 209,000$m^3$ per annum. This enunciate that the exploitation of 209,000$m^3$ per annum is the harmless volume for the sand pocket. Consequently the production capacity of 356,000$m^3$ is adopted for the aggregate plant. This amount suffice the demand of the Yawa sabo projects of 191,000$m^3$ and consume all the dredged materials for the maintenance. Moreover the amount will extend the life of the proposed Pawa-Burabod sand pocket.

The production capacity of the proposed plant is 1,480$m^3$ per day assuming 20 working days per month. The hourly production capacity is 230$m^3$ assuming 6.5 operation hours a day.

3) Aggregate Plant Component

Main equipment for aggregate plant are crusher plant, dump truck, pay loader, backhoe, and bulldozer. In addition to the equipment, office, laboratory, warehouse, plant yard and stockyard for raw material and products are necessary.

In order to enjoy scale factor, all the production works are concentrated to one plant. In this connection, Barangay Mabinit is proposed as the aggregate plant with a capacity of 250$m^3$ per hour since the substantial raw materials are to be exploited from the Pawa-Burabod sand pocket. The materials from Anoling-Budiao sand pocket shall be conveyed to the plant site through the existing provincial road. The necessary plant yard is estimated to be 4.0ha including 20ha of stockpile yard. The specificaitons of equipment are as follows:

| | |
|---|---|
| Crushing plant x 1 | 250m/h |
| Pay loader x 1 | 2.5m |
| Back hoe x 1 | 1.2m |
| Bulldozer x 1 | 22t with ripper |
| Dump truck x 10 | 11t |
| Generator x 3 | 250KVA |

4) Cost Estimation

Cost requisite to the proposed aggregate plant comprises investment cost and running cost. Investment cost comprises cost for equipment, construction of office, and yard cost. Running cost comprises cost for employment, OMR cost for equipment, OMR cost for office and yard and tax.

a. Investment cost

The estimated investment cost of 75,100,000 pesos is broken down as follows:

**Investment Cost**

| Item | No. | Unit Cost (pesos) | Total Cost (pesos) | Remarks |
|---|---|---|---|---|
| - Crashing Plant | 1 | 32,000,000 | 32,000,000 | Production Capacity: 250$m^3$/hr/1 plant |
| - Generator | 3 | 2,400,000 | 7,200,000 | Spec. of Generator: 200kw/0.8 = 250KVA, 1 plant needs for 2 generators |
| - Pay loader | 1 | 4,300,000 | 4,300,000 | New, Bucket Capacity: 2.5$m^3$ |
| - Dump Track | 10 | 2,200,000 | 22,000,000 | New, Bucket Capacity: 10$m^3$ |
| - Back Hoe | 1 | 7,100,000 | 7,100,000 | New, Bucket Capacity: 1.2$m^3$ |
| - Plant Yard | 1 | 2,500,000 | 2,500,000 | Office include |
| - Bulldozer | 1 | 6,270,000 | 6,270,000 | With ripper |
| Total | | | 81,370,000 | |

b. Running cost

The estimated exploitation tax is PHP4,600,000 assuming rate of PHP13 per $m^3$.

The proposed aggregate business might employ about 49 staff. The cost for employment is assumed to be PHP3,084,000 per annum. The cost for employment is broken down as follows:

**Cost for Employment**

| Personnel | Number | Unit Cost (pesos/day) | Total Cost (pesos/day) |
|---|---|---|---|
| - General Manager | 1 | 550 | 550 |
| - Administrator | 4 | 400 | 1,600 |
| - Equipment and Plant operator | 20 | 350 | 7,500 |
| - Mechanical Technician | 2 | 350 | 700 |
| - Labor | 20 | 250 | 5,000 |
| - Guard | 2 | 250 | 500 |
| Total | 49 | - | 15,850 |

The estimated annual employment cost is PHP3,084,000. The annual maintenance cost for equipment and office is estimated to be 10% of the investment cost or PHP81,370,000 per annum. The operation cost for the plant is estimated to be PHP4,100,000 per annum on the basis of fuel consumption. The total running cost is estimated to be PHP19,921,000.

5) Financial assessment

The prevailing price of aggregate is assumed to be PHP30 per $m^3$. The annual sales amount is estimated to be PHP46,280,000. The annual benefit to be obtained by running the proposed aggregate business is estimated to be PHP26,359,000. The investment can be paid back in about 3.1 years without interest.

6) Recommendations

The aggregate business attested its financial viability. The early establishment is recommended. The business should be on operation before the commencement of the construction works of the proposed sand pocket project. The implementation organization should be designated as soon as possible. EIS should be conducted as soon as possible.

The facility such as water supply, drainage, electricity, communication system and road should be so developed as to contribute the benefit of the related barangay.

## 2.2 Mineral Water Development Project

(1) Introduction

The mineral water development project aims at contributing for the development of the regional economy through introducing a sustainable industry in the most economically depressed region in the country.

The estimated mean annual precipitation depth in the Study Area is 3,000mm according to the recorded data observed in Legazpi the gauging station which is located at lower elevations than 100m. The mountain slopes with higher elevations might have received much more rainfall. In addition, the estimated average annual rainy days of 210 days distribute through out the year almost evenly. Meanwhile, a part of received rain water intrude deep into the soil and become groundwater with high quality by the purification effect and mineral contents of volcanic deposit.

In the circumstances, the mineral water development project at the foot of Mayon volcano is recommended.

(2) Present Conditions

Test exploitation of water has been done in and around Carayucay, a barangay of Municipality of Santo Domingo, to examine the quality and quantity of the resources preliminarily.

(3) Quality of ground water

According to a result of the inspection at the laboratory of this test exploitation, the physical components of the resources are as follows:

| Components | |
|---|---|
| Total Dissolved Solids (Parts Per Million) | PPM 99 |
| Calcium | 1 |
| Magnesium | 0.19 |
| Iron | < 1 |
| Chloride | 4 |

(4) Quantity of ground water

Based on the estimated mean annual precipitation (3,000mm), the quantity of groundwater is estimated by the following manner.

1) It is assumed that 1,000mm/year of received rain water will intrude deep into the soil.
2) It is assumed that 20% of this 1,000mm/year can be pumped from a well, and the remaining water will pour into the sea.
3) As a result of these assumptions, the amount of 0.2m/year/$m^2$ equivalent to 2,000$m^3$/year/ha might be exploited.

(5) Demand for Domestic Water

According to the JICA Study Report titled "Natural Water Resources Management Study, 1997", Metro Manila, Metro Sebu and Baguio City are identified as a significant water critical area. It means that water supply development is a emergency issue for the areas. Thus, the potable water also has a great demand for the areas. Meanwhile, at present many kinds of bottled mineral water are selling in the local market. The market prices of bottled mineral water are about 30PHP/liter for local products and more than 50PHP/liter for imported one respectively. The market of bottled mineral water is expected to be further expanded.

(6) Market Aspect

The operation of production will be carried out initially to sell the mineral water to the places lacking in water in the country, and then may be expanded to export it to foreign countries.

(7) Planning of Mineral Water Plant

The facilities to be prepared at mineral water plant in principle are as follows:

| Facilities |
|---|
| 1. Exploitation facility |
| Well and pump |
| Intake |
| Utility |
| 2. Conveyance facility |
| Water conveyance channel and pipe |
| Utility |
| 3. Plant and laboratory |
| Purification plant |
| Laboratory |
| 4. Building and civil works |
| Office, factory and laboratory buildings |
| Access road |
| Yard |
| 5. Storage and loading facility |
| Storage tank |
| Loading facilities for bulk and bottled water |
| Storage yard |
| Utility |

On the assumption that concession area is 500ha in the Santo Domingo Area, the production capacity is estimated at 1.0 million $m^3$/year on the basis of the estimated quantity of exploitable groundwater (2,000$m^3$/year/ha).

(8) Cost Estimate

The construction cost of the mineral water plant with this assumed production capacity is roughly estimated as follows.

(Unit: 1,000PHP)

| Facility | Unit | Quantity | Total |
|---|---|---|---|
| 1. Deep well drilling (20 m depth) | unit | 15 | 4,500.0 |
| 2. Submersible pump, 5 HP (3.7 kW), cap. = 0.2 m3/min | unit | 15 | 2,250.0 |
| 3. Elevated water tank, 10,000 gal. | unit | 15 | 8,100.0 |
| 4. Distribution PVC pipe | L.S. | | 4,000.0 |
| 5. Purification plant | unit | 15 | 3,000.0 |
| 6. Laboratory equipment | L.S. | | 2,000.0 |
| 7. Office, factory and laboratory buildings | L.S. | | 3,500.0 |
| 8. Storage and loading facilities | L.S. | | 3,000.0 |
| 9. Civil works (Access road, yard etc.) | L.S. | | 8,000.0 |
| 10. Others (30%) | L.S. | | 11,505.0 |
| **Grand Total** | | | **49,855.0** |

It should be noted that this construction cost does not include the cost of bottling facility, transportation, administration and engineering services, since the business in bulk is possible and the works of bottling and transportation can contract separately.

(9) Financial Assessment

The prevailing price of mineral water in bulk is assumed at 30PHP per $m^3$. The annual sales amount is estimated at 30,000,000PHP.

The total annual running cost is assumed at about 19,900,000PHP equivalent to 40% of construction cost. Thus, the annual benefit to be obtained by running the proposed mineral water business is estimated at about 10,100,000PHP. The investment can be paid back in about 4.9 years without interest.

## 2.3 Productivity Enhancement Programs in the Protected Area

(1) Present Situation and Scenario for the Project Area

The land around Mayon Volcano is very fertile but agricultural production has remained very low. The present area to be protected by the project is a total of 2,339 hectares and about 1,850.34 hectares is currently being used for agricultural production; broken down as coconut lands, 811.068 hectares, non-irrigated paddy,

310.746 hectares, and irrigated paddy, 728.526 hectares (JICA Land Use Map, 1999).

Due to lack of farm activity, the agricultural land utilization is not maximized, and the productivity is quite low compared to the potential of the crop.

| Crop Type | Current Yields | Potential Yields | Percentage of Potential |
|---|---|---|---|
| Coconut | 33/tree/year | 55/tree/year | 60% |
| Rice | 2.97 tons/year | 14.75 tons/year | 20.1% |
| Corn | 2.03 tons/year | 15 tons/year | 13.5% |

Source: Bureau of Agricultural Statistics-Department of Agriculture
Provincial Agricultural Office

There are no easy solutions to low productivity and poverty, as each location has its own development peculiarities. For the case of the areas surrounding Mt. Mayon, however, calamity is a factor, which directly or indirectly affect productivity. Lessening the risk of crop losses caused by flooding or intense water flow, could encourage the farmers to invest more in the crop inputs.

For the purpose of this Study, crop productivity is envisioned to be raised up to at least 65% the potential for rice, and 40% for corn.

(2) Cause and Effect of Low Productivity in the Protected Area

The land area around Mayon is one of the best areas for agro-industrial development in the province. Siltation from the slopes of the mountain keeps the soil fertile and the constant supply of fresh water is suitable for agro-industrial activities. The full potential of the land is not, however, taken advantage of by the farmers because of fear of calamities, lack of technical knowledge, and lack of sufficient capital to invest into the farm.

Even with these excellent conditions, the productivity of the farmers in Albay has been generally low. Bicol University research results have indicated the low productivity in the area as a result of the following reasons. The main reasons for the low farm productivity of the farmers in the project area, are ignorance, lack of capital to invest in farming due to poverty, and calamities due to adverse weather conditions. The very low productivity due to poverty is also the cause of the increasing poverty situation in the area. There is a notable decreasing trend in the share of agricultural income in terms of total family income. The average income in the project area is below the poverty line of PHP57,733.50.

**Project Area Household Expenditures**

| Items | Relocation Center Respondents November 1999 | | Proposed Protected Area (November, 1999) | | Poverty Study of Albay, 1989 | |
|---|---|---|---|---|---|---|
| | Family Average | % | Family Average | % | Family Average | % |
| Food Meals | 30,911.45 | 63.34 | 31,916.30 | 64.30 | 14,632.73 | 73.63 |
| Clothing | 1,447.78 | 2.97 | 2,690.30 | 5.42 | 562.41 | 2.83 |
| Education | 4,963.12 | 10.17 | 5,549.37 | 11.18 | 2,215.88 | 11.15 |
| Medicine | 1,900.03 | 3.89 | 1,315.37 | 2.65 | 347.78 | 1.75 |
| House repair | 2,280.75 | 4.67 | 1,226.02 | 2.47 | 268.29 | 1.35 |
| HH asset acquisition | 1,698.39 | 3.48 | 1,360.04 | 2.74 | 139.11 | 0.70 |
| Fiesta/special occasion | 1,416.19 | 2.90 | 1,255.80 | 2.53 | 343.81 | 1.73 |
| Recreation | 200.83 | 0.41 | 312.71 | 0.63 | 125.20 | 0.63 |
| Wine/Cigarette | 922.84 | 1.89 | 684.98 | 1.38 | 254.38 | 1.28 |
| Repayment of non-farm loan | 1,544.69 | 3.17 | 1,171.42 | 2.36 | 288.16 | 1.45 |
| Repayment on-farm loan | 56.22 | 0.12 | 367.31 | 0.74 | 59.62 | 0.30 |
| Expenditures on farm inputs | | | | | | |
| Seeds | 59.04 | *0.12* | 94.31 | *0.19* | 15.90 | *0.08* |
| Fertilizer | 411.79 | *0.84* | 446.73 | *0.90* | 151.04 | *0.76* |
| Pesticide | 136.58 | *0.28* | 143.95 | *0.29* | 47.70 | *0.24* |
| Labor | 138.96 | *0.28* | 153.87 | *0.31* | 81.48 | *0.41* |
| Animal stock | 176.39 | *0.36* | 263.072 | *0.53* | 117.25 | *0.59* |
| Feeds | 345.79 | *0.71* | 461.62 | *0.93* | 129.18 | *0.65* |
| Biologics | 10.56 | *0.02* | 19.85 | *0.04* | 11.92 | *0.06* |
| Others | 180.44 | 0.37 | 203.51 | 0.41 | 81.48 | 0.41 |
| Total | 48,801.84 | 100.00 | 49,636.54 | 100.00 | 19,873.32 | 100.00 |

Source: * People's Intention Survey for Resettlers and Candidate Resettlers on Resettlement Site and Livelihood Development
The JICA Study on Comprehensive Disaster Prevention around Mayon Volcano

** Rapid Appraisal Survey on Proposed Protected Area
The JICA Study on Comprehensive Disaster Prevention around Mayon Volcano

*** National Economic Development Authority
Local Resource Management Project
Albay Province-Wide Resources Inventory and Mapping and Poverty Study

The survey made by the project on the residents of the resettlement areas who are still going back to farm along the slopes of Mayon have shown very little income from farming. As shown however in their expenditure pattern, they have spent efforts in planting into the area as reflected in their expenditure pattern during the year, as reflected in their expenditures on fertilizers and other farm inputs. Income from farming among the families who have resettled is probably lower because they have tried to plant in their farm, which are now prone to repeated destruction during rain. Either the poor productivity was caused by the excessive sand and gravel deposits in the farm, or succeeding crop damages may have affected their calamity prone area.

Project Area Household Expenditures clearly shows the lack of capability of the farmers to invest in the farm. Only a little more than 2% of the expenditure budget is spent in the farm inputs and majority is spent on food and essentials. It can be noted that even if the main expenditure is on food, the child malnutrition rate in the area remains high, ranging between 25 to 35% for children up to 12 years of age (DSWD, National Nutrition Council Report 1997). Any additional investment therefore in the farm would mean greater sacrifice on the daily life of the farmer, especially if the crop becomes a failure. The amount of investment they are putting therefore, is only less than 15% of the required. Almost all their income is spent for basic necessities. There is no room for more investment into farming except their own labor.

It can be observed from Project Area Household Expenditures that the farmers in the relocation centers had a deficit year during the survey. They spend P6,727.17 more than they earned for the year. They particularly experienced a loss in their agricultural investment where they invested on the average of P1,279.11 and only harvested P1,242.32 worth of products from the farm. It may have been caused by damage due to weather.

A poverty mapping survey for Albay commissioned by NEDA shows that considerable number of rural area residents belong to the lower income group which barely make both ends meet to be able to survive.

It can be observed from the table in the next page that about 78.8% of the farmers belong to the low income level which can not make the necessary farm investment. It can therefore be concluded that almost 78.8% of the farms in the area are being farmed by people who cannot afford to make the necessary investments in the farm.

There is therefore the need to address this problem if the low productivity or poverty cycle is to be broken particularly in the project area.

**Distribution of Household Incomes by Income Level and Barangay,**

**Municipality of Daraga, 1985**

| Barangay | Perceived Household Income | | | | | | |
|---|---|---|---|---|---|---|---|
| | Frequency | | | | Percentage | | |
| | High | Average | Low | Total | High (%) | Average (%) | Low (%) |
| Alobo | | 31 | 83 | 114 | 0.00 | 27.19 | *72.81* |
| Anisalag | 10 | 133 | 353 | 496 | 2.02 | 26.81 | *71.17* |
| Balinad | 3 | 22 | 178 | 203 | 1.48 | 10.84 | *87.68* |
| Bañadero | 5 | 49 | 172 | 226 | 2.21 | 21.68 | *76.11* |
| Bongalon | 1 | 2 | 167 | 188 | 0.53 | 10.64 | *88.83* |
| Budiao | 2 | 11 | 250 | 263 | 0.76 | 95.06 | *4.18* |
| Burgos | 1 | 16 | 143 | 160 | 0.62 | 10 | *89.38* |
| Busay | 1 | 78 | 106 | 185 | 0.54 | 42.16 | *57.30* |
| Cabawan | | 37 | 170 | 207 | 0.00 | 17.87 | *82.13* |
| Canaron | 5 | 13 | 88 | 106 | 4.72 | 12.26 | *83.02* |
| De la Pas | | 6 | 100 | 106 | 0.00 | 5.66 | *94.34* |
| Dinoronan | 5 | 15 | 61 | 81 | 6.17 | 75.31 | *18.52* |
| Gapo | | 27 | 276 | 303 | 0.00 | 8.91 | *91.09* |
| Ibaugan | | | 214 | 214 | 0.00 | 0 | *100* |
| Inarado | 17 | 32 | 219 | 268 | 6.34 | 11.94 | *81.72* |
| Kidaco | | 27 | 97 | 124 | 0.00 | 21.77 | *78.23* |
| Kilicao | 31 | 67 | 364 | 462 | 6.71 | 14.50 | *78.79* |
| Kinawitan | 1 | 56 | 40 | 97 | 1.03 | 57.73 | *41.24* |
| Lacag | | 52 | 282 | 334 | 0.00 | 15.57 | *84.43* |
| Mabini | 3 | 20 | 164 | 187 | 1.60 | 10.70 | *87.70* |
| Malobago | 1 | 17 | 205 | 223 | 0.45 | 7.62 | *91.93* |
| Maopi | 6 | 39 | 137 | 182 | 3.30 | 21.43 | *75.27* |
| Maroroy | | 190 | 274 | 464 | 0.00 | 40.95 | *59.05* |
| Matnog | | 12 | 174 | 186 | 0.00 | 6.45 | *93.55* |
| Mayon | | 12 | 265 | 277 | 0.00 | 4.33 | *95.67* |
| Mi Isi | 1 | 7 | 121 | 129 | 0.78 | 5.43 | *93.80* |
| Nabasan | | 29 | 82 | 111 | 0.00 | 26.13 | *73.87* |
| Namantao | | 24 | 204 | 228 | 0.00 | 10.53 | *89.47* |
| Pandan | 1 | 61 | 80 | 142 | 0.70 | 42.96 | *56.34* |
| PenaFrancia | | 51 | 178 | 229 | 0.00 | 22.27 | *77.73* |
| Salvacion | 3 | 26 | 164 | 193 | 1.55 | 13.47 | *84.97* |
| San Rafael | | 18 | 233 | 251 | 0.00 | 7.17 | *92.83* |
| San Ramon | | 8 | 233 | 241 | 0.00 | 3.32 | *96.68* |
| San Vicente Grande | | 15 | 129 | 144 | 0.00 | 10.42 | *89.58* |
| San Vicente Pequenea | | 3 | 31 | 34 | 0.00 | 8.82 | *91.18* |
| Tabon-tabon | 2 | 12 | 156 | 170 | 1.18 | 7.06 | *91.76* |
| Tagas | | 26 | 111 | 138 | 0.00 | 19.57 | *80.43* |
| Talahib | | 17 | 201 | 218 | 0.00 | 7.80 | *92.20* |
| Total | 99 | 1,279 | 6,505 | 7,884 | 1.12 | 20.06 | *78.81* |

Source: National Economic Development Authority
Local Resource Management Project
Albay Province-Wide Resources Inventory and mapping and Poverty Study

As can be observed from this table, most of the rural farmers have very low income so that their capability to invest in a crop, especially if there is risk of loss, is very low.

There is also the problem on lack of technical knowledge of the farmers. While, for example, they could improve their yields by resorting to organic fertilizer inputs which they can produce from farm manure, and other farm organic wastes, there is very little evidence of organic farming in the area. Out of 180 farmers surveyed, none said that they are actively using organic fertilizers (JICA Survey). This is evidenced by the lack of nitrogen content and organic matter content of the soil in the area.

Because of this, agricultural production, in spite of the presence of the necessary technologies, has remained low in the past 10 years, approximately 2 tons for corn, and 3.5 to 4.0 tons for rice (see the following tables).

**Corn Production of Albay 1988 to 1998**

| Year | Area Planted Has | Area Harvested Has. | Production MT | Ave. Yd. MT | /Hectare Cav. | No. of Farmers |
|---|---|---|---|---|---|---|
| 1988 | 8,979 | 8,862 | 15,940.15 | 1.9 | 36 | 7,290 |
| 1989 | 8,355 | 6,245.57 | 10,481.96 | 1.6 | 32 | 7,703 |
| 1990 | 9,503.14 | 9,574.68 | 20,578.53 | 2.1 | 43 | 8,963 |
| 1991 | 11,945.66 | 10,148.65 | 21,768.09 | 2.16 | 43 | 12,478 |
| 1992 | 11,729.39 | 10,594.97 | 19,075.99 | 1.8 | 36 | 11,190 |
| 1993 | 12,617.16 | 15,776.34 | 23,630.63 | 1.5 | 30 | 10,556 |
| 1994 | 12,919.92 | 12,777.92 | 32,290.29 | 2.52 | 50.5 | 11,983 |
| 1995 | 16,384.69 | 15,918.69 | 31,517.25 | 1.98 | 39.59 | 15,216 |
| 1996 | No Data | - | - | - | - | - |
| 1997 | 10,327.75 | 10,327.75 | 26,764 | 2.59 | 51.82 | 11,130 |
| 1998 | 13,020.52 | 10,019.01 | 20,316.33 | 2.03 | 40.56 | 12,516 |

Note: * includes 1992 plantings but harvested in first quarter of 1993.

Source: Provincial Agriculture Office

**Rice Production of Albay 1988 to 1998**

| Year | Area Planted Has | Area Harvested Has. | Production MT | Ave. Yd. MT | /Hectare Cav. | No. of Farmers |
|---|---|---|---|---|---|---|
| 1988 | 45,868.58 | 43,522.87 | 161,247.00 | 3.7 | 74 | 45,742 |
| 1989 | 46,183.13 | 41,894.52 | 141,784.00 | 3.4 | 68 | 46,186 |
| 1990 | 49,096.44 | 48,796.62 | 186,228.00 | 3.9 | 78 | 45,719 |
| 1991 | 55,664.78 | 47,800.04 | 184,738.94 | 3.86 | 77 | 51,838 |
| 1992 | 43,780.37 | 42,147.29 | 160,274.19 | 3.8 | 76 | 46,747 |
| 1993 | 29,097.30 | 36,242.56 | 137,934.29 | 3.5 | 71 | 28,727 |
| 1994 | 52,521.59 | 52,521.59 | 186,164.59 | 3.54 | 71 | 47,751 |
| 1995 | 48,693.95 | 45,722.58 | 149,74.69 | 3.28 | 65.56 | 48,142 |
| 1996 | 42,291.35 | 41,071.39 | 154,028.31 | 3.75 | 75 | 43,860 |
| 1997 | 39,509.26 | 39,080.48 | 156,473.27 | 4 | 80 | 41,966 |
| 1998 | 37,005.34 | 30,062.62 | 118,042.31 | 3.93 | 78.5 | 37,272 |

Note: * includes 1992 plantings but harvested in first quarter of 1993.
Source: Provincial Agriculture Office

(3) Topographic Condition, soil Fertility, and Present Land Use of Project Area

1) Topography

The project area is characterized by varying slopes from the six-kilometer radius to the Yawa River where much of the water run-off from the slopes drain. Much of the paddy fields and vegetable farms are located on the gentle slopes with 1 to 5% inclinations. Non-irrigated areas are located mostly on 60 to 110 meters elevation with gentle slopes up to 7%. Much of the coconut lands are above 120 meters n elevation and with slopes from 7 to 10%.

**General Slope Classification of the Protected Area and the Sand Pockets**

| Slope | Area |
|---|---|
| 1 – 5% | 1,686 |
| 5 – 7% | 697 |
| 7 – 10% | 542 |
| Total | 2,925 |

Although the slope is still suitable for agriculture, water and silt retention in slopes is an essential part of any agricultural activity in the project area. Unfortunately, many of the farmers are lowland farmers trying to practice lowland agriculture on the slopes.

2) Soil Fertility

The upper area is beyond 150 meters elevation is generally composed of Mayon Gravelly Loam, most of the areas at 50 to 150-meter elevation are of the Legazpi Fine Sandy Loam (Stony Phase) type and below the 50 meter elevation is Legazpi Fine Sandy Loam.

The soil is very suitable for agriculture especially for crops other than rice. The loose characteristics of the soil allow good water drainage from the surface while allowing for sufficient air in the soil for root growth. Soil porosity of the project area ranges from 35 to 55%, which is beyond the minimum 15% porosity required for healthy plant growth. The nitrogen content is low at 0.15 to 0.3% and Calcium at 3 to 15ppm. The soil pH is mostly alkaline and therefore very responsive to fertilization. Macro and micronutrients would be more available to the plants under this pH level.

The rice lands have formed a natural hard pan of clay and silt for water retention. Surveys made by the project, however, have indicated the lack of use of farmers of both organic and inorganic fertilizers, depleting the nutritional contents of the soil and thereby decreasing yields. The present organic content of the soil ranges from 2 to 4%, which is less than the minimum 8% advisable for excellent plant growth.

3) Present Land Use

Many of the farmers cultivating the slopes of Mayon have their origins in the lowlands and are practicing lowland methods of farming. As shown on previous tables, these practices are often not very productive and promote further erosion and decrease in soil fertility. There are open areas which have been destroyed by lahar flow which are currently not being used.

**Summary of Existing Land Use for the Proposed Protected Area:**

| Land Use | Legazpi (Ha.) | Daraga (Ha.) | Camalig (Ha.) | Total | Percentage |
|---|---|---|---|---|---|
| Paddy | | | | | |
| Irrigated | 304.198 | 401.328 | 20 | 725.526 | 31.01 |
| Non-Irrigated | 115.249 | 121.623 | 11.340 | 248.212 | 10.61 |
| Coconut Land | 169.076 | 468.713 | 85.350 | 723.139 | 30.91 |
| Uncultivated Land | 240.221 | 178.595 | 5.0 | 423.816 | 18.12 |
| Residential Land | 35.362 | 82.756 | 3.12 | 121.238 | 5.18 |
| Commercial Industrial | 11.394 | 42.089 | - | 53.483 | 2.28 |
| Education and Institutional | 5.330 | 20.143 | - | 25.473 | 1.09 |
| Roadways | 4.080 | 10.020 | 3.34 | 18.140 | 0.77 |
| Total | 885.610 | 1,325.267 | 128.150 | 2,339.027 | 100.00 |

Source: JICA Land Use Map, 1999
Land Tax Map of the City of Legazpi and Municipality of Daraga

**Summary of Projected Land Use for the Proposed Protected Area**

**Up to Year 2020:**

| Land Use | Legazpi (Ha.) | Daraga (Ha.) | Camalig (Ha.) | Total | Percentage |
|---|---|---|---|---|---|
| Paddy | | | | | |
| Irrigated | 328.898 | 407.382 | 25000 | 761.280 | 32.55 |
| Non-Irrigated | 151.860 | 147.546 | 11.340 | 310.746 | 13.28 |
| Coconut Land | 254.572 | 471.146 | 85.350 | 811.068 | 34.67 |
| Agro-Forestry Land | 41.900 | 9.626 | 0 | 51.576 | 2.20 |
| Residential Land | 69.190 | 187.550 | 3.12 | 259.860 | 11.11 |
| Commercial Industrial | 26.080 | 66.000 | - | 92.080 | 3.93 |
| Education and Institutional | 8.280 | 25.999 | - | 34.279 | 1.46 |
| Roadways | 4.780 | 10.020 | 3.34 | 18.140 | 0.77 |
| Total | 885.610 | 1,325.267 | 128.150 | 2,339.027 | 100.00 |

Source: JICA Land Use Map, 1999
Land Tax Map of the City of Legazpi and Municipality of Daraga

Because of the ready availability of water, much of the project area, 41.62%, is cultivated to rice. The slopes are planted mostly with coconuts. Fear of calamities, however, restrains the people around Mayon from fully developing the area. Substantiating this fear is the existence of 423.816 hectares of land covered with sand and gravel due to strong water run off from the slopes of Mayon.

As shown on the table below, areas that have been deposited with lahar shall be rehabilitated to their previous land use before the eruption of 1993. Irrigated land will increase by 4.9%, non-irrigated land by 25%, coconut land by 12.6%. With the expected development of the area, however, it is expected that the residential, commercial, and industrial areas would grow the most.

**Summary of Changes in Projected Land Use for the Proposed Protected Area Up to Year 2020:**

| Land Use | Existing | | Projected | | Increase or Decrease | Percent Change (%) |
|---|---|---|---|---|---|---|
| | Total | Percen-tage | Total | Percen-tage | | |
| Paddy | | | | | | |
| Irrigated | 725.526 | 31.01 | 761.280 | 32.55 | 35.754 | 4.9 |
| Non-Irrigated | 248.212 | 10.61 | 310.746 | 13.28 | 62.534 | 25.19 |
| Coconut Land | 723.139 | 30.91 | 811.068 | 34.67 | 87.929 | 12.16 |
| Agro-Forestry Land | 423.816 | 18.12 | 51.576 | 2.20 | (372.24) | -87.83 |
| Residential Land | 121.238 | 5.18 | 259.860 | 11.11 | 138.622 | 114.33 |
| Commercial Industrial | 53.483 | 2.28 | 92.080 | 3.93 | 38.597 | 72.16 |
| Education and Institutional | 25.473 | 1.09 | 34.279 | 1.46 | 8.806 | 34.56 |
| Roadways | 18.140 | 0.77 | 18.140 | 0.77 | - | - |
| Total | 2,339.027 | 100.00 | 2,339.027 | 100.00 | - | - |

Source: JICA Land Use Map, 1999
Land Tax Map of the City of Legazpi and Municipality of Daraga

*Basis for the Projections:*

1. When fully protected by Sabo structures, it is assumed that the areas covered by sand and gravel will revert to the original land use after a certain degree of quarrying has been done. This phenomenon is already happening at some areas in the project site. After observing the project area, however, it has been assumed that some areas (about 12%) could not be easily rehabilitated without incurring much earth moving expenses and would be better to be developed as agro-forestry area. By extrapolating the old land use maps before the eruption, areas that could be recovered have been identified.
2. It is projected that the population of Legazpi and Daraga would increase by 45 to 50% by the year 2020. The number of households, however, is expected to increase by more than 61.6% for the same time span. By the year 2020, however, it is projected that Legazpi alone would have to accommodate 18,874 additional households in a city where space is becoming scarce. Daraga also will be experiencing an 11,742 increase in household number by the same year. With its proximity to the city center, cheap land costs, and easy access to water, it is assumed that there will be a lot of new households moving into the project site. If new investments for additional barangay roads or private roads were made in the project site, the projected area for new housing would easily increase by more than 200% over the existing.

(4) Proposed Agricultural Production and Cropping Pattern

The primary objective of this proposed cropping pattern is to increase the productivity of the farmers without having a destructive effect on the slopes. If implemented, the cropping patterns on the slopes would not only effectively prevent erosion on the slopes but also improve the capability of the slopes to absorb water and retain silt. This added ability of the slopes to retain water and reduce siltation would greatly reduce loads on Sabo dike structures and also reduce flooding and siltation incidents after strong rain. The capability of the slopes to absorb more water and release it slowly to the soil will have a balancing effect on the supply of water through springs and brooks to the agricultural of the farms and irrigation systems in the country.

For ease of implementation, the proposed cropping pattern does not drastically change the present land use but instead introduce improvements through additional technological knowledge and investment into the farm.

With a farm area more secure from calamities than before, more investments can be done to improve the farm and previous efforts and expenses incurred in the past in repairing and desilting canals every time there is a strong rain, could be spent in farm inputs for a more intensive farming activity.

1) Suggested Crops:

a) Abaca; *Musa Textilis*

Abaca are banana like succulent plants which are also shade loving. They are about 93 to 95% water but the fibers are very long and easy to extract manually with stripping knives. The local varieties, Tinawagang Pula and Tinawagan Puti, and the newly developed varieties, Musa Tex 50 to 52 will be propagated. They are known for their adaptability in the area and good equality fiber especially for handicrafts.

b) Pilinut; *Canarium ovatum*

Pilinuts are big trees with almond shaped fruits about 5cm in length. Its pulp is rich in protein and its kernel is a delicacy in the Philippines. It is only grown in the Philippines and 82% of the country's supply comes from the Bicol Region. It has very great export potential. The local varieties will be used for propagation.

c) Moras, *Vetiver zesanoides*

Moras or Vetiver is now a very well known grass in the world for its effectiveness against erosion. Its roots are very extensive and long and its stem can withstand strong runoff. Planted as line hedges, it makes one of the most effective erosion control methods practiced by bio-engineers today. It has an aromatic scent and its oil can be extracted for mixing with pesticides, detergents, etc.

d) Lemon Grass, *Paja de meca,* and Citronella

These are aromatic grasses which can easily grow in sandy soils and are drought resistant. They are also known as spices and the oil is also being extracted for mixture for detergents and other products.

e) Rice, *Oryza sativa*

The varieties that will be recommended for the project site are PSB-RC18, RSB-RC14 which have been developed at Philrice at Munoz, Nueva Ecija and are found suitable for the purpose of intensive cropping system because of its shorter maturity duration.

f) Corn; *Zea mays*

The variety of corn that will be used here will be the open pollinated varieties from the Institute of Plant Breeding so that the farmers can grow their own seeds for several seasons.

g) Egg Plant; *Solanum melongena*

h) Mungbean; *Vigna radiata*

Although the farmers along the slopes of Mayon produces a wide variety of vegetables these two vegetables are used as the basis for economic computation for feasibility of producing vegetables in the area.

i) Agoho; *Casuarina equisetifolia*

This is a very sturdy perennial tree which propagates through seeds which fall on the ground and are carried away by rainwater along the slopes of Mayon. It grows very well in the sand and can become a large tree. People in Mayon use these trees as house building materials and for firewood.

2) The utilization of Uncultivated and Gravel and Sand Covered Areas

Especially if the dikes are constructed, much of the 423 hectares in the protected areas made idle by deposition of gravel and sand from the volcano can be gradually recovered. In Mi-ishi, Budiao, Mabinit, Pawa, and Bonga, and some areas which have stabilized with decrease of water run-off coming from the upper slopes, the owners of the land actively clear the land by removing the deposited gravel and sand and allowing those interested to haul away the sand and gravel piles.

Even if the sand and gravel surface that accumulated in the surface is carried away by water or taken through gravel and sand business, it will still cost the land owner an average of P10 per square meter for irrigated rice paddy and P2.5 per square meter for non-irrigated land to rehabilitate the area. It is estimated that 372 hectares will be reclaimed in this manner in case the protection dikes are built.

Other covered areas whose owners gave up trying to remove the debris, natural vegetation made up of wild grasses and agoho trees from seeds that have traveled with the water run-off, are starting to establish in sporadic nature.

These exposed land areas are still very prone to further erosion. It is therefore advisable that they be covered with vegetation especially if they are near gullies or is susceptible to flash flooding.

There are only very limited plants that would readily establish itself on sandy soil. Some of these plants can be commercially viable.

For this project, aromatic grasses, which already exist wild in the area, can be commercially grown not only for its erosion control value but also for its aromatic oils.

For threes for firewood, agoho is the most hardy and prolific in the area. For shrubs, salago can be grown for its tree bark, now in demand for producing specialty papers.

To accelerate the utilization of these plants, it is necessary to establish nurseries to propagate planting materials. A distilling plant should be established in the project area to support this project. It is also necessary that technical assistance be provided to the interested farmers.

Grass is a very ideal crop in the area. It is non-perishable, grows well in sandy areas, very light to carry along the slopes, and because of the presence of water, can be distilled within the area easily.

3) The Coconut Area

With an area of 723 hectares, the coconut area is the quite large, but also very little utilized. The coconut farms are planned only as single crop and no fertilization is applied. As a result the coconuts in the area only produces 33 nuts per tree which is low compared to the potential of 55 nuts per tree. For the project area, they are dominant in areas with elevations of more than 100 meters. To maximize the coconut area, the project has identified areas where they may raise abaca, coffee, pilinut, or grass under the coconut tree.

Because of the fertilization activities on the coconut intercrop, the coconut trees also become automatically fertilized and the coconut yield can be expected to increase to 43 nuts per tree by adding phosphate to the fertilizer mix.

In order to accelerate the development of coconut farms, it is necessary that the following activities be undertaken:

a. Organization of the farmers into Cooperatives
b. Training programs on technologies on coffee, abaca, pilinut, and aromatic grasses
c. Establishment of nurseries for propagation of planting materials
d. Financing arrangements with Land bank or any financial institutions

4) The Rice Farms

The un-irrigated rice farms can be assisted to grow three crops a year by planting rice-legumes-corn. This pattern would be best especially for upper areas, which have been newly converted to rice.

Areas where irrigation is sufficient will be advised to plant legumes as its third crop for the following purposes:

a. Reduce the insect pests which prey on rice and corn by reducing the availability of host plants.
b. To enrich the land with natural nitrogen.

To improve the farm productivity, in the project area, the following have to be done:

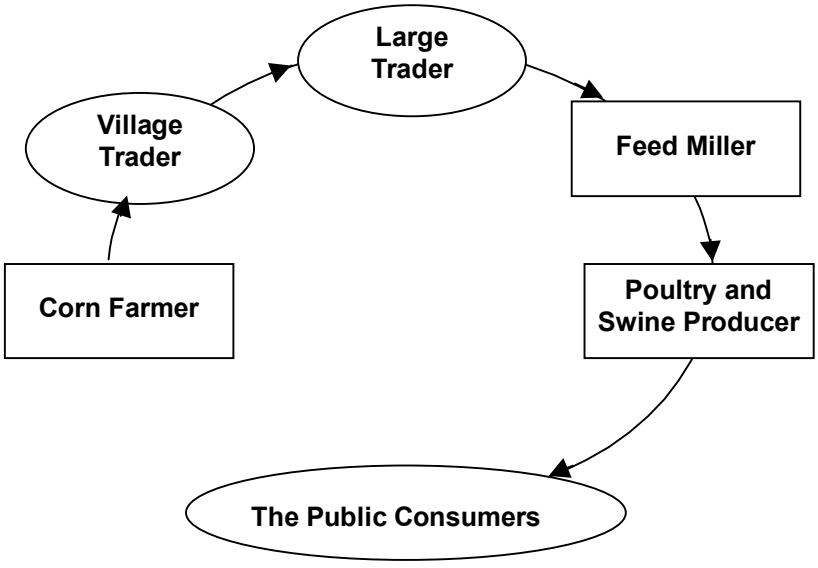
a. Organize the farmers into cooperatives so that they can have:
b. Financing Access
c. Training Program Development

(5) Integration of Medium/Large Scale Animal Production

At present, the province produces only 470.08 tons of chicken meat or only 11% of the required 4,289.99 tons for local consumption. The current demand for poultry eggs is 2,806.64 tons, and the production is only 1,162.84 tons or 41% of the demand. The consumption of pork in the province is estimated to be 8,740 tons while the available supply is only 5,004.33 tons.

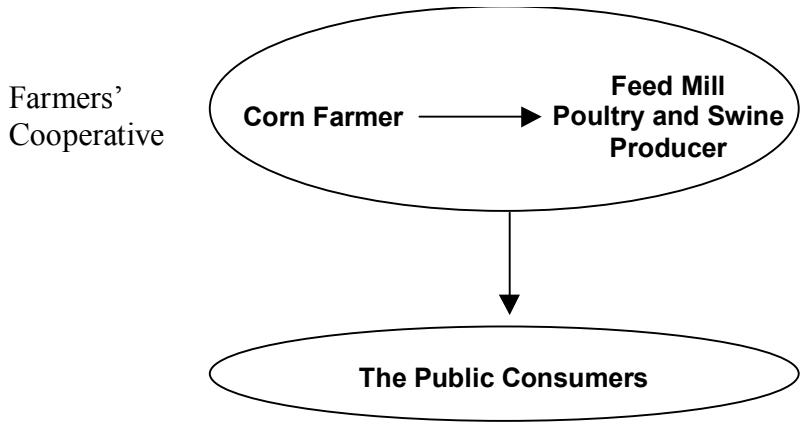
The lack of financing and facilities of the small farmers and animal raisers leads to inefficient methods of farming, which eventually make animal production expensive in the province. Small corn farmers, since they need money immediately and have no storage facilities, sell their corn at very cheap prices immediately after harvest. From the village trader, corn passes on to the larger trader who in turn sells the corn to the feed millers at a profit. The small/micro poultry and swine producers, since they can not afford to stock feeds and do not have their own facilities for mixing their own feeds, eventually buy from these feed millers at already expensive prices.

This inefficient system is one of the larger causes of the difficulties in poultry and swine production, and which causes the current lack of production in the province.




Source: Bicol University Grain Post Harvest Research Report, 1989

**Commodity Flow in Poultry and Swine Industry in Albay**




**Proposed Commodity Flow**

The current commodity flow makes the poultry and swine production expensive and makes the profit of corn farmers very low. In 1998 and early 1999 the large influx of cheap imported poultry and swine products caused a lot of furor and concern based on stories published several times in the newspapers. The fact remains that the cost of raising poultry and swine locally is expensive. This is caused by so many layers of traders along the production system. The weakness of the individual and unorganized farmers makes the existence of the rich traders necessary. The traders generally provide the following services which otherwise no one provides:

1) Financing

   Traders often lend money to the farmers at high rates. Farmers do not have ready access to institutional lending. They have to resort to non-formal lending arrangements which eventually become expensive for them.

2) Transportation

   The traders have transport facilities which the farmers do not have.

3) Storage

   The farmers can only store very limited amount of grains in their very small house. They are therefore forced to sell their produce at low prices because they might spoil.

4) Managerial Expertise

   The traders provide managerial skills to keep large volumes of transactions going which are otherwise unmanageable for ordinary farmers.

Done at a larger scale than what the rural farmers are doing now, production of poultry products and swine is profitable. At this level, however, the farmers must form a strong organization.

With the implementation of the General Agreements on Tariff and Trade (GATT), it is very necessary for the local farmers to compete with the imported food, which are being produced very efficiently and at very low costs in other countries.

To be able to produce more efficiently, it is necessary for the farmers to integrate their production, and lower the transfer costs from one hand to the other. The farmers, however, can eliminate the middlemen or the traders if they are able to get financing, have their own transportation facilities, have their own warehouses, feed mill, and large growing facilities.

This will eliminate a lot of transfer costs and will make poultry and swine production in the area not only profitable but eventually beneficial both for the farmers and the buying public. The farmers, however, would need external assistance on financing, technical knowledge, managerial and marketing skill development.

(6) Total Projected Yearly Production

The projected total population of Daraga and Legazpi by year 2020 will be 401,586 (the JICA Study). The volume of rice production which would be 9,136 tons will cover the rice requirement for 90,009 people at an average of 101.5kg/capita consumption, which is around 22.4% of the combined population of Daraga and Legazpi.

(7) Preliminary Economic Assessment

1) Incremental Benefit to Coconut Farmers

Through the project, coconut farmers will enjoy higher income due to intercropping and processing of essential oils. The project makes it possible for the coconut farmers to intensify production in the coconut lands through intercropping with coffee, pilinut, and abaca.

From the intercrops, the farmers stand to have an average increase of P32,234 in income per hectare per year. Fertilization will lead to an increase of production by 30% or 1,000 nuts per year per hectare. Translated to P2.5 per nut price, the increase is P2,500 per hectare per year. Given the average size of the coconut farms in the area, which is 3.8 hectares, the average increase in the family income for the coconut farmer is P131,989, which is high enough to elevate his income

from below the poverty line to a very comfortable income level of a government employee. The coconut farmers can also be members of the cooperative which shall engage in abaca and coffee trading, and essential oil production.

Increased in fertility due to application of fertilizers to the intercrop will also result in the better coconut harvest leading to an additional income of P25,000 per year per hectare.

2) Incremental Benefits to Irrigated Land Farmers

The rice farmer stands to benefit the most from the project. Firstly, he will not spend so much effort for the constant repair of his farm and will experience less loss due to calamities. The farmer could therefore be encouraged to invest money and efforts to improve his own farm.

More controlled water flow means more stable water supply, which is quite important for rice farmers. The result of additional investment by the farmer will be evident in the increase in farm income per year. It is hoped that with the level of investment, the farmer would be able to increase his yield from about 20% of the potential to 60%.

The ability to plant three crops a year would mean a great difference for the rice farm. This would, however, entail more technological knowledge, more capital, mechanization of land preparation and harvesting to eliminate time delays, and technical knowledge.

3) Non-Irrigated Paddy Fields

Incremental benefits for un-irrigated rice farms will come from the possibility of planting high value crops and corn after rice. Farming technologies on the production of vegetables, corn, and legumes will be extended to the farmers. With the ability to raise three crops a year, and by improving their farm practice, the farm yields will definitely increase.

The average increases in net income per year of the non-irrigated farmer is P39,642 per hectare. This, however, requires the ability to produce a third crop of vegetables which the farmer need to sell without post harvest losses as much as possible.

4) Availability of Loanable Funds Due to Increase in Land Values

Because of the relative safety of the area protected by the dikes, more people will locate in the area, raising prices due to increase in demand for land. More agricultural activity and putting improvements on the land will definitely increase

the value of the land. Higher property values allow the residents in the area access to necessary capital though institutional loans or simple sale of portions of their land.

Just for agricultural production, the farmers need to spend about P63,462,930 per year. The farmers would need to be financed with the necessary capital to be able to increase yields.

The higher values of the land in the project area will surely enable the farmers to access loans from low interest banks with the land as their security.

5) Benefits for Increased Food Production for Food Security

More production from the area for rice and corn and meat products are realized.
Contribution of the Project Area to Food Security:

**Per Annum Production of Food in the Project Area**

| Commodity | Estimated Production w/o Project (tons) | Estimated Production w/ Project (tons) | Increase in Supply (tons) | Current Supply Deficit in Albay (tons) |
|---|---|---|---|---|
| Rice | 2,647 | 9,136 | 6,849 | 40,436 |
| Corn | Negligible | 3,118 | 3,118 | No shortage |
| Vegetables | 789.39 | 1,324 | 534.61 | 26,352 |
| Chicken | 7.4* | 109.2 | 101.8 | 3,608 |
| Pork | 79* | 97 | 18 | 3,735 |

Source: Provincial Agriculture Office

* Backyard Production

6) Benefits on Land Reclamation

Of the estimated 423 hectares of land covered with lahar, about 372 hectares will be recovered. Right now, gradual reclamation on already stabilized areas are being done by individual owners of land. The fastest method of reclamation is piling and selling lahar as sand and gravel now being used as construction and filling materials in the city and surrounding towns.

Even with that method of reclamation, the owner of the land will still have to spend about P10.00 per square meter for irrigated land and P2.50 per square

The cost of reclamation will be recovered in 1.85 years in case of irrigated lands, 2.1 years for non-irrigated lands. This means that the farmers themselves can pay for the reclamation of their land provided that they are given the initial necessary support to produce their crops.

7) Negative Benefit on Sand Pocket Area

It is expected that the sand pocket area will have a negative project economic effect on agriculture. The area will be covered by sand and gravel debris at the average of two meters.

Although much of the area would still probably be arable up to 2020, there is danger that sand and gravel deposition would occur in the area. For the purposes of this project, it will be recommended that the area be acquired by the government as a designated public land. Although parts of the sand pocket may be totally arable at any point in the next twenty years, anybody farming in the area would be doing it at his own risk.

**Existing Land use on Sand Pocket Area**

| Land Use | Area (Ha.) | Productivity/year without Project (Pesos) | Productivity/year with Project | Net Effect |
|---|---|---|---|---|
| Coconut | 363.30 | 4,359,600 | | (3,359,600) |
| Forest | 28.50 | 114,000 | | (114,000) |
| Bush/Grassland | 129.73 | - | | |
| Idle Land (Covered by Sand and Gravel) | 64.42 | - | - | - |
| Total | 585.973 | 4,473,600 | | (4,473,600) |

(8) Support Programs

1) Yawa River Basin Development Project:
A Proposed Umbrella Support Program

The Sabo dike would effectively protect the down slope areas of Legazpi City and Daraga and in theory, the people in the protected areas should be able to take advantage of the relative safety of the area. The farmers have very little resources and capabilities to make improvements and investments on the land.

There is a need to accelerate the development in the area by creating a concerted effort aimed at being able to economically develop the project protected area and at the same time preserve a desirable vegetative cover that would provide a desirable environmental protection to the area.

Mayon is the main watershed of the province of Albay and it is the main source of water for many populated and economically active areas surrounding its slopes. A deterioration of the slopes of Mayon will have a great effect on the economic activities on the down slope areas.

The 1993 eruption has contributed heavily to the deterioration of the Yawa river system and watershed areas. The area has become unstable and prone to

disasters. The Municipality of Legazpi and Daraga are the most populated and most economically active in the region and its urban population depends heavily on the slopes of the Yawa River watershed for water.

The slopes of Mayon have many potentials not only for agriculture but also for industrial development and tourism. Even during drought situations, constant supply of water from the clouds that condenses on the upper areas of Mayon flows through springs at very many locations situated at the foot of Mayon. Being the main watershed of the province, the water that regularly flows to the lowlands, collected by the slopes of Mt. Mayon from rain or condensation from clouds, greatly affects the socio-economic life of the population.

Feeling this importance, many government and private agencies have been conducting uncoordinated and separate projects and activities affecting the area. Rather than undertaken in a very uncoordinated manner, it may be better that these resources are pooled and the separate activities are placed in one umbrella development activity.

There are projects being proposed by the different agencies for the Province of Albay whose components for Daraga and Legazpi can be incorporated into or assisted by one umbrella project called the Yawa River Basin Development Project, which could also be a consolidating support project for the economic development of Daraga and Legazpi City. The following projects are currently being proposed for implementation by various agencies in the area.

**Existing Proposed Projects for Funding**

| Project Title | Proponent | Proposed Budget (PHP) |
|---|---|---|
| 1. Development and Implementation of the Yawa River Management Project | DENR | 61.5 Million |
| 2. Development, Protection, and Management of ERDS-DENR Experimental Forest in Lagazpi City | DENR | 7.2 Million |
| 3. Operation and Development of Water Service in Legazpi City for the Legazpi City Water District | BOT Scheme<br>• Compagnie des Eaux<br>• Aboitiz<br>• Marubeni | 1.52 Billion |
| 4. Operation and Development of Water Service in Daraga for the Daraga Water District | BOT Scheme<br>• Compagnie des Eaux<br>• Aboitiz<br>• Marubeni | 635 Million |
| 5. Seedling Production Project | DENR | 18 Million |
| 6. Development and Implementation of the Ecological Waste Management Program in the Bicol Region | DENR | 153 Million |
| 7. Abaca Industry Recovery and Promotion Project | LGU's, FDiA, DA | 50 Million |
| 8. Poultry and Piggery Development Project | LGU, DA, DTI | Under Discussion |
| 9. Pili Nut Planting Promotion | LGU-MAO | For Budgetary Allocation |
| 10. Commercial Production of High Value Vegetables/Fruits in the Slopes of Mt. Mayon | LGU-MAO/PAO DA, CDA | For Discussion with Implementing Agencies |
| 11. Expansion of Cattle Production | DA, LGU | For Consultation |
| 12. Productivity Improvement of Riceland Areas | LGU-PAO/MAO, DA | For Consultation |
| 13. Common Service Facility and Warehousing | DTI | For Discussion |
| 14. Industry-Tourism Linkage Building | DTI, LGU, DOT | For Discussion |
| 15. Cooperative networking | LGU, DTI | For Finalization |

Source: NEDA Region V, Proponent Agencies

At least in Daraga Legazpi Area of the slopes of Mt. Mayon, the many separate activities could be more efficiently and effectively covered by one project, which could become a model for other areas.

2) The Main Objectives of the Project:

   a. To maintain optimum ecosystem along the slopes of Mayon that will not only improve the present environmental conditions but also increase the income of farmers working along the slopes of Mayon

b. To develop and encourage minimum tillage farming systems along the higher slopes to reduce the exposure of farmers to danger and minimize erosion
c. To improve water retention along the slopes of Mayon to reduce stress on drainage and Sabo Project structures and reduce flooding during storms
d. To improve water quality and stabilize water supply from the slopes into springs and tributaries feeding into the Yawa River System
e. To improve farm productivity of farmers not only for rural economic development but also for the food security of the province

3) Project Components:

a. Project Management

Personnel mostly seconded from line agencies, local government units, will provide the project management. Their basic salaries will be drawn from their mother agencies. Project contractual workers and consultants will support them.

b. Pilot Reforestation Projects

After so many failed experiences in reforestation projects, the DENR have developed ideas for reforestation and agro-forestry concepts that may be implemented not only on the National Park, but the upper slopes of the volcano. An agro-forestry system that involves the active participation of the farmers, which also encourages them from cutting the threes are deemed effective. These pilot projects shall also be used for training farmers from other parts of Mayon and the region.

c. Pilot Farms Along the Slopes of Mayon

Except for areas buried under the sand and gravel, much of the slopes of Mayon are being cultivated to different crops under different levels of intensity. Managed properly by using sloping agriculture land technologies (SALT), farming along the slopes of Mayon could be profitable due to the availability of water. The pilot farms to be established in different parts of the project areas will become model farms where farmers both from Mayon and other areas could be provided training. The project will introduce the planting of Vetiver Grass (Morass) and Lemon Grass as hedgerows to prevent erosion and siltation. They are also good sources of aromatic oils used as ingredients for perfumery for soap, insecticides, and other products.

It will also introduce abaca and pilinut as high value crops to be intercropped with coconut lands along the slopes of Mayon.

d. Model Rice Farms

The area near the foot of Mt. Mayon is the main rice producing area of the province. Because of the almost year round water availability, small privately developed irrigation systems have been developed in many areas at the foot of the mountain. There is actually more irrigated than non-irrigated rice farms in the project area. Productivity, however, have remained low because of low investments on farm inputs by the farmers, either because of lack of capital or fear of losing large investment due to calamities that could wipe out the crops planted.

The Sabo project would, however, provide a certain degree of security for the farmers from flooding or destruction. This model farm will be used to train farmers on a more intensive and productive rice farming system on a three planting seasons a year. For irrigated areas, rice-vegetable/legume-rice and for non-irrigated areas, rice-vegetable/legume-corn cropping patterns shall be modeled. Even for irrigated rice areas, three rice cropping is not advisable due to problems in pests and soil fertility.

e. Technical Support and Training Center

One of the reasons for the low productivity of the farmers is lack of technical knowledge. The average farmers had only six years of formal education and have not been given any formal education on farming. Socio-economic and household surveys consistently shows that whatever he learned came from his parents or close relatives and friends. Only 1.6% of the farmers ever has experienced at least one day training or received technical assistance from technicians. At present, very little inputs, other than putting inadequate amounts of fertilizers, is placed on the farm.

If the farmers have to increase their farm production, they have to undergo considerable educational and training activities. For this purpose, a small training center enough to accommodate training center offices and accommodate about 30 farmers will be established at the project area.

The following will be the main training topics of the Training Center.

- Principles and Management of Agroforestry Farms
- Sloping Agriculture Land Technology
- Farm Management

- Soil and Water Conservation
- Cooperative Organization and Management
- Management and Maintenance of Irrigation Systems
- Organic Farming
- Pest and Disease Management
- Post Harvest Technologies
- Soil Fertility Management
- Nursery Establishment and Management
- Erosion Control Principles

f. Soils Laboratory

The present farmers in the project area have very little information on the fertility of the soil they till. Accurate information on what the soil needs is very important to maximize yields. Low cost and easy to operate computerized soil analysis equipment is now available. This laboratory can initially be operated by the project in cooperation with the Provincial Agricultural Office and later on donated to the Provincial Government for operation and maintenance.

g. Extension Activities

Farmers, having very little experience in formal education, find classroom type training insufficient to learn new technologies. It is therefore very important for them to have somebody demonstrate it for them on actual operations. In this case, other means of instructional methods should be explored to transfer skills to the farmers.

h. Cooperative Development

Because of the weak financial and economic capabilities of individual farmers, it has become necessary for them to form into cooperatives in order to pool their resources for better efficiency and productivity. Unfortunately however, there is no history of cooperativism in the Philippines and the Bicol Region. Long history of colonialization and insurgency has created situations wherein governments discouraged formation of organizations among farmers. Many farmers also lack the capabilities to manage cooperatives.

The Bicol Region is an example of an area where farmer cooperatives are needed most but unfortunately very few cooperative succeed.

There are approximately 1,323 registered cooperatives in the Bicol Region (Cooperative Development Authority, Region V) and most of them are inactive. Of those number only a total of 379 cooperatives have managed to avail of production loan from the Land Bank of the Philippines (LBP) in the past years. Most of the cooperatives have become past due with their loans and have become inactive.

According to the classification of the Land Bank, only 19 (Class A & B) remain viable and active. 38 (Class C) have to be rehabilitated, 106 (Class D) are inactive, and 216 (Class F) are totally failed cooperatives.

There is, therefore, a need for strengthening of cooperatives through technical support and education programs for the farmers. Particular attention should be given to the cooperatives especially in the initial stages, and guidance and education through hands on operation would be considered.

**Classification of Cooperatives in the Bicol Region**

| Area | Class A | Class B | Class C | Class D | Class F | Total |
|---|---|---|---|---|---|---|
| ALBAY | | 1 | 3 | 7 | 14 | 25 |
| DAET | | 2 | 1 | 3 | 15 | 21 |
| LABO | | 2 | 2 | 6 | 36 | 46 |
| GOA | | 1 | 2 | 13 | 60 | 76 |
| IRIGA | | 1 | | 5 | 12 | 18 |
| NAGA | 1 | 2 | 5 | 14 | | 22 |
| LIGAO | | | 1 | 1 | 27 | 29 |
| SIPOCOT | 1 | | 6 | 12 | 16 | 35 |
| PILI | | 1 | 3 | 3 | 16 | 23 |
| VIRAC | | | 1 | 16 | 8 | 25 |
| MASBATE | | | 10 | 13 | 1 | 24 |
| IROSIN | | 3 | 1 | 6 | 8 | 18 |
| SORSOGON | | 4 | 3 | 7 | 3 | 17 |
| Total | 2 | 17 | 38 | 106 | 216 | 379 |

Source: Land Bank of the Philippines, 1999

While there are many examples of failed cooperatives in the region, there is a need to study how the cooperatives can be strengthened through various methods such as; full time assistance of professional managers, joint undertaking with private firms, or joint venture with Land Bank and other companies which can provide them the expertise they do not have.

There are no existing cooperatives in the project area. If the farmers are to be assisted, two main cooperatives will be organized:

The Upland and Coconut Farmers' Cooperative

This cooperative will be mainly composed by the more than 250 coconut farmers in the 811 hectares of coconut farms in the project area. Their capabilities will also be strengthened in order to own and operate the model projects plant on essential oil, and the warehouse and baling facility for abaca fibers. They will eventually include other coconut farmers in the adorning areas of the project. They will also operate nurseries for morass, citronella, abaca, and pilinut for propagation in the project area.

The Lowland Farmers Cooperative

This cooperative will be composed of the more than 700 farmers tilling the paddy fields of the project area. They will be assisted and trained also to operate the feed mill, warehouse, and the piggery and poultry model projects.

To strengthen these cooperatives, technical personnel will initially provided to them by the project until they are capable enough to manage their enterprises.

i. Cooperative Financing and Linkage with Financial Institutions

While the initial development activities and facilities will be included as project expenditure, the finances necessary for the operation of the projects should be raised by the cooperative.

The farmers can raise cooperative funds for the projects through:

- Individual contributions and investments through cooperative membership fees or personal investments and deposits
- Using the facilities turned over to the cooperative, the farmers can form a partnership with the Land Bank of the Philippines and other companies to form joint venture wherein the LBP can invest up to 49 Million Pesos not to exceed 49% of the subscribed stocks.
- Easy term loans from financial institutions or non-bank institutions, which are interested in supporting innovative farming ventures for rural development

j. Marketing Support Project

A marketing support group will initially be made composed of members detailed from the Department of Trade and Industry, Department of Agriculture, and consultants and contractual staff from the project.

Marketing agreements could be forged with existing companies and major players in the industry.

(8) Eco-Prevention and greenbelt Model Project

Bio-engineering, or the effective utilization of plants to prevent erosion and stabilize soil structures, is now being practiced all over the world. It is now regarded not only as ecologically sound soil structure protection but also as very low technology and low cost system that can be readily adopted by the residents and farmers of the project area.

The project will consist of putting up model sites as training venues for farmers, and training programs will be regularly held along the following topics:

a. General Concepts for Water and Soil Retention on Slopes
b. General Concepts for Gully Embankment and Slope Erosion Control
c. Nursery Development
d. Training and Extension Project for Upland Farmers

If adopted by the residents, it will contribute to the soil siltation reduction and water retention in the area, thus contributing considerably tot he lessening of pressure on the Mayon infrastructures and extending the life of the dikes, roads, and drainage systems.

(9) Buffer Zone green Belt Area

The dyke system that will be constructed on the project area sand pocket shall consist of 1,100 meters of dam, 5,600 meters to Type B spur dykes and 600 meters of Type C spur dykes. The Type B and Type C spur dykes have unarmored top and back slope made of compacted earth. The exposed parts are susceptible to constant erosive action from rain and may cause rill erosion and pose bigger problems in the future.

To prevent erosion on the earth dikes and strengthen the tensile strength of the whole dike structure, a combination of grass and trees will be planted on a 25 meter strip along the 6,100 meter length spur dykes.

A total of 152,500 square meters of land will be covered with grass and pilinut planted on a 3 meters x 3 meters distance. The excess pilinut trees shall just be later trimmed or cut by natural selection process.

Implementation Methodology:

A quick survey of the area where the dykes would be built showed not residential houses being affected. The area that will be occupied by the dykes, however, are mostly under-utilized coconut and un-irrigated farms.

It may be a good strategy to involve the landowners in developing the Buffer Zone Green Belt by selecting plants that may be economically profitable for them. In that way, they will help in the maintenance of the plants and not contribute to their destruction.

The grass plant species that will be used are Vetiver *zesanoides* and lemon grass. Both have commercial values and can be harvested by cutting the leaves for sale at the distilling plant for P1.25 pr kilo. Cutting the leaves encourages the plant to develop more extensive root system, becoming permanently entrenched into the slope, adequately protecting the dyke from surface erosion. When planted as hedges, these grasses prevent sand or soil particles from flowing with the surface water run off.

Both the pilinut and grass seedlings will be given free to the owner of the land and they will be paid for planting them. Whoever maintains the plants on the slope shall have the right to harvest them. In this way, the cost of planting and maintaining the plants would be reduced.

## 3. INSTITUTIONAL STREGTHENING PROGRAMS

### 3.1 Provincial Disaster Management System Strengthening

(1) Objectives of the Project

This program is designated with a view to upgrading managerial and operational capability of the Provincial Government staff in charge of disaster management (especially PDMO and PDCC), so that they can properly cope with disasters and take quick response actions in accordance with the Disaster Management Operation Manual.

(2) Components

a. Capability building activities will be undertaken for the Provincial officers and staff involved in the Provincial disaster management operations, especially those in the Provincial Management Office (PDMO) and other agencies concerned, through execution of periodical staff training. These training programs will be implemented by holding seminars and workshops to be

conducted by higher DCC or the Asia Pacific Disaster Management Center (APDMC) based in the Philippines.

b. The disaster management training will cover a wide range of functions and skills. These include planning, organization, day-to-day management activities, counter-disaster operations, crisis management activities, logistic functions, recovery management, participation in major programs such as regional development prevention and mitigation, special skills applicable to rescue, first aid assessment, emergency relief and welfare, communications, information management and so on. These training components must be integral parts of Basic and Advance Disaster Courses.

c. These training coursed will be prepared by the higher Disaster Coordinating Council (DCC) and/or professional third parties (ex. Asian Pacific Disaster Management Center) taking into account the existing basis of competence of the target personnel. The annual training program will be made up in October before entering into negotiations about budget allocation.

d. To assure communications with the subordinate LGUs concerned (City/ Municipalities and Barangays), an information network system will be established or improved by installing a set of the facilities and equipment such as radio transceivers or computer sets with internet communication connections.

e. The disaster management center needs to upgrade accuracy and reliability of the data and information on vulnerabilities to hazards, hazard areas and number of population residing in danger areas, etc., which are essential to the disaster-related activities and project planning. These are to be translated into maps using GIS software.

f. In this program, the following will be taken up as program component:

- Policy and legal arrangements to cope with the current disaster-related issues such as optimum land use, enforcement of national building code, and so on.
  - Institutional arrangement for mud and debris flow observation and monitoring for DPWH
  - Coordination of existing rules and regulations related to public safety along Mayon danger zone enacted by the Sangguniang Panlawigan ng Albay (SPA)
- Capability building of PDCC/PDMO offices and staff
  - Establishment of rescue equipment for skills training and actual search, rescue and recovery operations
  - Installation of internet system of communication and warning information within the MDCCs/CDCC of Albay

- Installation of appropriate warning information device at the barangay level
- Establishment of the early and accurate forecasting, timely warning and prompt and reliable evacuation system
- Reproduction of risk map along the Mayon area, utilizing a processing software designed for mapping and accurate data capture like GIS
- Improvement of training of equipment on disaster education and information campaign using Magnabyte
- Provision of emergency operation quarters for medical and non-medical personnel who will render 24 hours operation
- Undergoing of training and education on the following:
  - Advance disaster management
  - Vulnerability assessment and planning using GIS
  - Disaster management on environmental aspects
  - Disaster management on socio-economic aspects
  - Disaster management on meteorological aspects
  - Disaster management on volcanological aspects
  - Disaster management on seismological aspects
  - Disaster management on local governance
  - Environmental safety
  - Skills training on environmental high angle slope rescue
  - Evacuation management with health and sanitation

- Networking
  - Consolidation of coordination framework and networking for disaster management (LGUs – DCCs – PDMO – NGAs - Private Sector/NGOs). Conferences for institutional arrangements leading to policy recommendations for clearer guidelines
  - Reorientation of cooperation in disaster coping and conclusion of an agreement on response and recovery operations among the neighboring LGUs at every level. Redefining their roles and responsibilities to avoid overlapping and duplication in order to maximize resources
- Organization Development
  - Restructuring of the provincial system for integrating disaster mitigation into area development. Improvement of working relationships between Disaster Coordinating Council and Development Council.

- Restructuring/Expansion of PDMO into Provincial Public Safety Office
  - · Expansion of PDMO's function on public safety to augment the economic and financial status of the province for disaster prevention works and activities
  - · Involvement of the institutionalized Provincial Public Safety Office (PPSO) in and expanded program to develop and implement a multi-sectoral approach to public safety and disaster management by organizing, utilizing and maximizing the local organic capabilities at both human and non human resources
  - · Creation of programs and projects designed for implementation within the next five years

(3) Training Program and Estimated Cost for Capability Building

a. Estimated Cost for Administrative Programs

(Unit : Million PHP)

| | | |
|---|---|---|
| 1. | PPSO Extension/Field Offices | 2.0 |
| 2. | Emergency Operation Quarters | 1.0 |
| 3. | Institutionalization of Regional Education Center for Public Safety and Disaster Management | 10.0 |
| | Subtotal | 13.0 |

b. Estimated Cost for Operational Programs

| | | |
|---|---|---|
| 1. | Emergency Ambulance Services | 1.5 |
| 2. | Public Safety Education | 0.8 |
| 3. | Traffic Management | 1.2 |
| 4. | Patrol Motorcycle Project | 0.4 |
| 5. | 10-year Reforestation Project | 20.0 |
| 6. | Research and Data Banking System | 3.0 |
| 7. | GIS-run Risk and Resource Maps | 0.5 |
| 8. | Organization of Municipal Emergency Response Intervention Team (MERIT) | 1.8 |
| 9. | Strengthening of Communication and Warning System | 2.0 |
| 10. | Public Information System | 0.1 |
| 11. | Disaster Mitigation on Health Hazards at Evacuation Centers | 0.5 |
| | Subtotal | 31.8 |

c. Capability Building Cost

| | |
|---|---|
| Grand Total ( a. + b. ) for Capability Building | 44.8 |

## 3.2 Community-based Disaster Management Strengthening

(1) Objective

This program aims to extend the ongoing efforts to upgrade/strengthen the disaster management system of the City/Municipalities and Barangays concerned in the Study Area.

(2) Components

a. Capacity building will be made to the city/municipality and barangay staff in charge of disaster management, through execution of periodical staff training. These training programs will be implemented by holding seminars, workshops and drills especially on Search, Rescue and Recovery and Evacuation Management which includes Health and Sanitation.
b. The training program will be prepared by PDMO and/or professional third party considering the competence level of the target personnel. The training program will start from the Basic Disaster Management to Advance Disaster Management going into specific assets like Disaster Management Medical Aspects, Socio-Economic Aspects, Local Governance Aspects, and others. The target participants to the training will be the BDCCs, Media, Agencies, NGOs and Volunteers/Social Workers.
c. The disaster management training will include a wide range of functions and skills relating to planning, organization, day-to-day management activities, counter-disaster operations, crisis management activities, logistic functions, recovery management, special skills applicable to rescue, first aid, assessment, emergency relief and welfare, communications, information management so on.
d. Improvement of information network system to assure quality communications among PDMO/PDCC, CDCC/MDCCs and BDCCs.
e. Establishment and strengthening of communication with other municipalities using internet communication facilities.
f. This program will incorporate the following disaster-related component:
    - Capability building
        - Institutional consolidation of CDCC/MDCCs including BDCCs
        - Strengthening of volunteer disaster operation groups through organizing and training
        - Enhancement of disaster coping capacity through upgrading of the forecasting & warning and evacuation system through internet communication facilities

  - Preparation of the comprehensive city/municipal land use plan including hazard mapping & resource assessment, key commodity development strategy
  - Development of the integrated community disaster planning program
- Advocacy
  - Awareness promotion campaign and enlightenment on disaster management through seminars, workshops and drills for general public, including the disaster-related education at primary and junior schools
  - Advocacy works through seminar, fora and symposia
- Resettlement and Livelihood Development
  - Resettlement community development program in association with livelihood programs and projects for 137 families from the 6km-radius PDZ of Mayon Volcano at PHP100,000 each or a total for PHP13.7 millions.
  - Research studies on resettlement development

(3) Training Modules and Estimated Cost for the Community-based Disaster Management Strengthening

| | Training Title | Target Participants | Time Frame | Cost (PHP1,000) |
|---|---|---|---|---|
| 1. | Basic Disaster Management | PDCC, MDCC, CDCC, Media, NGOs<br>300 participants | 5 days | 450 |
| 2. | Advance Disaster Management | DCCs, Agencies, NGOs<br>300 participants | 5 days | 600 |
| 3. | Vulnerability Assessment and Planning Workshop | DCCs<br>100 participants | 3 days | 100 |
| 4. | Search, Rescue and Recovery | Volunteers, NGOs, DCC Personnel<br>140 participants | 30 days | 1,120 |
| 5. | Evacuation Management (includ. Health & sanitation) | DCCs, DECs, Relief Volunteers, Social Workers<br>300 participants | 3 days | 300 |
| 6. | Disaster Management (D.M.) Medical Aspects | Rural Health Workers<br>100 participants | 3 days | 100 |
| 7. | D.M. Environmental Aspects | DENR, LGUs<br>100 participants | 3 days | 100 |
| 8. | D.M. Socio-Economic Aspects | DCCs<br>100 participants | 3 days | 100 |
| 9. | D.M. Meteorological Aspects | DCCs<br>100 participants | 5 days | 175 |
| 10. | D.M. Volcanological Aspects | DCCs<br>100 participants | 3 days | 100 |
| 11. | D.M. Seismological Aspects | DCCs<br>100 participants | 3 days | 100 |
| 12. | D.M. Local Governance | DCCs<br>100 participants | 3 days | 100 |
| 13. | Road Safety | LGUs<br>100 participants | 5 days | 175 |
| 14. | Sea Water Safety | LGUs<br>140 participants | 5 days | 175 |
| 15. | Family Disaster Preparedness | DCCs<br>100 participants | 3 days | 100 |
| 16. | Building Code and Fire Safety | DCCs, LGUs<br>100 participants | 5 days | 175 |
| | | Total | | 3,970 |

**Table XXIII 1.1 Estimated Cost of Production & Maintenance of One-Hectare Abaca Farm**

(Unit : PHP)

| Item | Mandays | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total |
|---|---|---|---|---|---|---|---|
| 1. Land Preparation & Planting | P 150 /day | | | | | | |
| - Planting of shade trees (if needed) | 2 | 300.00 | - | - | - | - | 300.00 |
| - Land cleaning (underbrushing) | 10 | 1,500.00 | - | - | - | - | 1,500.00 |
| - Tumbling unnecessary trees, etc. | 4 | 600.00 | - | - | - | - | 600.00 |
| - Staking, Layouting | 6 | 900.00 | - | - | - | - | 900.00 |
| - Digging of holes, planting | 15 | 2,250.00 | - | - | - | - | 2,250.00 |
| - Hauling of Seedpieces (PHP0.15/pc) | | 375.00 | - | - | - | - | 375.00 |
| Subtotal | | 5,925.00 | - | - | - | - | 5,925.00 |
| 2. Maintenance | | | | | | | |
| - Underbrushing (3x/year) | | 900.00 | 1,350.00 | 1,350.00 | 1,350.00 | 1,350.00 | 6,300.00 |
| - Ringweeding (2x / year) | | 1,200.00 | 1,500.00 | 1,800.00 | 2,100.00 | 2,100.00 | 6,300.00 |
| - Fertilization (2x / year) | 8 | 1,200.00 | 1,200.00 | 1,200.00 | 1,200.00 | 1,200.00 | 6.000.00 |
| - Replanting | 3 | 450.00 | - | 450.00 | - | - | 900.00 |
| Subtotal | | 3,750.00 | 4,050.00 | 4,800.00 | 4,650.00 | 4,650.00 | 21,900.00 |
| 3. Inputs & Other Costs | | | | | | | |
| - Shade trees seedling | | 1,000.00 | - | - | - | - | 1,000.00 |
| - Seedlings (2,500 pcs) @ PHP2/pc) | | 5,000.00 | - | - | - | - | 5,000.00 |
| - Replants (250 pcs) | | 500.00 | - | - | - | - | 500.00 |
| - Fertilizers – organic | | 450.00 | 450.00 | 540.00 | 540.00 | 600.00 | 2,580.00 |
| - UREA & Complete | | 2,500.00 | 2,500.00 | 2,875.00 | 2,875.00 | 3,306.25 | 14,056.25 |
| - Shed tuxy knife, stakes | | 3,600.00 | - | - | - | - | 3,600.00 |
| Subtotal | | 6,5550.00 | 2,950.00 | 3,415.00 | 3,415.00 | 3,906.25 | 20,236.25 |
| 4. Harvesting, Processing | | | | | | | |
| - Topping, etc. of stalks | | - | 1,800.00 | 2,700.00 | 3,600.00 | 6,250.00 | 14,350.00 |
| - Tuxying, 4 bundles/man @ 10 stalks | | - | 4,650.00 | 6,975.00 | 9,380.00 | 11,562.00 | 32,567.00 |
| - Hand Stripping, PHP5/kg. | | - | 4,275.00 | 8,195.00 | 11,875.00 | 14,845.00 | 39,190.00 |
| - Handling & Drying of Fiber | | - | 450.00 | 600.00 | 900.00 | 1,050.00 | 3,000.00 |
| - Bundling & Marketing | | - | 300.00 | 450.00 | 600.00 | 900.00 | 2,250.00 |
| Subtotal | | - | 11,475.00 | 18,920.00 | 26,355.00 | 34,607.00 | 91,357.00 |
| 5. Interest on PHP50,000 Loan @ 15% p.a. | | 7,500.00 | 7,500.00 | 7,500.00 | 7,500.00 | 7,500.00 | 37,500.00 |
| Land Rent | | 1,000.00 | 1,000.00 | 1,000.00 | 1,000.00 | 1,000.00 | 5,000.00 |
| Total Production Cost | | 24,725.00 | 26,975.00 | 35,990.00 | 46,435.00 | 59,903.25 | 181,918.25 |

Source: Department of Agriculture (DA)

**Table XXIII 1.2 Benefit-Cost Analysis for One-Hectare Pili Plantation**

(Unit : PHP)

| Items | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 | Y8 | Y9 | Y10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Revenue- Production (# of nuts) | | | | | | 75,000 | 100,000 | 125,000 | 156,250 | 200,000 |
| Price : PHP 0.25/nut | | | | | | 18,750 | 25,000 | 31,250 | 39,062 | 50,000 |
| 1. Production Cost | 4,375 | 975 | 1,075 | 900 | 1,000 | 1,988 | 2,385 | 2,636 | 3,173 | 3,855 |
| - Planting stock (110 pcs @ 7/pc) | 770 | | | | | | | | | |
| - Transport/Hauling | 300 | | | | | | | | | |
| - Clearing & weeding (4 days) | 600 | | | | | | | | | |
| - Staking & hole digging (4 days) | 600 | | | | | | | | | |
| - Outplanting (5 mandays) | 600 | | | | | | | | | |
| - Replanting (0.5 days) | 75 | | | | | | | | | |
| - Ring weeding w/cultivation (2 days) | 300 | | | | | | | | | |
| - Pruning (0.5 manday) | 75 | 75 | 75 | | | | | | | |
| - Fertilization (1 day/quarter/year) | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 | 600 |
| - Stakes (PHP0.50/pc) | 55 | | | | | | | | | |
| - Bolos | 100 | | 100 | | 100 | | 100 | | 100 | |
| - Fertilizer – 10 sacks organic | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| - Plastic straw (PHP25/roll) | | | | | | 25 | 25 | 25 | 25 | 25 |
| - Sacks (PHP10/pc) | | | | | | 390 | 488 | 609 | 762 | 953 |
| - Harvesting (starts on the 6th. Year) | | | | | | 450 | 450 | 450 | 600 | 600 |
| - Bagging (1 day/20 sacks, 2000 seeds/sack | | | | | | 225 | 300 | 375 | 468 | 600 |
| - Hauling transport (15/sack) | | | | | | 562.5 | 750 | 937.5 | 1,172 | 1,500 |
| 2. Net Income | (4,375) | (975) | (1,075) | (900) | (1,000) | 16,762 | 22,615 | 28,614 | 35,889 | 46,145 |

Source: Department of Agriculture (DA).

## Table XXIII 1.3 Projection of Pili Population and Production Volume and Value in Bicol Region

**(Without Project Intervention)** *(Based on 1998 Data)*

| YEAR | TREE PROJECTION * 50% Reliability of DA Data * 60% Survival of Seedlings under Pili Dev't Proect * No Additional Planting | Equivalent Effective Hectarage (150 trees/ha) | Percent Fruit Bearing (%) | Number of Bearing Trees | Mortality at 2% Per Year | Average Production Per Tree Per Year (No. of Fruits) | Total Production Per Year | Percentage Production Spoillage (%) | Net Total Production Volume | Price Per Piece (PHP) | Gross Production Value (PHP) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999 | 570,407.90 | 3,802.72 | 40.00% | 228,163.16 | 11,408.16 | 400.00 | 91,265,264 | 5.00% | 86,702,001 | 0.20 | 17,340,400.16 |
| 2000 | 558,999.74 | 3,726.66 | 45.00% | 251,549.88 | 11,179.99 | 400.00 | 100,619,954 | 5.00% | 95,588,956 | 0.20 | 19,117,791.18 |
| 2001 | 547,819.75 | 3,652.13 | 50.00% | 273,909.87 | 10,956.39 | 450.00 | 123,259,443 | 5.00% | 117,096,471 | 0.20 | 23,419,294.19 |
| 2002 | 536,863.35 | 3,579.09 | 60.00% | 322,118.01 | 10,737.27 | 450.00 | 144,953,105 | 5.00% | 137,705,450 | 0.20 | 27,541,089.97 |
| 2003 | 526,126.09 | 3,507.51 | 60.00% | 315,675.65 | 10,522.52 | 450.00 | 142,054,043 | 5.00% | 134,951,341 | 0.20 | 26,990,268.17 |
| 2004 | 515,603.56 | 3,437.36 | 60.00% | 309,362.14 | 10,312.07 | 500.00 | 154,681,069 | 5.00% | 146,947,016 | 0.20 | 29,389,403.12 |
| 2005 | 505,291.49 | 3,368.61 | 60.00% | 303,174.90 | 10,105.83 | 500.00 | 151,587,448 | 5.00% | 144,008,075 | 0.20 | 28,801,615.06 |
| 2006 | 495,185.66 | 3,301.24 | 60.00% | 297,111.40 | 9,903.71 | 500.00 | 148,555,699 | 5.00% | 141,127,914 | 0.20 | 28,225,582.75 |
| 2007 | 485,281.95 | 3,235.21 | 60.00% | 291,169.17 | 9,705.64 | 500.00 | 145,584,585 | 5.00% | 138,305,355 | 0.20 | 27,661,071.10 |
| 2008 | 475,576.31 | 3,170.51 | 60.00% | 285,345.79 | 9,511.53 | 500.00 | 142,672,893 | 5.00% | 135,539,248 | 0.20 | 27,107,849.68 |
| 2009 | 466,064.78 | 3,107.10 | 60.00% | 279,638.87 | 9,321.30 | 500.00 | 139,819,435 | 5.00% | 132,828,463 | 0.20 | 26,565,692.68 |
| 2010 | 456,743.49 | 3,044.96 | 60.00% | 274,046.09 | 9,134.87 | 600.00 | 164,427,656 | 5.00% | 156,206,273 | 0.20 | 31,241,254.60 |
| 2011 | 447,608.62 | 2,984.06 | 60.00% | 268,565.17 | 8,952.17 | 800.00 | 214,852,137 | 5.00% | 204,109,530 | 0.20 | 40,821,906.01 |
| 2012 | 438,656.45 | 2,924.38 | 60.00% | 263,193.87 | 8,773.13 | 1,200.00 | 315,832,641 | 5.00% | 300,041,009 | 0.20 | 60,008,201.83 |
| 2013 | 429,883.32 | 2,865.89 | 60.00% | 257,929.99 | 8,597.67 | 1,500.00 | 386,894,985 | 5.00% | 367,550,236 | 0.20 | 73,510,047.24 |
| 2014 | 421,285.65 | 2,808.57 | 60.00% | 252,771.39 | 8,425.71 | 1,800.00 | 454,988,503 | 5.00% | 432,239,078 | 0.20 | 86,447,815.55 |
| 2015 | 412,859.94 | 2,752.40 | 60.00% | 247,715.96 | 8,257.20 | 2,000.00 | 495,431,925 | 5.00% | 470,660,329 | 0.20 | 94,132,065.82 |
| 2016 | 404,602.74 | 2,697.35 | 60.00% | 242,761.64 | 8,092.05 | 2,000.00 | 485,523,287 | 5.00% | 461,247,123 | 0.20 | 92,249,424.51 |
| 2017 | 396,510.68 | 2,643.40 | 60.00% | 237,906.41 | 7,930.21 | 2,000.00 | 475,812,821 | 5.00% | 452,022,180 | 0.20 | 90,404,436.02 |
| 2018 | 388,580.47 | 2,590.54 | 60.00% | 233,148.28 | 7,771.61 | 2,000.00 | 466,296,565 | 5.00% | 442,981,736 | 0.20 | 88,596,347.30 |
| 2019 | 380,808.86 | 2,538.73 | 60.00% | 228,485.32 | 7,616.18 | 2,000.00 | 456,970,633 | 5.00% | 434,122,102 | 0.20 | 86,824,420.35 |
| 2020 | 373,192.68 | 2,487.95 | 60.00% | 223,915.61 | 7,463.85 | 2,000.00 | 447,831,221 | 5.00% | 425,439,660 | 0.20 | 85,087,931.94 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1998 | Pili Survey of Department of Agriculture and Local Government Unit | Albay = | 117,885 | trees | Sorsogon = | 92,987 | trees | The Pili Development Project (1993-1998) of DA, DENR, DOST and Bicol University reported to have distributed a total of about 608,879 sexually propagated seedlings | | |
| | | Cam. Sur = | 102,328 | trees | Catanduanes = | 61,742 | trees | | | |
| | | Cam. Norte = | 35,219 | trees | Total Bicol = | 410,161 | trees | | | |
| | Reported Percentage Fruit Bearing = | | 24% | with | 98,439 | fruit bearing trees | | | | |

## Table XXIII 1.4 Projected Incremental Increase in Pili Population, Volume and Value in the Bicol Region

**(With Project Intervention)**

| | TREE PROJECTION Incremental Planting of Asexually Propagated Pili thru 6-Year Pili Dev't Project | NET Accumulative Number of Planted Standing Asexual Pili Trees | Percent Bearing (%) | ADDITIONAL Number of Bearing Trees | Mortality at 2% Per Year | Average Production Per Tree Per Year (No. of Fruits) | ADDITIONAL Total Production Per Year | Percentage Production Spoillage (%) | ADDITIONAL Net Total Production Volume | Price Per Piece (PHP) | ADDITIONAL Gross Production Value (PHP) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1999 | - | - | - | - | - | - | - | 5.00% | - | 0.20 | - |
| 2000 | - | - | - | - | - | - | - | 5.00% | - | 0.20 | - |
| 2001 | 50,000 | 50,000 | - | - | 1,000.00 | - | - | 5.00% | - | 0.20 | - |
| 2002 | 100,000 | 149,000 | - | - | 2,980.00 | - | - | 5.00% | - | 0.20 | - |
| 2003 | 100,000 | 246,020 | - | - | 4,920.40 | - | - | 5.00% | - | 0.20 | - |
| 2004 | 100,000 | 341,100 | 25.00% | 85,275 | 6,821.99 | 50 | 4,263,745 | 5.00% | 4,050,558 | 0.20 | 810,111.55 |
| 2005 | 100,000 | 434,278 | 50.00% | 217,139 | 8,685.55 | 100 | 21,713,880 | 5.00% | 20,628,186 | 0.20 | 4,125,637.28 |
| 2006 | 50,000 | 475,592 | 70.00% | 332,914 | 9,511.84 | 150 | 49,937,166 | 5.00% | 47,440,308 | 0.20 | 9,488,061.51 |
| 2007 | - | 466,080 | 80.00% | 372,864 | 9,321.60 | 200 | 74,572,834 | 5.00% | 70,844,193 | 0.20 | 14,168,838.53 |
| 2008 | - | 456,759 | 85.00% | 388,245 | 9,135.17 | 250 | 97,061,205 | 5.00% | 92,208,144 | 0.20 | 18,441,628.90 |
| 2009 | - | 447,623 | 90.00% | 402,861 | 8,952.47 | 350 | 141,001,383 | 5.00% | 133,951,314 | 0.20 | 26,790,262.78 |
| 2010 | - | 438,671 | 95.00% | 416,737 | 8,773.42 | 550 | 229,205,582 | 5.00% | 217,745,302 | 0.20 | 43,549,060.49 |
| 2011 | - | 429,898 | 95.00% | 408,403 | 8,597.95 | 850 | 347,142,272 | 5.00% | 329,785,158 | 0.20 | 65,957,031.62 |
| 2012 | - | 421,300 | 95.00% | 400,235 | 8,425.99 | 1,250 | 500,293,274 | 5.00% | 475,278,610 | 0.20 | 95,055,722.04 |
| 2013 | - | 412,874 | 95.00% | 392,230 | 8,257.47 | 1,850 | 725,625,364 | 5.00% | 689,344,096 | 0.20 | 137,868,819.25 |
| 2014 | - | 404,616 | 95.00% | 384,385 | 8,092.32 | 2,000 | 768,770,656 | 5.00% | 730,332,124 | 0.20 | 146,066,424.71 |
| 2015 | - | 396,524 | 95.00% | 376,698 | 7,930.48 | 2,000 | 753,395,243 | 5.00% | 715,725,481 | 0.20 | 143,145,096.22 |
| 2016 | - | 388,593 | 95.00% | 369,164 | 7,771.87 | 2,000 | 738,327,338 | 5.00% | 701,410,971 | 0.20 | 140,282,194.30 |
| 2017 | - | 380,821 | 95.00% | 361,780 | 7,616.43 | 2,000 | 723,560,792 | 5.00% | 687,382,752 | 0.20 | 137,476,550.41 |
| 2018 | - | 373,205 | 95.00% | 354,545 | 7,464.10 | 2,000 | 709,089,576 | 5.00% | 673,635,097 | 0.20 | 134,727,019.40 |
| 2019 | - | 365,741 | 95.00% | 347,454 | 7,314.82 | 2,000 | 694,907,784 | 5.00% | 660,162,395 | 0.20 | 132,032,479.01 |
| 2020 | - | 358,426 | 95.00% | 340,505 | 7,168.52 | 2,000 | 681,009,629 | 5.00% | 646,959,147 | 0.20 | 129,391,829.43 |
| REMARKS: | | Gross Total Number of Grafted/Inarched Pili Trees Planted | | | | | = | | | 500,000 | trees |
| | Additional | Equivalent Effective Hectarage at 6.0 meters x 6.0 meters planting distance | | | | | (Monocrop Open Areas) | | = | 1,818.18 | hectares |
| | Additional | Equivalent Effective Hectarage at 8.0 meters x 8.0 meters planting distance | | | | | (Pili Intercrop With Coconut) | | = | 3,205.13 | hectares |