

**Japan International Cooperation Agency (JICA)**

**Ministry of Agriculture, Livestock and Food (MAGA)**

**THE MASTER PLAN STUDY  
ON  
SUSTAINABLE RURAL DEVELOPMENT  
FOR THE REDUCTION OF POVERTY  
IN  
THE CENTRAL HIGHLAND REGION  
OF  
THE REPUBLIC OF GUATEMALA**

**VOLUME-III : ANNEX-2**

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**Nippon Koei Co., Ltd.**

**Asia Air Survey Co., Ltd.**

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8. SMALL PILOT PROJECTS

## **CURRENCY EQUIVALENTS**

US \$1 =Quetzales 7.70 = Japanese Yen 119.35 (Q.1 = Yen15.50)  
as of June 2001

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**VOLUME-III : ANNEX-2**

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## ATTACHMENT : ILLUSTRATIONS FOR THE PILOT PROJECTS

### CURRENCY EQUIVALENTS

US \$1 = Quetzales 7.70 = Japanese Yen 119.35 (Q.1.0 = Yen 15.50)  
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### UNITS

#### Area :

1 manzana = 0.7 ha

1 cuerda (Chimaltenango) = 1/6 manzana = 0.117 ha

1 cuerda (Sololá) = 1/9.7 manzana = 0.072 ha

1 cuerda (Quetzaltenango & Totonicapán) = 1/16 manzana = 0.0438 ha

#### Weight :

1 quintal (qq.) = 100 lb. = 45.36 kg

## ABBREVIATION

ACNUR	: United Nations High Commissioner for Refugees (UNHCR) (Alto Comisionado de las Naciones Unidas para los Refugiados)
AGEXPRONT	: Asociacion Grimal de Exportadores de Productos No Tradicionales
AIDS	: Acquired Immune Deficiency Syndrome (Sindrome de Inmuno Deficiencia Adquirida)
ANACAFE	: National Association of Coffee (Asociacion Nacional del Café)
ARI	: Acute Respiratory Infection
ASINDES	: Asociacion de Entidades de Desarrollo y de Servicios No Gubernamentales de Guatemala
AVIDEH	: Victim Assistance Program of Violations to the Human Rights (Asistencia a Victimas de Violaciones a Derechos Humanos)
BANRURAL	: Bank for Rural Development (Banco para el Desarrollo Rural)
BOSCOM	: Municipal and Communal Forestry Reinforcement Program (Proyecto de Fortalecimiento Forestal Municipal)
CADISOGUA	: Association for coordination for Integrated Development in South-east Guatemala (Coordinadora de Asociaciones en Desarrollo Integral del Sur Occidente de Guatemala)
COINDE	: Council of Development Institution (Consejo de Instituciones de Desarrollo)
CONADEA	: National Council for Agriculture and Livestock Development (Consejo Nacional de Desarrollo Agropecuario)
CONAMA	: National Commission for Environment (Comision Nacional de Medio Ambiente)
CONAP	: National Council for Protected Area (Consejo Nacional de Areas Protegidas)
CONGCOOP	: Coordination for NGO and Cooperatives (Coordinacion de ONG y Cooperativas)
CONTIERRA	: Presidential Office for the Resolucion of Land Conflict (Oficina Presidencial para la Resolucion de Conflictos)
COPMAG	: Guatemalan Maya Council (Consejo de Pueblos Mayas de Guatemala)
CPR	: Communities of Population in Resistance (Comunidades de Poblacion en Resistencia)
CTEAR	: Comision Tecnica para la Ejecucion del Acuerdo sobre el Reasentamiento de las Poblaciones Desarraigada por el Enfrentamiento Armado
DHS	: Demographic and Health Survey (Programa de Encuestas de Demografia y Salud)
E.E.U.U.	: Estados Unidos de Norte America (USA)
EMPAGUA	: Municipal Company of Water of Guatemala
FAO	: Food and Agriculturral Organization of United Nations (Organizacion de Naciones Unidas para la Agricultura y Alimentacion)
FIS	: Social Investment Fund (Fondo de Inversion Social)
FODIGUA	: Guatemalan Fund for Indigenous Development (Fondo para el Desarrollo Indigena Guatemalteco)
FOGUAMA	: Guatemalan Fund for the Environment (Fondo Guamatemalteco de Medio Ambiente)
FONAGRO	: National Fund for Reactivation and Modernization of Agriculture and Livestock Activities (Fondo Nacional para la Reactivacion y Modernizacion de las Actividades Agropecuarias)
FONAPAZ	: National Peace Fund (Fondo Nacional para la Paz)
FONTANERO	: Plumber
FONTIERRA	: National Land Fund (Fondo Nacional de Tierra)
Foror Permanente	: Foro Permanente de ONG y Cooperantes
FSDC	: Solidarity Fund for Community Development
FUNCEDE	: Central America Fundation for Development (Fundacion Centroamericana de Desarrollo)
GDP	: Gross Domestic Product
HIV	: Human Immunodeficiency Virus
ICTA	: Institute of Science and Agricultural Technology (Instituto de Ciencias y Tecnologia Agricola)
IGN	: National Geographical Institute (Instituto Geografico Nacional)
IGSS	: Instituto Guatemalteco de Seguridad Social (Guatemalan Social Security Institute)
IICA	: Inter-American Institute of Agicultural Cooperation (Instituto Interamericano de Cooperacion Agricolas)



INAB	: National Institute of Forest (Instituto Nacional de Bosques)
INCAP	: Institute of Nutrition of Central America and Panama (Instituto de Nutricion de Centoamerica y Panama)
INDE	: National Institute of Electrification (Instituto Nacional de Electrificacion)
INE	: National Institute of Statistics (Instituto Nacional de Estadistica)
INFOM	: Municipal Development Institute (Instituto de Fomento Municipal)
INSIVUMEH	: Instituto de Sismologia, Volcanologia, Meteorologia
INTA	: National Institute of Agrarian Reform (Instituto Nacional de Transformacion Agraria)
INTECAP	: Technical Institute for Capacitation and Productivity (Instituto Tecnico de Capacitacion y Productividad)
JICA	: Japan International Cooperation Agency (Agencia de Cooperacion Internacional del Japon )
MAGA	: Ministry of Agriculture, Livestock and Food
MINUGUA	: Mision de Verificacion de las Naciones Unidas en Guatemala
MMR	: Maternal Mortality Rate (Tasa de Mortalidad Materna)
MSPAS	: Ministry of Public Health and Social Assistance (Ministerio de Salud Publica y Asistencia Social)
MTIV	: Minitry of Transportation and Road (Ministerio de Transporte y Vial)
OMS	: Organizacion Mundial de la Salud (WHO)
ONG/NGO	: Non-governmental Organization (Organizacion No Gubernamental)
ORS	: Oral Rehydration Salt (Sobre de Rehidratacion Oral)
PDP	: Small Project Program for the Productive Development of the Resettled Areas (Programa de Pequeños Proyectos para el Desarrollo Productivo de las Areas de Reasentamiento)
PEA	: Economic Active Population (Poblacion Economicamente Activa)
PINFOR	: Forest Incentive Program (Programa de Incentivos Forestales)
PLAMAR	: Action Plan for Modernization and Encouragement of Low Risk Agriculture (Plan de Accion para la Modernizacion y Fomento de la Agricultura Bajo Riego)
PNUD/UNDP	: United Nations Development Program (Pragrama de las Naciones Unidas para el Desarrollo)
PROAM	: Programa de Facilidad de Acceso a Medicamentos
PROFRUTA	: Fruits Farming Development Project (Proyecto para el Desarrollo de la Fruticultura)
PRONADE	: National Education Programe (Programa Nacional de Educacion)
PROTIERRA	: Institutional Committee for the Development and Strengthening of the Property of Land (Comision Institucional para el Desarrollo y Fortalecimiento de la Tierra)
PROZACHI	: Chixoy River Project (Proyecto del Rio Chixoy)
RADEAS	: Network of Agents for Sustainable Agriculture and Livestock Development (Redes de Agentes de Desarrollo Agropecuario Sostenible)
RENICAM	: National Network of Institutions of Training for Municipal Reinforcement (Red Nacional de Instituciones de Capacitacion para el Fortalecimiento Institucional)
S/W	: Scope of Work (Alcances del Trabajo)
SEGEPLAN	: Secretary for Planning (Secretaria de Planificacion)
SEPAZ	: Secretaria de la Paz
SIAS	: Integrated System of Health Care (Sistema Integral de Atencion en Salud)
TBA	: Traditional Birth Attendant (Comadrona)
TFR	: Total Fertility Rate
TZUK-KIM POP	: Movimiento TZUK-KIM POP
UNDP	: United Nations Development Program (Programa de Naciones Unidas para el Desarrollo)
USAID	: US Agency for International Development (Agencia para el Desarrollo Internacional)
USDA	: US Department of Agriculture
WFP (PMA)	: World Food Programe (Prorama Mundial de Alimentos)

## **8. SMALL PILOT PROJECTS**

### **8.1 Purpose**

In the Study, it is planned that the rural development plan which are formulated by the Study Team should be polished up by reviewing outcomes through implementation of pilot projects. In this context, 18 pilot projects were selected out of 59 approaches (project components) which were chosen by the criteria mentioned in Chapter 7. The detail plans for each pilot project was studied and formulated as shown in this chapter.

The Pilot Projects will be carried out for the following purposes:

- Monitoring and assessment of technical soundness of the Project through the implementation of the pilot projects
- Monitoring and assessment of organization for implementation and support system for the Projects and its management (operation and maintenance) through the implementation of the pilot projects
- Monitoring and assessment of improvement for the farmers' capability in solving problems and constraints through the implementation of the pilot project

Based on the results of monitoring and assessments above, problems and constraints on the implementation of the Projects and its management will be identified. Countermeasures for these identified problems and constraints will be proposed for finalization of the procedure of survey and formulation of project development.

### **8.2 Selection Criteria and Selection of Pilot Projects**

#### **8.2.1 Selection Criteria**

As mentioned in section 7.3, Development Plan, 59 project components were selected, consisting of 11 for Xeatzán Bajo, 14 for Panyebar, 16 for Pachum and 18 for Palestina. For selection of pilot projects, evaluation for these 58 project components was made on the basis of the following 5 evaluation factors.

- (1) Degree of farmers' desire and perception on implementation of pilot projects;
- (2) Economic efficiency (cost performance);
- (3) Possibility of materialization of pilot projects by other authorities;
- (4) Duration necessary for setting up organization(s); and

(5) Demonstration and ripple effects from the pilot projects

The evaluation of project components was made by giving weighted points to each evaluation factor and selection was made based on the total weighted point. The evaluation criteria and corresponding weighted points are shown in the following table.

<b>Evaluation factor</b>	<b>Grade</b>	<b>Description</b>	<b>Point</b>	<b>Weighted point (*)</b>
Degree of farmers' perception	1	No (there is no perception according to the participatory survey results)	1	0.1
	2	Strong (less than 6th rank of prioritized development approaches in the participatory survey results)	2	0.2
	3	Very strong (1st-5th ranks of prioritized development approaches in the participatory survey results)	3	0.3
Economic efficiency	1	Low economic viability	1	0.2
	2	Medium economic viability	2	0.4
	3	High economic viability	3	0.6
Possibility of materialization	1	The project component is planned and/or constructed at present by other organization(s)	1	0.3
	2	There is a plan that other organization will implement in near future.	2	0.6
	3	There is no plan that other organization will execute in near future.	3	0.9
Duration necessary for setting up organization	1	Long time necessary for setting up organization	1	0.2
	2	Short to medium time necessary for setup organization	2	0.4
	3	At present there is an organization or implementation can be performed by simple setup organization.	3	0.6
Demonstration and ripple effects	1	The ripple effects of the project to other areas can not be expected.	1	0.2
	2	The ripple effects of the project to other areas can be expected.	2	0.4
	3	The ripple effects of the project to other areas can be highly expected.	3	0.6

\* Weighted point is calculated multiplying point by weight %.

<b>Item</b>	<b>Weight (%)</b>
1. Degree of farmers' perception	10
2. Economic efficiency	20
3. Possibility of materialization	30
4. Duration necessary for setting up organization	20
5. Demonstration and ripple effects	20

In this study, the project component of which total weighted point is above 2.5 was selected as pilot project.

## 8.2.2 Selected Pilot Projects

Based on the selection criteria, all components of the rural development plans in the 4 model areas were evaluated. The results of the evaluation are shown below:

### (1) Xeatzán Bajo Model Area

No	Project Components	Degree of farmer's perception		Economic efficiency		Possibility of materialization		Duration necessary for setting up organization		Demonstration and ripple effects		Total weighted point	Evaluation and adoption
		Grade	Weighted point	Grade	Weighted point	grade	Weighted point	grade	Weighted point	Grade	Weighted point		
	<i>Environmental and Conservation Plan</i>												
a-3	Reforestation plan	1	0.1	2	0.4	3	0.9	2	0.4	2	0.4	2.2	
	<i>Plan for increasing income generation</i>												
b-1	Plan for making composts	1	0.1	1	0.2	2	0.6	2	0.4	3	0.6	1.9	
b-5	Mini-irrigation plan	3	0.3	2	0.4	3	0.9	3	0.6	2	0.4	2.6	○
b-9	Agro-processing development plan	3	0.3	2	0.4	3	0.9	1	0.2	1	0.2	2.0	
b-10	Plan of direct sale of vegetables	2	0.2	2	0.4	3	0.9	1	0.2	1	0.2	1.9	
b-12	Institutional plan for fostering nucleus farmers	1	0.1	3	0.6	3	0.9	2	0.4	2	0.4	2.4	
b-13	Plan of revolving fund for hand weaving thread	3	0.3	2	0.4	3	0.9	3	0.6	2	0.4	2.6	○
	<i>Improvement plan for living environments</i>												
c-1	Rehabilitation plan of roads in the village	3	0.3	1	0.2	2	0.6	3	0.6	1	0.2	1.9	
c-2	Rehabilitation plan of regional roads	3	0.3	1	0.2	2	0.6	3	0.6	1	0.2	1.9	
c-5	Water quality improvement plan for the existing drinking water supply	1	0.1	3	0.6	3	0.9	2	0.4	3	0.6	2.6	○
c-11	Plan for installation of minimal pharmacy unit (MPU)	1	0.1	2	0.4	3	0.9	3	0.6	2	0.4	2.4	

(2) Panyebar Model Area

No	Project Components	Degree of farmers' perception		Economic efficiency		Possibility of materialization		Duration necessary for setting up organization		Demonstration and ripple effects		Total weighted point	Evaluation and adoption
		Grade	Weighted point	Grade	Weighted point	Grade	Weighted point	Grade	Weighted point	Grade	Weighted point		
	<i>Environmental and Conservation Plan</i>												
a-2	Soil conservation plan for steep farm lands	2	0.2	2	0.4	2	0.6	2	0.4	3	0.6	2.2	
a-3	Reforestation plan	2	0.2	2	0.4	2	0.6	2	0.4	3	0.6	2.2	
a-4	Agro-forestry development plan	2	0.2	2	0.4	2	0.6	2	0.4	3	0.6	2.2	
	<i>Plan for increasing income generation</i>												
b-1	Plan for making composts	1	0.1	1	0.2	2	0.6	3	0.6	3	0.6	2.1	
b-6	Layer-chicken raising plan for women's groups	3	0.3	2	0.4	3	0.9	1	0.2	2	0.4	2.2	
b-7	Coffee production improvement plan	3	0.3	2	0.4	3	0.9	2	0.4	3	0.6	2.6	○
b-8	Coffee processing plan	3	0.3	1	0.2	3	0.9	2	0.4	2	0.4	2.2	
b-12	Institutional plan for fostering nucleus farmers	2	0.2	3	0.6	2	0.6	2	0.4	3	0.6	2.4	
	<i>Improvement plan for living environments</i>												
c-2	Rehabilitation plan of regional roads	3	0.3	1	0.2	1	0.3	3	0.6	1	0.2	1.6	
c-4	Rehabilitation plan for drinking water system	3	0.3	1	0.2	3	0.9	3	0.6	3	0.6	2.6	○
c-5	Water quality improvement plan for the existing drinking water supply	1	0.1	3	0.6	3	0.9	3	0.6	3	0.6	2.8	○
c-9	Plan medicine growing plan	1	0.1	2	0.4	2	0.6	2	0.4	3	0.6	2.1	
c-11	Plan for installation of minimal pharmacy unit (MPU)	2	0.2	2	0.4	3	0.9	1	0.2	2	0.4	2.1	
c-14	Coffee processing plan for workload reduction in mountainous area	1	0.1	2	0.4	3	0.9	3	0.6	3	0.6	2.6	○

(3) Pachum Model Area

No	Project Components	Degree of farmer's perception		Economic efficiency		Possibility of materialization		Duration necessary for setting up organization		Demonstration and ripple effects		Total weighted point	Evaluation and adoption
		Grade	Weighted point	Grade	Weighted point	Grade	Weighted point	Grade	Weighted point	Grade	Weighted point		
	<i>Environmental and Conservation Plan</i>												
a-1	Restoration plan of the collapsed lands	2	0.2	1	0.2	3	0.9	1	0.2	3	0.6	2.1	
a-2	Soil conservation plan for steep farm lands	2	0.2	2	0.4	3	0.9	2	0.4	3	0.6	2.5	
a-3	Reforestation plan	2	0.2	3	0.6	3	0.9	3	0.6	3	0.6	2.9	○
a-4	Agro-forestry development plan	2	0.2	3	0.6	3	0.9	1	0.2	3	0.6	2.5	
	<i>Plan for increasing income generation</i>												
b-5	Mini-irrigation plan	3	0.3	2	0.4	3	0.9	1	0.2	2	0.4	2.2	
b-6	Layer-chicken raising plan for women's groups	3	0.3	2	0.4	3	0.9	2	0.4	3	0.6	2.6	○
b-12	Institutional plan for fostering nucleus farmers	2	0.2	2	0.4	3	0.9	2	0.4	2	0.4	2.3	
	<i>Improvement plan for living environments</i>												
c-1	Rehabilitation plan of roads in the village	3	0.3	1	0.2	2	0.6	3	0.6	1	0.2	1.9	
c-2	Rehabilitation plan of regional roads	3	0.3	1	0.2	2	0.6	3	0.6	1	0.2	1.9	
c-3	Plan of rural electricity	2	0.2	1	0.2	3	0.9	3	0.6	1	0.2	2.1	
c-5	Water quality improvement plan for the existing drinking water supply	1	0.1	3	0.6	3	0.9	2	0.4	3	0.6	2.6	○
c-6	Plan of extension use of improved cooking stoves and of sauna bath "Temascal"	2	0.2	3	0.6	3	0.9	3	0.6	3	0.6	2.9	○
c-7	Plan of provision toilette facilities	2	0.2	3	0.6	2	0.6	3	0.6	2	0.4	2.4	
c-8	Plan of night time health education	3	0.3	3	0.6	2	0.6	3	0.6	2	0.4	2.5	
c-10	Improvement plan of service quality given to comadronas	3	0.3	3	0.6	2	0.6	3	0.6	2	0.4	2.5	
c-11	Plan for installation of minimal pharmacy unit (MPU)	3	0.3	2	0.4	3	0.9	3	0.6	2	0.4	2.6	○

(4) Palestina Model Area

No	Project Components	Degree of farmer's perception		Economic efficiency		Possibility of materialization		Duration necessary for setting up organization		Demonstration and ripple effects		Total weighted point	Evaluation and adoption
		Grade	Weighted point	Grade	Weighted point	Grade	Weighted point	Grade	Weighted point	Grade	Weighted point		
	<i>Environmental and Conservation Plan</i>												
a-2	Soil conservation plan for steep farm lands	2	0.2	1	0.2	3	0.9	2	0.4	2	0.4	2.1	
a-3	Reforestation plan	2	0.2	2	0.4	3	0.9	2	0.4	2	0.4	2.3	
a-5	Management plan of water quality	2	0.2	2	0.4	3	0.9	1	0.2	2	0.4	2.1	
a-6	Solid wastes treatment plan	1	0.1	1	0.2	3	0.9	1	0.2	2	0.4	1.8	
	<i>Plan for increasing income generation</i>												
b-1	Plan for making compost	1	0.1	2	0.2	2	0.6	1	0.2	2	0.4	1.5	
b-2	Plan of model farm on potato production	3	0.3	3	0.6	3	0.9	2	0.4	3	0.6	2.8	○
b-3	Potato storage plan	3	0.3	2	0.4	3	0.9	2	0.4	3	0.6	2.6	○
b-4	Potato processing plan	3	0.3	1	0.2	3	0.9	1	0.2	2	0.4	2.0	
b-5	Mini-irrigation plan	3	0.3	2	0.4	3	0.9	2	0.4	3	0.6	2.6	○
b-6	Layer-chicken raising plan for women's groups	1	0.1	2	0.4	3	0.9	2	0.4	2	0.4	2.2	
b-12	Institutional plan for fostering nucleus farmers	1	0.1	3	0.6	3	0.9	2	0.4	2	0.4	2.4	
	<i>Improvement plan for living environments</i>												
c-1	Rehabilitation plan of roads in the village	3	0.3	1	0.2	2	0.6	3	0.6	1	0.2	1.9	
c-4	Plan of rural electricity	2	0.2	1	0.2	2	0.6	3	0.6	2	0.4	2.0	
c-5	Water quality improvement plan for the existing drinking water supply	1	0.1	3	0.6	3	0.9	3	0.6	3	0.6	2.8	○
c-8	Plan of night time health education	2	0.2	2	0.4	3	0.9	2	0.4	3	0.6	2.5	
c-10	Improvement plan of service quality given to comadronas	2	0.2	2	0.4	3	0.9	2	0.4	3	0.6	2.5	
c-12	Municipality community health activity plan	2	0.2	2	0.4	3	0.9	3	0.6	3	0.6	2.7	○
c-13	Plan for migrant people to the coastal areas	2	0.2	2	0.4	3	0.9	3	0.6	3	0.6	2.7	○

As a result, 18 pilot projects were selected as shown below:

(a) Xeatzán Bajo Model Area

- Mini-irrigation plan

- Plan of revolving fund for hand weaving thread
  - Water quality improvement plan for the existing drinking water supply
- (b) Panyebar Model Area
- Coffee production improvement plan
  - Rehabilitation plan for drinking water system
  - Water quality improvement plan for the existing drinking water supply
  - Coffee processing plan for workload reduction in mountainous area
- (c) Pachum Model Area
- Reforestation plan
  - Layer-chicken Raising Plan for Women's Group
  - Water quality improvement plan for the existing drinking water supply
  - Plan for extension use of improved cooking stoves and of sauna baths "Temascal"
  - Plan for installation of minimal pharmacy unit
- (d) Palestina Model Area
- Plan for model farm on potato production
  - Potato storage plan
  - Mini-irrigation plan
  - Water quality improvement plan for the existing drinking water supply
  - Municipality community health activity plan
  - Plan for migrant people to the coastal areas

### **8.3 Xeatzán Bajo**

#### **8.3.1 Mini-Irrigation Plan**

##### **(1) Background and Objectives**

Most of the land in Xeatzán Bajo model project area is used for vegetable production under rainfed condition. Majority of farmers plant vegetables twice a year during the rainy season, some farmers make three harvests per year. Large part of the land in the project area is not utilized during dry season, that is 5 to 6 months long. Crops yield under rainfed condition are very unstable, and because majority of farmers produce at the same time, farm gate prices are depressed during harvesting in the rainy season.



Development of irrigation project was the highest priority of farmers in Xeatzán Bajo Model Project Area. The objective of the mini-irrigation project is to increase farmers income through: i) Increase in cropping intensity from 225 % under present condition up to 300 % with project conditions; ii) Increase crops yield by about 1.5 times; iii) Increase quality of produce, and therefore attain better farm gate prices.

(2) Basic Plan

**Basic Plan of the Mini-Irrigation Project**

Water resource	<i>Pachomochai</i> springs
Type of water delivery	Pumping up with a pump :
Irrigation area	4.6 ha in net (1 plot = 580m <sup>2</sup> )
Number of beneficiaries	80 farmers approximately
Type of irrigation	Sprinkler/drip irrigation for 12 hours a day
Target	Irrigating cultivation in dry season
Target crop	Snow pea, Broccoli, Carrot, Lettuce, Cabbage, and so on.
Daily operation of the system and maintenance works	Executed by the irrigation committee

(2-1) Basic Plan ; Demarcation of Irrigation Area

The basic concept of demarcation of the irrigation area is summarized below.

- From the economic and technical points of view, the standard size of an irrigation area to be distributed to one (1) farmer shall be 580m<sup>2</sup> (1/2 cuerda).
- Before starting the project, each irrigation area should be measured, approved and registered by the irrigation committee.
- The high-elevated land will be excluded from the irrigation potential area in order to establish economical water delivery system.
- The beneficiary should have 580m<sup>2</sup> (1/2 cuerda) of his own land in the irrigable area designated by the Study Team in Xeatzán Bajo.

(2-2) Basic Plan; Farming Development Plan

(a) Proposed Crops and Cropping Pattern

The proposed crops are decided considering:

- (i) Farmers' experience in managing the present cropping system.
- (ii) Farmers' willingness for crop diversification
- (iii) Crop adaptability to the project area.

- (iv) Profitability of different crops
- (v) Market demand of produce
- (vi) Importance of crop rotation.

The potential crops are broccoli, snow pea, sugar snap, cauliflower, carrot, French bean, Brussels sprout, lettuce, cabbage, mini-vegetables, and the existing area of black berry. The proposed cropping pattern was determined considering the construction period of irrigation system, climatic conditions in the project area and market demands. Final selection of crops to be planted will be made based on market demands. The proposed cropping pattern is shown in Figure 8.3.1 (1).

(b) Proposed Farming Practices

In order to obtain the target yields, the proposed farming practices were selected from most suitable recommendations from ICTA and/or making reference to recognized Guatemalan sources published by vegetable seeds dealers. The proposed farming practices are described in Table 8.3.1 (1).

(c) Expected Yield and Production of Crops

Under irrigation condition and with application of the proposed adequate farming practices, high increase in yield of proposed crops is expected. Expected yields and production for proposed cropping pattern are summarized in Table 8.3.1 (2).

(d) Crop Budget

The estimated average cost of material farming input for one cropping season of 8 proposed crops is summarized as follows:

(Unit: Q/manzana)

Seeds	Fertilizers				Insecticides	Fungicides	Ropes	Water* Charge	Total
	N	P	K	Compost					
3,300	470	235	450	900	575	155	500	7,354	<b>13,939</b>

\* Water charge during dry season.

Prices of farming inputs and a proposed irrigation water charge are summarized in Tables 8.3.1 (3) and (4). The average monthly variation of vegetables price in Guatemala city wholesale market for the years 1999 and 2000 is shown in Figure 8.3.1 (2). Crop budgets for vegetable crops prepared by the Bank of Guatemala are summarized in Figure 8.3.1 (3). Crop budgets prepared by the JICA Study Team for proposed crops are presented in Table

### 8.3.1 (5).

#### (2-3) Basic Plan ; Agriculture Support Services

##### (a) Extension Services

At present, extension services in the project area are provided only by companies that sign contract growing with farmers. During the participatory diagnostic, farmers expressed the need for agricultural extension services, especially the training of local people who can function as community extension workers.

It is planned to make arrangements with ICTA and INTECAP of Chimaltenango for training of 5 local youth selected by farmers in the project area. The training will be theoretical-practical; theory will be provided by ICTA and INTECAP; practices will be done at ICTA compound and at demonstration farms to be installed in the project area. The project will cover the costs of training materials needed such as booklets, and transportation costs for trainers and trainees. The training period was estimated to be 3 months. After finishing training, the 5 young farmers will provide volunteer extension services to other farmers in the project area. It is proposed that the group of beneficiary farmers provide some incentives to the volunteer extension workers.

The director of ICTA at Chimaltenango (September 2000) expressed that they want to install validation farms of integrated crop management practice at the farmer level. The project will make arrangements with ICTA to install some of their validation farms within the project area. Those farms will be used at the same time as Demonstration Farms for Integrated Crop Management. The main requirements of ICTA's technicians for installation of Demonstration Farms in the project area are the provision of farming inputs and transportation for their visit to the fields.

##### (b) Agricultural Loan

Farmers in the Xeatzán Bajo project area get agricultural farming inputs as a form of credit from vegetables exporter companies. The majority of farmers in the Xeatzán Bajo project area expressed that they are not satisfied with the system for farming input credit from vegetables exporter companies, because the unit prices of farming inputs provided by exporter companies are higher than market prices; also the companies charge some expenses that farmers do not know, resulting in a high production cost. Another complain against

exporter companies is their delay in paying the profit to farmers.

Some farmers in the Xeatzán Bajo project area get loans from the BanRural at an annual interest rate of 20%. Farmers should pay the loan to the BanRural after harvesting and selling the produce.

Alternative sources of agricultural loan to farmers for buying farming inputs required under with project condition are, in preferred order: i) BanRural; ii) Contract growing for some NGOs/traders such as “Horticultores Unidos de Chirijuyu”, “OPCION”, “ACT”, etc; and iii) Contract growing for some large exporter companies. The specific need of farmers for obtaining agricultural loan for farming inputs and their preferred source for obtaining loan will be decided 3 months before initiating planting in the first crop under with project condition.

#### (c) Marketing Support Service

Most farmers in the project area produce and sell vegetables through a contract growing system, by which vegetables exporter companies provide farming inputs to farmers, and farmers must deliver their produce to the company that they make contract with. The exporter companies offer a fixed price for each type of vegetable. As indicated above, many farmers in the project area complain about the high costs charged by exporter companies and their delay in payment to farmers.

The vegetable demand at the national market is relatively small, therefore export market should be the target for marketing a large percentage of vegetables produced in the project area. Alternative marketing channels that can be used by farmers in the Xeatzán Bajo project area for export of vegetables are described below and shown in Figure 8.3.1 (4).

- i) The National Agricultural Exchange Market, which is a relatively new private institution in Guatemala. Until now this institution has done very little activities on marketing of vegetables. Managers of the National Agricultural Exchange Market expressed their high interest in more active participation in marketing of vegetable produces and providing marketing information to farmers’ groups.
- ii) Medium size local NGOs/traders engaged in marketing of vegetables, such as “Opcion-Ajticonel”, “Horticultores Unidos de Chirijuyu”, “ACT” etc.

- iii) Existing traditional large exporting companies, through contract growing.
- iv) Some crops, in a relatively small volume, could be sold at national markets, trying to get sure market and good prices through supply agreements with supermarkets and fast foods chains.

The selection of marketing channels for selling the vegetables produced in the Xeatzán Bajo project area should be decided upon discussion with beneficiary farmers; Final decision and arrangement on market channels should be made at least 3 months prior to begin planting vegetables under with project condition. The project will facilitate negotiation between representative farmers and exporter of vegetables. The final selection of crops and the area to be planted for each crop will be made based on marketing arrangements.

#### (2-4) Basic Plan ; Irrigation Facilities Development Plan

##### (a) Water Sources and Irrigation Water Requirement

###### (i) Water Sources

Only the *Pachomochai* spring can be used as a source for the irrigation system in the area, while other springs are not suitable in view of their discharges and topographic conditions. The present effective use of the *Pachomochai* spring in annual average was roughly estimated to be less than 30 %. Detailed information of the springs is given in Table 5.1.1 (2) and Figure 5.1.1 (1).

###### (ii) Available Water and Design Discharge

The design discharge obtained from the *Pachomochai* springs is set at 56% of the total spring discharge, i.e. 7.0 lit/s. (See Table 8.3.1 (6) in detail).

###### (iii) Irrigation Water Requirement

The calculated irrigation water requirement in the Xeatzán Bajo area for sprinkler irrigation is 6.6 mm/day, 0.76 lit/sec/ha.

In this case, the potential evapotranspiration (ET<sub>o</sub>) at San Martin Jilotepeque in Chimaltenango measured by INSIVUMEH was applied for the area.

The detailed calculation and the defined conditions are mentioned in Table 8.3.1 (7).

#### (2-5) Basic Plan ; Organization Development Plan

##### (a) Farmers' Participation

Farmer should attend the project at the following stages.

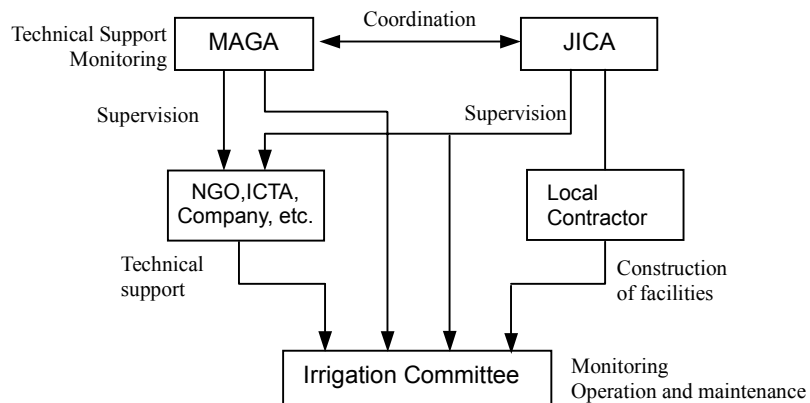
Stages	Activities/Items	Remarks
1) Construction stage*	Voluntary service as a un-skilled labor in the construction works	The project facilities; tanks, pipelines and related structures.
2) Construction stage and cultivation period	Provision and preparation of the farm plot system in their own plot at their own expenses	The farm plot system - sprinkler ; 2-3 nos. - tertiary pipe ; $\phi$ 1", 100m - Pressure regulator : 1 no.
3) Operation period	Daily maintenance works	All the beneficiaries are obliged to attend the maintenance works if required.
4) Cultivation period	Cost to be paid by the beneficiaries 1) All the agriculture farm input	1) Fertilizer, seed, pesticide, water charge, and so on.

\*: The beneficiaries should provide voluntary work as unskilled labors, about 3,500 man-days, i.e. 7-8 man-days per month for each beneficiary on average (See Table 8.3.1 (8)).

#### (b) Basic Organization Plan

The definitive regulations and organization structure should be discussed with members of the irrigation committee and decided. The basic concept of the organization plan proposed by the Study Team is described in Table 8.3.1 (9). The responsibility and relation among organization concerned are shown in table and figure below.

Activity	Organization in Charge
1. Overall Supervision	MAGA, JICA
2. Installation of facility	Local contractor and beneficiaries (for hand labor)
3. Operation and Maintenance	Irrigation Committee
4. Technical Assistance	Farming Practice and Marketing: Local consultant, ICTA, INTECAP, Contract-farming company, NGO, etc. Irrigation facility: MAGA Provincial Office
5. Monitoring	Irrigation Committee and MAGA Provincial Office



### (3) Project Works

The facilities to be constructed in the project are listed below and given in detail in Table 8.3.1 (10). The general features of the proposed irrigation system are shown in Figure 8.3.1 (5).

The conveyance and distribution facilities for delivery of water from the springs to each farm plot, will be constructed by the project fund and owned by the community. On the other hand the farm plot facilities, such as sprinkler system, should be purchased and prepared by farmers with their own fund.

### (4) Project Cost

The total project cost for the mini-irrigation project in Xeatzán Bajo is Q. 906,000 as detailed in Table 8.3.1 (11).

Apart from the above amount of construction cost, the beneficiaries should provide voluntary work as unskilled labors.

### (5) Implementation Plan

The construction period for the irrigation system was estimated to be for 4.5 months. The implementation schedule was planned as shown in Table 8.3.1 (12)

### (6) Expected Benefits

Project benefits will be accrued from increase in cropping intensity from estimated 225% under the present condition to about 300% under project condition and also from a significant increment in crop yield. The average net project incremental benefit was estimated at about 51,900 Quetzals per ha per year. IRR is estimated at 21.0 % as shown in Table 8.3.1 (13).

## (7) Monitoring and Evaluation

The following table shows the indicators for evaluating the achievement of the project targets in each stage. The evaluation method is also described below.

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- No. of beneficiary's attendants to the construction work.	- Everyday during construction period.	- Irri. Committee.	- MAGA	- Study Team	- Attendant rate is over 80%.
- Progress of construction works.	- Every half-month.	- MAGA/Study Team.	- Study Team	- Study Team	- Progress rate is over 90% of original schedule.
- Total benefits.	- Before and after 1st crop season.	- MAGA/Study Team.	- Study Team	- Study Team	
- Collection rate of the water charge.	- Every month	- Irri. Committee.	- MAGA/Study Team	- Study Team	- Collection rate is over 80%.

### 8.3.2 Plan of Revolving Fund for Hand Weaving Thread

#### (1) Background and Objectives

##### (a) Background

##### 1) Current Situation

In Xeatzán Bajo, the majority of women are engaged in traditional hand weaving, making Mayan women's traditional blouses called *Huipils*. Patzun is considered one of the centers of huipil industry in Guatemala, however, the earnings of the weavers are far lower than their basic needs.

##### 2) Problems to be solved

The major problems in this sector were recognized as follows.

- Majority of women in Xeatzán Bajo has quite limited. They have to purchase a small quantity of thread by the higher price at retailers, which results in increasing of production cost and reducing profit from production of Huipils.
- Women in Xeatzán Bajo are well organized and are familiar with committee and group activities, however, they do not have capital nor skills and knowledge to start their original activities to strengthen the organization and economic bases.

##### 3) Justification

In the socio-economic context Poverty degree of women is recognized as more serious than that of men in Guatemala. Women are more marginalized in terms of access to cash, source of income, and chance of education. However, considering the fact that the impact of increase of income earned by women on the households is more direct and bigger than that of men, the provision of revolving funds associated with programs of training of women can be a potential to improve the general living condition of the villagers.



(b) Objectives of the project

- Increase income by reducing production cost of huipils through introducing revolving fund to the weaving women in Xeatzán Bajo.
- Widen women's capacity to understand the basic current problems and scope of the huipil business.
- Increase women's organizational skills and self evolving activities.
- Increase Women's literacy rate

(2) Basic Project Plan and Project Works

(a) Basic Project Concept

This pilot project should satisfy the following requirements.

Self Sustainable

- This project should be sustained even after the intervention of the JICA Study Team from the perspectives of finance and organization.

Self Manageable

- The selected project should encourage the beneficiaries to take part in the management of the project
- Through the implementation of the project, participants should be given appropriate training programs in order to enable them to manage the project

(b) Project Components

This project is composed of four components as shown in the table below.

	Component of the Project	Particular
1	<b>Establishment of a Cooperative and Revolving Fund System</b> <ul style="list-style-type: none"> <li>- Establishment of a Cooperative</li> <li>- Provision of initial investment as revolving funds and purchase of thread by cheaper price at wholesaler</li> <li>- Sales of thread at lower price at a Cooperative.</li> <li>- Management of a cooperative.</li> </ul>	1) Number of participant is estimated at 200 and will be finalized. 2) Group formation of participants: about 25 groups of 8 women in each group 3) Organize Preparatory Committee composed of representatives of each group. 4) Establishment of a Cooperative
2	<b>Market Survey</b> <ul style="list-style-type: none"> <li>- A market survey on thread in terms of quality and price.</li> <li>- A market survey on market routes of Huipils production</li> </ul>	1) Marketing survey will be done by NGO
3	<b>Training Scheme</b> <ol style="list-style-type: none"> <li>1 Organizational Training</li> <li>2 Administrative training</li> <li>3 Huipil Business training</li> <li>4 Gender Awareness Training</li> <li>5 Evaluation and Planning Training</li> </ol>	1) NGOs will make training to the representatives of a cooperative and groups.
4	<b>Monitoring and Evaluation Scheme</b> <ol style="list-style-type: none"> <li>1 Monitoring will be carried out by NGO for three monitoring items, i) amount of thread that are sold and stocked, ii) financial status, iii) reduction of production cost.</li> <li>2 Supervision of progress will be done by NGO, MAGA and provincial .</li> <li>3 Overall project evaluation is made by JICA.</li> </ol>	

(c) Initial investment as revolving funds

Initial investment for revolving funds was determined as about Q87,000 that is equivalent the total thread cost necessary for monthly Huipils production that will be made by 200 women's participants. Detail cost of thread necessary for preparing one Huipil, total quantity of thread and initial investment is shown in Table 8.3.2(1) and Table 8.3.2(2).

(d) Provision of the materials

Equipment and materials necessary for the office of the Cooperative will be provided by the JICA and listed as follows;

(1) 4 storage shelf, (2) one-photocopy machine, (3) office material such as stationary and (4) other necessary materials

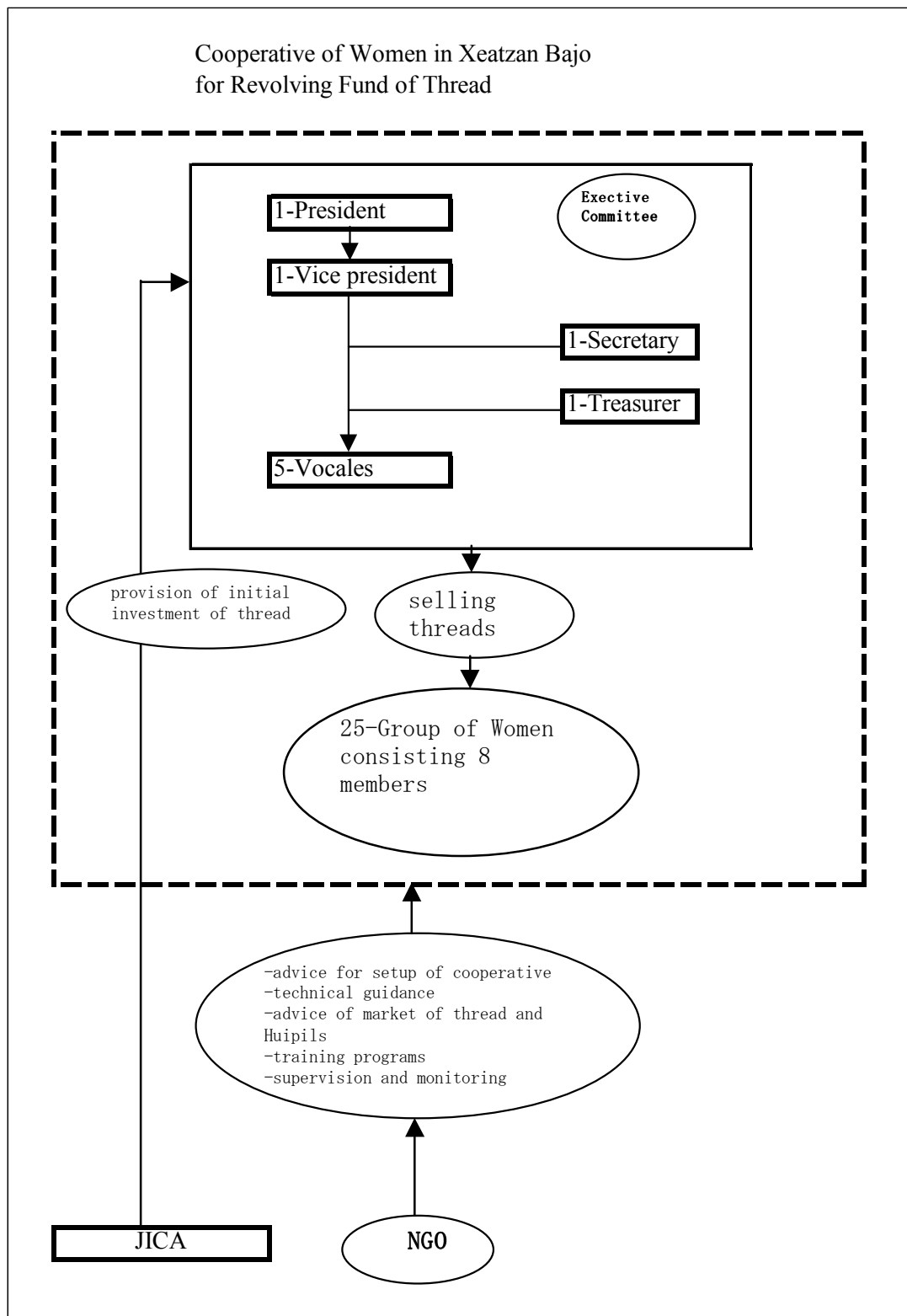
(3) Project Costs

The total project cost is estimated to be Q 261,800 as shown in Table 8.3.2 (2).

#### (4) Implementation Plan

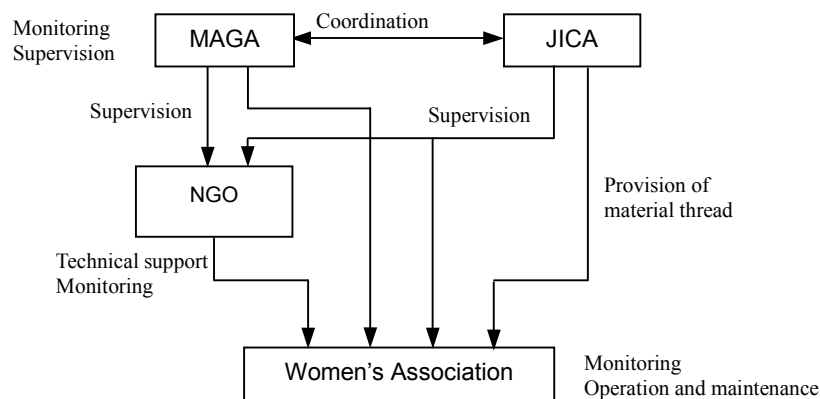
This Pilot Project will be started September 2001. In the first, NGO will be selected for one month. A selected NGO will be responsible for all the work on project management covering institutional setup, training, project operation, and supervision and monitoring. Formation of ‘a Cooperative of Women in Xeatzán Bajo for revolving Fund of thread’ will be made until the end of October. A proposed executive committee consists of 1-president, 1-vice president, 1-secretary, 1-treasurer and 5-vocals. Under an executive committee, 25 groups will be formed and each group comprises 8 member. Training, including literacy classes, will be done for the members of an executive committee and representatives of each group for 12 months from the middle of November. An initial investment for purchase of threads will commence at the middle of January 2002 according to requirement of threads from the cooperative members. The implementation schedule and organization is shown below:

Item	2001					2002												
	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
1) Selection of NGO		■																
2) Formation of Cooperative			■	■														
3) Markeing survey				■	■													
4) Training programs					■	■	■	■	■	■	■	■	■	■	■	■	■	■
5) Investment of capital and purchase of threads						○												
6) Monitoring						■	■	■	■	■	■	■	■	■	■	■	■	■



The responsibilities and relation of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall Supervision	MAGA, JICA
2. Provision of Material Thread at Initial Stage	JICA
3. Operation and Management	Women's Association
4. Technical Support and Supervision	NGO
5. Monitoring	Women's Association and NGO



#### (5) Expected Benefits

Direct benefit created by this Pilot Project is defined as difference of thread cost reduction between present condition and with project condition. Cost of threads necessary for making one Huipil on the basis of the retail price in March 2001 was estimated for both cases of type-1 (Q67) Huipil and type-2 (Q112). The Pilot Project will provide a basis that a cooperative is able to purchase cheaper threads at wholesalers and also distribute its thread to the members of the cooperative. Similarly cost for preparation of Huipils of type-1 and type-2 was calculated on the basis of wholesale price. Benefit per one Huipil is estimated at Q12 for type-1 and Q19 for type-2. Details of thread cost are shown in Table 8.3.2 (1).

**Benefit from One Huipil**

Type of Huipils	Present cost estimated on the basis of retail price	Expected cost estimated on the basis of wholesale price	Benefit or cost Reduction (Q/one Huipil)	Reduction rate
Type-1:Q67	Q66	Q54	Q12	↓ 18.0%
Type-2:Q112	Q112	Q93	Q19	↓ 20.0 %

Total benefit per month will be calculated at Q 18,600 in the following table below; If 100% of the initial investment is rotated, annual benefit amounts to

Q223,000.

Type of Huipil	Number of huipil to be produced per month (nos.)	Benefit per one huipil (Q/one huipil)	Total benefit (Q)
Type-1	600	12	7,200
Type-2	600	19	11,400
Total	1,200*		18,600

\* Remark: the total number of participants (200) x 6huipils/month/one participant

## (6) Monitoring and Evaluation

The following table shows indicators to achieve the project targets and monitoring/evaluation method.

### Indicators for Evaluation and Monitoring Methods

Item	Frequency	Data collector	Aggregation	Decision Maker	Target
- Amount of thread that are sold and stocked in cooperative.	- Once a week	- Cooperative	- NGO	- JICA Study Team	- There is not discrepancy in record on thread volume stocked and sold.
- Financial statement.	- Once a week	- Cooperative	- NGO	- JICA Study Team	- There is not discrepancy in financial statement.
- Reduction of production cost.	- Once a month	- Cooperative	- NGO	- JICA Study Team	- Reduction rate is over 15%.

### 8.3.3 Water Quality Improvement Plan for the Existing Drinking Water Supply

#### (1) Background and Objectives

##### a) Present situation

In Xeatzán Bajo, Patzún, Chimaltenango, there is a drinking water supply system. The water sources are located in mountainous area in the southeast of the community, and there are 3 capture tanks. The first tank was installed in 1965 with the fund of Guatemalan government and BID. Later, the community installed the second capture tank with its fund. The third tank was installed in 1992 with the fund of CARE as the water source for the dry season, summer, was considered to be sufficient, supplying more than 60 gallons per minute. These 3 capture tanks and conveyance pipes cross over one another.

Water flows into those tanks and then joins in the collection tank; which is conducted by PVC pipeline of 4 inches in diameter by gravity system to the pump house. Then water is pumped up to the distribution tank where the community entrance is located. The drinking water is distributed by gravity system to community people. According to the result of the interview of the Plumber, who is in charge of the water supply system, the pump is operated 7 hours daily and the maintenance and operation cost are collected with the water charge.

The Drinking Water Committee is responsible for maintaining the water supply system and the Plumber operate the system daily. He cleans the capture tanks and the distribution tank once a month.

However, water treatment plant and hypo-chlorinate equipment are not provided in the distribution tank. Therefore digestive illness, parasitic insect and kin illness are often found among the residents. .

b) Problems to be solved

The capture tanks at the water sources are very complicated and are not in good conditions. Since they were installed about 36 to 20 years ago and are not in good condition. The water production is enough, however, water isn't used efficiently under those conditions.

In the community the health and sanitary problems are issues to be solved as hypo-chlorinate equipment does not exist in the system. Therefore, the Water Committee considers that the installation of hypo-chlorinate equipment of sodium type is necessary for getting safe and pure water. However, the specific and detailed plan for such installation has not been planned yet.

c) Justification

It is necessary for each household to obtain safe water for a better life. Water is used for drinking, washing hands and tooth, taking a shower, cooking meals, washing clothes and cleaning the houses.

Water is indispensable for our daily life. However attention must be paid to the quality of drinking water from the health perspective, as drinking water is not always clean and free of contamination. It can be contaminated and can contain invisible microbes. According to the result of water quality analysis made in this study, microbes were found in the samples taken from the water tap in the community, from which many villagers drink water directly. This is considered to be one of the causes of digestive diseases.

Installation of hypo-chlorinate equipment can improve the water quality and can supply safer water. It can also provide information and knowledge on sanitation and health to the village people.

d) Objective

Stable supply of safe drinking water in Xeatzán Bajo.

## (2) Basic Plan

The basic principles of this project are expected to be applicable to other similar areas as a pilot project. Therefore, the supply of hypo-chlorinate equipment and liquid sodium for hypo-chlorinate should be by selected providers in the local market. It is also important to consider the collection of water charge for the maintenance of the equipment. The installation work is to be managed by the supply company.

## (3) Project Works

In Xeatzán Bajo there is one drinking water supply system. However there is neither water treatment plant nor sodium hypo-chlorinate equipment in the distribution tank. In this pilot project, a dispenser will be installed at the outlet of the distribution tank as the drinking water is conducted by gravity system, and the water pressure of the reserved tank can be utilized for injecting the hypo-chlorinate liquid.

The equipment together with its installation is to be provided by the Government of Japan through JICA. The labor work such as transportation of the equipment and the materials will be provided by the community. Therefore, the project cost includes the equipment supply.

## (4) Contents of the Project

### (Equipment Provided)

- Hypochlorinate Dosing	1 set	Q. 9,200
- Tank housing		Q. 800
- Sodium hypochlorinate liquid, 55 gallons		Q. 300
- Installation cost		Q. 5,000
- Sundry expenses for public meeting		Q. 2,500
- Estimated miscellaneous		Q. 1,100
Total		<u>Q. 18,900</u>
- Operation and Maintenance cost (year)		Q. 3,300

The details are shown in Table 8.3.3(1).

## (5) Implementation Plan

The work will be executed in the dry season, summer, and the equipment and materials must be supplied before the work starts by the supplier from local market.



(6) Equipment Maintenance Organization and Perception of Water Fee

The plumber through the Development Committee in the community will execute the maintenance job. It is usually necessary to supply the hypochlorinate liquid once every three months. After the installation of the dosing equipment the water fee will surely increase. The MSP personnel will train the Development Committee and the Committee will have to inform the beneficiaries (users) of the advantage, the objective, and importance of the project as to their health and the sanitation of their homes.

(7) Organization

Organization plan for the project is summarized in the table below and details are explained in the following. Overall organization and support structure are illustrated in Figure 8.4.3(1).

Activity	Organization in charge
1. Installation	Local Company of Sterilizer
2. Education	Initial Stage: Development Committee After Installation: Development Committee and FIS provincial office
3. O&M	O&M charge collection: Development Committee Simple maintenance work: Pump Committee Medicine replenishment: Contractor
4. Technical Support	Simple technical assistance: Contractor Management assistance: FIS & Study Team
5. Monitoring	Development Committee, Pump Committee, FIS

(a) Installation Work

Installation of the equipment and replenishment of hypo-chlorinate will be made by a local company of sterilizer.

(b) People's Education

1) Initial Stage

In advance to installation of the equipment, it is necessary to provide education to the users of present water system. The objectives of this activity is to make people understand advantages and necessities of water quality improvement and to obtain consensus for installing the equipment. Without consensus, the installation is impossible, because all the users will be affected and have the obligation to pay charge for the O&M cost once it is installed. The Development Committee of the community will be in charge of education activity under the supervision of JICA Study Team.

The education activity will be basically in the form of public meeting. The contents to be explained in the meeting would be as follows;

- a) General outline of the project
- b) Taste of water and influences to human bodies
- c) Advantages of improving water quality
- d) Obligations to be shouldered by the villagers (O&M cost)

As the results of the meeting, the list of beneficiaries will be prepared to show the agreement of users for the installation. It is expected, however, that some of the water users will not attend the meeting by any reason. For these users, the Development Committee will visit them to make explanation and have to obtain their agreement.

## 2) After Installation

Although the consensus will be made during the initial stage, there might be users who don't pay charge or who don't use improved water. For these users, it would be necessary to make follow-up education. This will be conducted basically by the Development Committee at the time of charge collection. In addition to this, FIS provincial may give education regarding colon bacillus and necessity of improved water at the time of water quality test. Its contents will be 1) present water quality, and 2) influence of bacteria in the water.

## (c) O&M and charge collection

### 1) O&M Charge Collection

Presently, in Xeatzán Bajo, Development Committee collects the water charge for drinking water. And the collected water charge is paid to the Pump Committee for water pump maintenance. By utilizing this system, Development Committee will collect the maintenance cost of sterilizer (cost for replenishment of hypo-chlorinate) together with the water charge.

### 2) O&M Work

Maintenance work (replenishment of hypo-chlorinate) itself will be made basically by a local company of sterilizer based on the payment from the community. However, Pump Committee will be in charge of simple maintenance work such as check of hypo-chlorinate in cooperation with the Development Committee.

(d) Technical Support

Basic operation skill will be transferred to the Pump Committee by the local company at the time of installation. MAGA will be in charge of coordination between community and local company, other support such as management and administrative matters in cooperation with JICA Study Team.

(e) Monitoring and Evaluation

Monitoring indicators and organizations in charge are summarized as below.

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Users of improved water.	- Every 3 months	- Dev. Committee	- FIS	- Study Team	- Number of present users does not reduce.
- Operation status of sterilizer.	- Monthly	- Dev. Committee	- FIS	- Study Team	- Operation is constantly performed.
- Number of diarrhea patient.	- Every 3 months	- Dev. Committee	- FIS	- Study Team	- Present number of patient decreases.
- Simple water quality test.	- Every 3 months	- FIS	- FIS	- Study Team	- No colon bacillus is detected.

a) Number of users of improved water

Purpose: To check people's understanding on necessity and usefulness of improved potable water.

Target: Number of improved water users will not be less than the total beneficiaries of present water supply system.

Method: The Development Committee will collect data every 3 months by interviewing beneficiaries. Interview will be simple one that simply asking whether the beneficiaries use it or not.

b) Operation Status of Sterilizer

Purpose: To check whether the sterilizer (hypo-chlorinate dispenser) is properly maintained.

Target: The sterilizer is continuously in operation. In other words, hypo-chlorinate should be continuously replenished and injected into the potable water. If hypo-chlorinate is run out of and not replenished, it means the target is not attained. As the supplemental indicator for this point, payment rate of O&M cost should be monitored and it should be above 90% of total number of beneficiaries.

Method: As to the operation of sterilizer, the Pump Committee will go to

the water tank and check operation condition of the sterilizer every month. Regarding payment rate, the Development Committee will check account book and calculate the payment rate every month after the fee collection.

c) Number of visiting patients at the Health Post

Purpose: To check the effect of water quality improvement in terms of reduction of diarrhea.

Target: Number of visiting patients of diarrhea will be reduced. Specific percentage is not fixed as the target because of complexity of the causes for diarrhea.

Method: Development Committee will check the number of visiting patients of diarrhea at health post every 3 months. Data source would be the record of diarrhea patients at the health post.

d) Simple Water Quality Test

Purpose: To check the water quality in terms of colon bacilli.

Target: No colon bacilli will be detected in the drinking water after 3 months of the installation of sterilizer.

Method: FIS Chimaltenango office will check water quality with simple water quality test kit for every 3 months. In this test, presence of colon bacilli in drinking water is simply checked at several points in the community. Sampling points would be one at water tank, one at school, and 2 to 3 points at beneficiaries' houses. Precise points will be decided at implementation stage.

## **8.4 Panyebar**

### **8.4.1 Project for Improvement of Coffee Plantations**

#### **(1) Background and objectives**

The present prices of coffee at the world market are low, therefore the income of coffee farmers is also low. Many farmers in the project area go out of the village to seek other sources of income, this results in inadequate management of coffee farms. As a result, the yield of coffee in the project area is lower than the national average yield, 7 qq/cuerda in the project area compared to 15 to 20 qq/cuerda at national level.

To improve the productivity of coffee in the Panyebar project area, proper management of coffee farms must be carried out, including adequate pruning of

tree, replacement of old trees, adequate fertilization, clearing obtrusive cover trees, etc. Especially, the replacement of old coffee trees is an urgent matter because there are many old coffee trees of over 20 years in; this is a major cause of low productivity of coffee farms in the project area.

By adequate management technology to coffee farms in the Panyebar project area, the low productivity could be improved to high productivity sustainable coffee farms, aiming at stable increase of farmers' income.

## (2) Basic Plan

### (a) Basic idea

Due to the nature of coffee production, it is desirable to implement this project two programs, a short-term program and a long-term program. The basic idea of this project with short-term objective is to provide a nursery facilities for raising coffee seedlings for the replacement of old coffee trees. The replacement of old coffee trees is considered the most urgent measures to improve the yields of coffee farms, and to contribute to the long-term improvement by operating these nurseries effectively.

- A management program for coffee farms with a spun of 15 to 20 years (long-term program)

This is a long-term program in which village farmers work voluntarily for improving the coffee farms. To implement the project, it is necessary to have functional system of organization and a technical capacity.

- A project with a spun of 2 to 5 years (short-term program)

This program will have a small project that will play the role of starter for the above mentioned long-term program. The objective of the project is to set up a nursery facility for growing coffee seedlings and its management. Through the management of this nursery facility, an active organization in the project site and the technical capacity necessary to improve the coffee farms will be fostered.

Since this project will be implemented by JICA study mission as a small pilot project, it must be completed in a short period of time, including monitoring. Therefore a practical measure would be to select a project that can be completed in a short time, such as setting up of a nursery facility and its management.

(b) Outline of the project

The basic plan of this project is to carry out following three operations:

(i) Nursery operation

To improve the coffee farms the following works will be carried out:

- Setting up a nursery
- Growing seedlings of improved coffee variety such as Caturra and Kafuare to be distributed to beneficiary farmers.
- Growing some types of cover tree seedlings to be sold at low prices to beneficiary farmers.
- Growing seedlings of popular fruit trees such as avocado, peach, etc. for selling to project beneficiaries and outsiders.

(Some beneficiary farmers expressed strong wishes for growing and sell ornamental plants in the nursery. However, it was not included in this project due to the lack of experience of farmers and some problems anticipated in the stable sales of such plants).

(ii) Technical training

The transfer of technical knowledge to farmers will be done by training on management of coffee plantation technology.

(iii) Cash making operation

The improvement of coffee farms implies a financial burden and require a long time for completion; therefore, the sustainability of the coffee farms improvement works is uncertain after the project. To cope with this problem, a cash making operation is recommendable for securing financial resource. There are several kinds of promising fruits trees that can be cultivated in the coffee nursery and marketed with high demand in domestic markets. It should be effective to secure income source to strengthen financial conditions of this project.

(3) Project Works

(a) Demand of seedlings

The estimated necessary number of seedlings to be grown annually for replacing the old coffee trees to improve coffee farms in the target area (600 cuerdas, 42 ha.) in a twenty years period is as follows:

Kind of Seedling	Planted Area		Existing number of plant	Number of trees to be renewed annually
	Cuerdas	(ha)		
Coffee	600	42	132,000 (600 cuerdas x 220 plants)	4,950 (132,000/20 years) 75 %
Avocado 1	600	42		412 (8,000 in 20 years)
Avocado 2	To be newly planted			1,250 (5,000 in 5 years)
Peach	600	42		500 (5,000 in 5 years)

(b) Scale of the nursery

Considering the demand for the various seedlings in the target area, the scale of the nursery should have capacity for growing the following numbers of seedlings annually:

Coffee: 5,000 seedlings; Avocado: 1,650 seedlings; Peach: 600 seedlings.

Due to technical reasons it would be difficult to grow all the above seedlings since the first year; the target for seedlings production for the first year is to produce half of the total 5,000 seedlings. The other half (2,500 seedlings) needed for planting in the first year will be provided by the project to the beneficiaries, free of charge only in the first year of the project, in order to promote the improvement of the coffee plantation. Also, 500 seedling of avocado will be given free of charge. However, from the second year, all the demand of 5,000 coffee seedlings, 1,650 avocado seedlings and 600 peach seedlings will be produced in the nursery to be newly built by the project.

(c) Facility plan

The estimated number of seedlings, composition and scale of the nursery facility are as follows:

- Vinyl house A: 384m<sup>2</sup>/ 5,500 coffee seedlings, with 10 % mortality
- Vinyl house B: 330m<sup>2</sup>/3,000 seedlings of avocado and peach considering 25 % mortality

The basic type of nursery facility for coffee seedlings is shown in Figure 8.4.1 (1).

(4) Project Cost

The total cost of the project is summarized as follows:

Item	Cost (Quetzals)
Nursery facilities and equipment	89,050
Training	15,600
Operation costs	9,200
Grant for coffee and avocado seedlings	14,250
Labor charges (borne by the beneficiaries)	(9,600)
Total (Beneficiaries' share is not included)	128,100

The details of above costs are shown in Table 8.4.1(1).

## (5) Implementation Plan

### (a) Organization

#### (i) Participants (beneficiaries)

The participants in this project are 72 families of small coffee farmers in Panyebar village, covering 600 cuerda (42 ha), which is about 85 % of the coffee plantation area in the study area.

#### (ii) Group/association

The coffee growers association will be formed among the farmers participating in this project. The association will be the executing body to conduct the project in the form of cooperative operation. The association members will select representative members and form an executive committee. The committee consists of the following members:

- President            1 person
- Vice-president    1 person
- Secretary           1 person
- Treasurer           1 person
- Vocals                5 persons

#### (iii) Ownership of the nursery

Two nurseries are planned to be constructed under this project. Since the land area is provided by individual members, however, it is necessary to clarify the ownership of the nursery at the initial stage to avoid any conflict. Basically, the land area belongs to the original land owner and the facility belongs to the association. For the clarification, lease contract may be made between the association and land owner and the contract has to be registered at the Alcalde Auxiliar's office. Detail conditions of the contract such as lease charge (or free of charge), lease period have to be decided at the implementation stage.



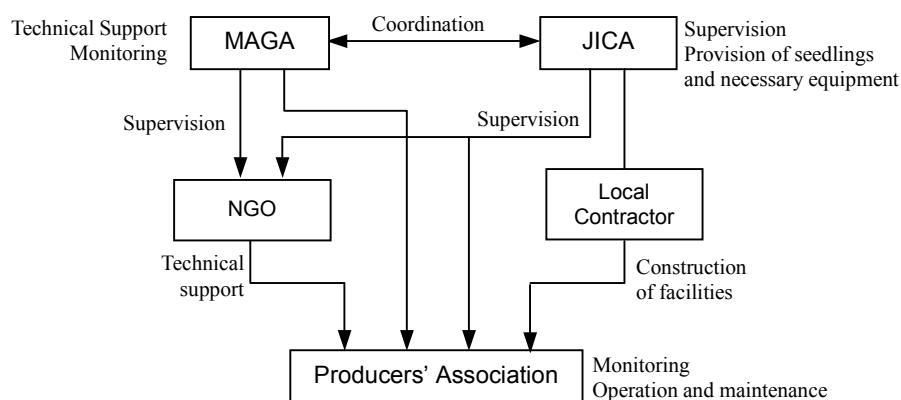
(b) Project support

Supporting system of the project is summarized in the table below.

Support	Organization	Contents
Administrative support	MAGA	- Periodical supervision, - Coordination with other agency - Legal procedure for ownership - Assist in bank credit application
Technical training and cash making operation	NGOs	- Operation and maintenance of nursery garden - Coffee plantation improvement technology - Cultivation and marketing of avocado and ornamental plants

The responsibilities and relations of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall Supervision	MAGA, JICA
2. Provision of materials and seedlings at initial stage	JICA
3. Construction of Nursery	Local Contractor
4. Operation and Maintenance	Coffee Producers' Association
5. Administrative Support	MAGA Provincial Office
6. Technical Support	NGO
7. Monitoring	Producers' Association and MAGA Provincial Office



(c) Training plan

- (i) Training in operation and maintenance of nursery 3 times in a year,
- (ii) Techniques for nursery operation such as grafting, compost preparation, etc. once between February to March.

(d) Selling Plan

The prices of coffee seedlings around the project site are Q1.0 for conventional variety, and Q1.5 for improved variety such as Caturra and Kafuare. In case of avocado, Q15 for the grafted one of Hass variety. The price of peach seedling is Q10. The seedlings grown in the nursery shall be sold to the

project participants at about 1/2 of the market price. Namely, Q0.75 for coffee improved variety, avocado Q10 and peach at Q5.0

(e) Implementation schedule

The project execution schedule shown in attached Table 8.4.1 (2) shows actions to be taken and timing. The coffee seedling shall be shipped 4 to 5 months after seed broadcasting, grafted avocado is shipped after about 10 months.

(f) Project Sustainability

Operational balance sheet is shown in Table 8.4.1(3). The improvement of coffee plantation strongly desired by farmers can be realized as profitable business. Therefore, the project sustainability is prospective.

(6) Effects and Expected Benefits

(a) Area and number of farmers beneficiaries of the Project

Panyebar, San Juan Laguna, Sololá and the population that will benefit is about 400 persons with 85 families.

(b) Expected social and economic effect

(i) Current situation

- Stagnation of local industry due to slow economy of agricultural village
- Labor working outside of the village (low domestic wage, illegal departure to foreign countries)

(ii) Expected effect of the Project

- Restoration of village economy by increasing farmers' income.
- Promotion of local industry such as cultivation of avocado, peach and ornamental plants, etc.
- Preservation of natural environment by practicing sustainable agriculture.

(7) Monitoring and Evaluation

(a) Index of monitoring

It is difficult to evaluation the seedling raising project that will be completed in a short time but its effects will appear several years after its completion. In this case, the evaluation works are limited to the items in which the degree of farmers' participation and operational results of nursery such as number of seedlings raised and sold can be measured indirectly. Therefore, it provisionally monitors the effect of the project.

(b) System of monitoring

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Number of renewed coffee tree.	- End of rainy season (about August)	- Coffee Growers Association	- MAGA	- Study Team	- Over 70% of renewed coffee tree.
- Number of participant to training course.	- After training course closed.	- Coffee Growers Association	- MAGA	- Study Team	- Participant rate is over 70%.
- Result nursery operation.	- End of rainy season (about August)	- Coffee Growers Association	- MAGA	- Study Team	- Over 70% of scheduled seedling production.
- Sales of fruit seedlings.	- End of rainy season (about August)	- Coffee Growers Association	- MAGA	- Study Team	- Over 70% of fruit seedling sold.

8.4.2 Rehabilitation Plan for Drinking Water System

(1) Background and Objectives

(a) Actual situation

The community of Panyebar already has two drinking water supply systems. One system was installed by CARE in 1978 and the other system was installed by FONAPAZ in 1998.

The water sources on both systems are located amid the mountainous hills in the southwest of the community. The water tanks are located in the galleries and water is conveyed to the community through galvanized iron and PVC piping by gravity. These systems do not have water treatment plant, nor hypochlorinate equipment. The lack of water treatment causes that local people suffer from gastrointestinal diseases, insects, parasites, and skin diseases.

The intake systems are very rustic and water is lost due to leakage. Nevertheless, the community has water most of the time, but sometimes the community suffers from water scarcity. Most of the people can only clean themselves by using water out of a bucket.

The water system is operated and maintained by three plumbers. Their salaries, maintenance costs, spare parts and materials are paid by the income collected from the water fee charged for every faucet, that is Q.6.00 per year.

(b) Problems to be solved

The pipes of the water supply systems have structural problems such as lack of sufficient support at the crossing of the creeks, and in some locations the pipes are on the ground surface, so falling rocks and trees damaged them.

The water distribution tank of the system built by CARE lacks of capacity to

store the volume of water carried by the conduction system, so from 11 p.m. to 4 a.m. water spills from the tank and causes damage to the surrounding houses. The works to be done by the project are:

- i) Repairing the conduction pipes from the intake of water source up to some 4 kilometers down stream.
- ii) Construction of one additional distribution tank nearby the site the tank installed by the CARE system.

(c) Justification

The rehabilitation of the water supply system to make it stable and without risks for the community of Panyebar.

The water source for the systems constructed by CARE and FONAPAZ has a discharge of approximately 70 gallons per minute (approximately 260 liters per minute) during the dry season. This is the most important water source for the community. With the rehabilitation work, the water supply system will be improved and the provision of water will be guaranteed.

(d) Objective

To achieve stable, sure, and constant drinking water supply in the community of Panyebar.

(2) Basic Principle

The basic principle of the project is that it should be considered a pilot project to be extended in similar areas. Therefore, the suppliers of materials should be selected from the local market. In the implementation of the work is important to take into account the natural environment and the existing resources.

A local company will execute the construction of the new distribution tank, using the voluntary unskilled labor provided by the beneficiaries of the community.

(3) Profile of the Project

The land near the water source has a strong slope in approximately 4 kilometers, and there are 7 creeks. Currently the pipes of both systems are installed on the skirts of the mountain so rocks, trees, and strong winds damage them. This project will also undertake reparation and protection of the pipeline system.

The additional distribution tank will be constructed a little higher than the existing tank installed by CARE project.

The Japanese Government, through JICA, (Japan International Cooperation Agency) will provide the materials, and the beneficiaries will execute the work. The direct labor cost is not included. It will be estimated in the indirect cost of this project. As to direct expenses, the only estimated cost is that of materials. The labor expense will be charged to the community's Drinking Water Committee.

#### (4) Project Cost

(Materials to be provided by JICA)

(a) River crossing work	7 sites	Q.	25,300
(b) Pipe protection work	2.4 km	Q.	287,800
(c) Distribution tank			
Concrete, 50 m <sup>3</sup> , 5x5x3m		Q.	174,800
(d) Conduction pipes (modified)			
3 inches (PV C, 160 PSI)	3 km	Q.	114,200
(e) Connection pipes			
3 inches (PVC, 160 PSI)	30 m	Q.	3,100
Total		<u>Q.</u>	<u>605,200</u>
(f) Operation and Maintenance Cost (yearly)		Q.	2,600

Details of cost estimates are presented in Table 8.4.2(1).

#### (5) Implementation Program

The work will be executed during the dry season. All materials should be supplied before starting the project by local providers.

#### (6) Maintenance Organization and Collection of Water Fee

The plumber, supervised by the Drinking Water Committee will execute the maintenance job.

#### (7) Organization Plan

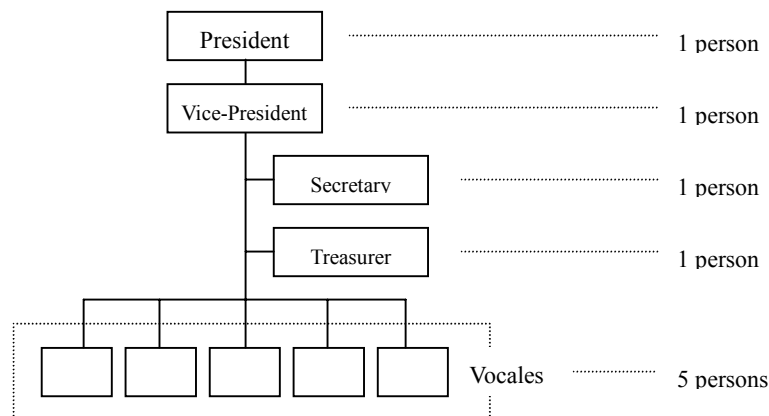
##### (a) Present System

##### 1) General

Presently, about 300 households are the beneficiaries of the water supply system. They are divided into 5 sectors based on the water system. The number of beneficiaries by sector is as follows.

	Number of Households	Number of Water Taps
Sector I	75	119
Sector II	72	105
Sector III	43	68
Chuacananac	68	109
Panacal	40	62
Total	298	463

For the operation and maintenance of the system, a Water Committee is formed among the community members. The committee consists of 9 persons. The Water committee is in charge of collecting the water charge, and implementing operation and maintenance of the water supply system. The structure of the committee is shown below.



## 2) Water Charge Collection

Present basic water charge is Q6.00/tap/year. However, those who have only one tap in their house pay an additional of Q3.00/tap/year for the right to obtain water from other taps in case his tap is broken. Therefore, present tariff of water charge is as follows.

Condition	Charge (Q/year)
1 tap per house	9.00
2 taps per house	12.00

The water committee does not go to the beneficiaries to collect the water charge. Instead, the beneficiaries are supposed to come to the Alcalde Auxiliar's office to pay their water charge for the previous year. Until the year 1999, beneficiaries' list was not prepared for the water charge

collection and only the name of beneficiaries who paid were listed in the account book. Because of this system, a large number of defaulter was not clearly grasped. Since last year (2000), the committee started to prepare a list of beneficiaries and use it for water charge collection. Accordingly, the payment rate was improved and the defaulter for the last year was only 5% (15 persons out of 298 beneficiaries).

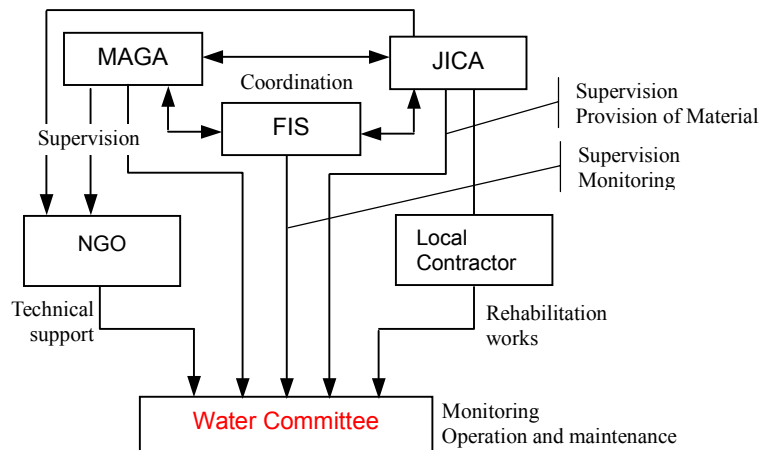
### 3) Operation and Maintenance Work

The water committee is in charge of maintenance of the system, especially for the repair of pipeline. For the repair works, the “fontanero” is assigned, and receive a payment of Q25.00 per working day; The repair work in the mountain occurs about 8~9 times a month. For the repair of water system in the houses, the “fontanero” receives 5 Quetzals per working day, and this occurs about 5 times a week. The budget for repair is quite limited and not enough to afford materials for repair. Payment to “fontanero” is also delayed sometimes because of hard financial situation.

#### (b) Organization for the Project

Since the present organization system is relatively good, basically it will be utilized for the implementation of the project. After the rehabilitation of the system, however, O&M cost has to be raised and surely collected in order to make the system sustainable in the future. Therefore, only strengthening of water charge collection system is necessary at this moment. The responsibility and relations of the organization concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall Supervision	FIS, MAGA, JICA
2. Provision of Construction Material	JICA
3. Rehabilitation Works	Local contractor and Beneficiaries (Hand Labor)
4. Operation and Maintenance	Water Committee
5. People’s Education	Water Committee
6. Monitoring	Water Committee and FIS Provincial Office



The problem of water charge collection at present system is summarized into 3 points.

- 1) No penalty is set for the defaulters
- 2) Charge collection relies on passive method. (Beneficiaries come to pay by their own will.)
- 3) To much burden on the major member of water committee (2 to 3 person have to be responsible for charge collection from 300 beneficiaries)

With the consideration of the problems mentioned above, the following improvement will be necessary to strengthen water charge collection.

1) Adoption of group water charge collection

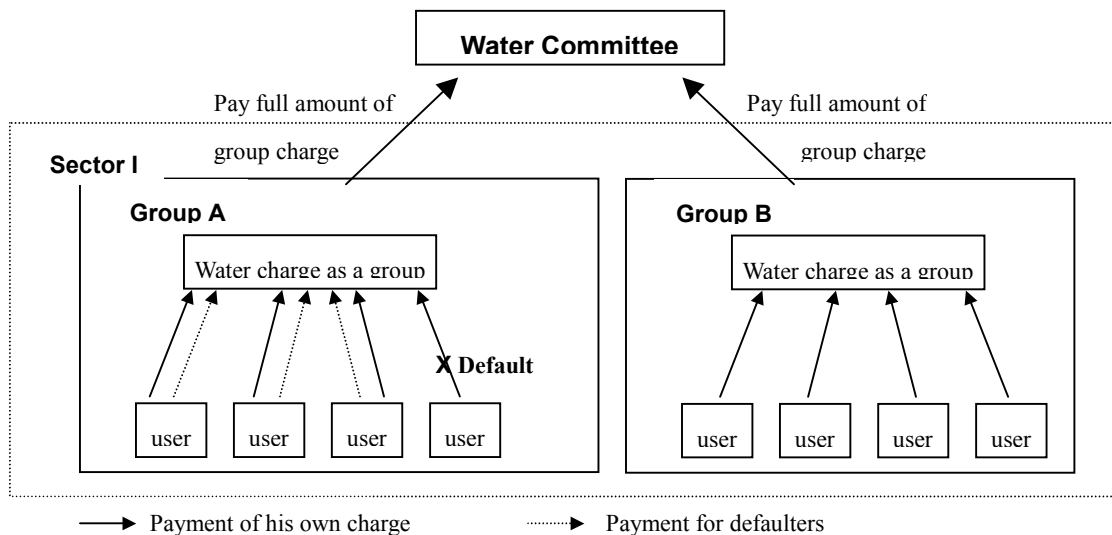
To reduce the burden of the water committee and secure water charge collection, beneficiaries will be divided into groups based on the sector of water system. The beneficiaries will be divided into 2~3 groups for each sector (20 to 25 persons per group) as indicated in table below and a person in charge of collection will be selected.

	Number of Households	Number of groups
Sector I	75	3
Sector II	72	3
Sector III	43	2
Chuacanac	68	3
Panacal	40	2
Total	298	13

Then, water charge will be collected within these groups at first. The cost



of the defaulter will be covered within the group and the full amount for the group will be paid to the water committee. Although any penalty is not set at this moment to avoid drastic change in the system, group member will be the one who collect money from the defaulter. Hence, stronger control will be expected.



## 2) More frequent collection

Frequency of charge collection will be increased at least 3 times a year (once in 4 months) instead of once in a year of the present system. By increasing the collection frequency, it is expected that people will have custom to pay water charge constantly and feel easy to pay because amount to be paid each time will be very small (Q3.00 for 1 tap users, and Q4.00 for 2 taps users). However, at present in Panyebar, people have custom to pay necessary fees at yearly base; it is necessary to explain the modification of the system in advance to its implementation.

## (c) Education on Water Use

There are two reasons for the people to feel that water supply is insufficient. One is frequent breakdown of the supply system and another is amount of water use. Water consumption per person is high (estimated as more than 100 lit/day/person) compared to other areas. To have a constant water supply at house, it is necessary for the people to provide labor force for the repair of water supply system to recover as soon as possible and to save use of potable water. Regarding these two points, education has to be made. The water committee will be in charge of this activity. During the general meetings of

the community members, the water committee will give explanation about their situation and urge people to reduce the use of water and offer hand labor in case of breakdown.

(d) Monitoring and Evaluation

The monitoring indicators and the organizations in charge are summarized as below.

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Progress of construction of water supply.	- Monthly	- Water Committee	- FIS	- Study Team	- Progress rate is over 90% of original schedule.
- Payment rate of water charge.	- Every 4 months	- Water Committee	- FIS	- Study Team	- Payment rate is over 80%.
- Status on O&M of facilities.	- Once half year	- Water Committee	- FIS	- Study Team	- Payment of water charge is not used for other purpose of water supply.
- Status of water use.	- Monthly	- Water Committee	- FIS	- Study Team	- 5% reduction of water volume used at present.

a) Water Supply at beneficiaries' houses

Purpose: To check whether water is supplied constantly at beneficiaries' houses

Target: The frequency of water suspension will be reduced by 50% from the present situation.

Method: Two beneficiaries will be selected as monitor at each sector (10 monitors in total). The monitor's family will check 1) date that water suspension occurs and its duration. The water committee will collect this data every month and check how frequent suspension occur and how long.

b) Collection rate of water charge

Purpose: To check whether water charge is constantly collected and whether number of defaulter is reduced.

Target: Collection rate of water charge will be continuously higher than 90%.

Method: The water committee will prepare account books at community level and group level. The water committee will check account books at the time of water charge collection and calculate collection rate at the community level. The representatives of each group will check account book and calculate collection rate at group level. Then, the committee will

gather data for all groups and submit to MAGA. This will be conducted at the time of collection, that will be done every 4 months.

#### 8.4.3 Water Quality Improvement Plan for the Existing Drinking Water Supply

##### (1) Background and Objectives

###### a) Present situation

In Panyebar, municipality of San Juan La Laguana, department of Sololá there are two systems to provide drinking water; the first is CARE System (installed in 1978 with the fund of CARE), and the second is FONAPAZ System (installed in 1998 with the fund of FONAPAZ).

The water sources for each system are installed in mountainous area in the southeast of the community. These systems have galleries and water collection tanks, equipped with galvanized iron pipes and PVC pipes for water supply by gravity to Panyebar. By now, there is no treatment plant or even hypo-chlorinate equipment in the distribution tanks installed at the end of each pipeline system. For this reason, many parasitic, digestive and skin diseases can be found in this community.

###### b) Problems to be solved

In this community, there are health and sanitary problems to be solved, because hypo-chlorinate equipment does not exist in the system. For this reason, the Drinking Water Committee is thinking to install hypo-chlorinate equipment of sodium type necessary for securing the supply of safe water to the beneficiaries. However, they do not have any idea about where to install this equipment nor its specifications.

###### c) Justification

It is necessary to use water properly for the better life of each household. Water is used for drinking, washing hands and tooth, taking shower, cooking meals, washing clothes and cleaning houses.

Water is thus indispensable for the daily life, then it has to be careful about the drinking water, as the water is not always clean and free of impurities. It can be polluted and have microbes that are not visible. According to the water quality analysis conducted in the second stage of the study, microbes were found in the samples taken from the water tap of the houses in the community. Nevertheless, the community people are drinking water without boiling, and it is regarded as one of the causes of digestive diseases.

With the installation of the hypo-chlorinate equipment, better quality of water and the safer service can be provided. As well, sanitation and health knowledge can be disseminated among the community people.

d) Objective

Stable supply of safe drinking water in Panyebar.

(2) Basic Plan

The basic principle of the project is that this plan should be a pilot project that can be extended to similar areas. Therefore the suppliers of hypo-chlorinate equipment and liquid sodium for the equipment should be selected from the local market. It is also important to consider the well-balanced collection of water charge including the maintenance cost of the equipment. The installation work will be done by the supply company.

(3) Project Works

In Panyebar, there are two drinking water supply systems, but water treatment plant and the equipment for application of hypo-chlorinate sodium in the distribution tanks do not exist. Under this pilot project, a dispenser will be installed at the outlet of the distribution tanks and the water pressure of the reserved tank can be utilized for injecting the hypo-chlorinate liquid because the drinking water is conducted by gravity system.

The equipment will be provided by the Government of Japan through JICA, and the installation cost should be included in the equipment cost, however, the cost of workers (transportation of equipment and materials), and civil works will be borne by the beneficiaries of the community. Therefor the estimated project cost only includes the cost of equipment supply.

(4) Project Cost

(Equipment Provided)

- Hypochlorinate Dosing	2 sets	Q.	18,400
- Tank housing	2 sets	Q.	1,700
- Sodium hypochlorinate liquid, 55 gallons	2sets	Q.	1,000
- Installation cost	2 sets	Q.	10,000
- Sundry expenses for public meeting		Q.	2,500
- Estimated miscellaneous	2 sets	Q.	2,200
Total		Q.	<u>35,800</u>

- Operation and Maintenance Cost (yearly) Q. 4,950

The details are shown in Table 8.4.3(1).

(5) Implementation Plan

The work will be executed during the dry season (summer). All materials should be supplied by the provider in the local market before starting the project.

(6) Equipment Maintenance Organization and Collection of Water Fee

The plumber and the Drinking Water Committee in the community will execute the maintenance job. It is usually necessary to supply the hypochlorinate liquid once every four months. After the installation of the dosing equipment the water fee will surely increase. The MSP personnel will train the Drinking Water Committee and the Committee will provide the beneficiaries (users) with educational programs on the advantage, the objective, and importance of the project as to their health and the sanitation of their homes.

(7) Organization

Organization plan for the project is summarized in the table below and details are explained in the following. Overall organization and support structure are illustrated in Figure 8.4.3(1).

Activity	Organization in charge
1. Installation	Local Company of Sterilizer
2. Education	Initial Stage & After Installation: Water Committee
3. O&M	O&M charge collection: Water Committee Simple maintenance work: Water Committee Medicine replenishment: Local Company
4. Technical Support	Simple technical transfer: Local company Management assistance: MAGA & Study Team
5. Monitoring	Water Committee, FIS

(a) Installation Work

Installation of the equipment and replenishment of hypo-chlorinate will be made by a local company of sterilizer.

(b) People's Education

1) Initial Stage

In advance to installation of the equipment, it is necessary to provide education to the users of present water system. The objectives of this

activity is to make people understand advantages and necessities of water quality improvement and to obtain consensus for installing the equipment. Without consensus, the installation is impossible, because all the users will be affected and have the obligation to pay charge for the O&M cost once it is installed. The Water Committee of the community will be in charge of education activity under the supervision of JICA Study Team. The education activity will be basically in the form of public meeting. The contents to be explained in the meeting would be as follows;

- a) General outline of the project
- b) Taste of water and influences to human bodies
- c) Advantages of improving water quality
- d) Obligations to be shouldered by the villagers (O&M cost)

As the results of the meeting, the list of beneficiaries will be prepared to show the agreement of users for the installation. It is expected, however, that some of the water users will not attend the meeting by any reason. For these users, the Water Committee will visit them to make explanation and have to obtain their agreement.

## 2) After Installation

Although the consensus will be made during the initial stage, there might be users who don't pay charge or who don't use improved water. For these users, it would be necessary to make follow-up education. This will be conducted basically by the Water Committee at the time of charge collection. In addition to this, FIS provincial may give education regarding colon bacillus and necessity of improved water at the time of water quality test. Its contents will be 1) present water quality, and 2) influence of bacteria in the water.

### (c) O&M and charge collection

#### 1) O&M Charge Collection

Presently, in Panyebar, Water Committee collects the water charge for drinking water. In the Rehabilitation Plan for Drinking Water System (c-4), improvement of water charge collection system is proposed. With this improvement, water charge will be collected by each sector of water system (refer to the organization plan for the rehabilitation project for the detail). By utilizing this system, Water Committee will collect the maintenance cost of sterilizer (cost for replenishment of hypo-chlorinate) together with the water charge.

## 2) O&M Work

Maintenance work (replenishment of hypo-chlorinate) will be made basically by a local company based on the payment from the community. However, Water Committee will be in charge of simple maintenance work such as check of hypo-chlorinate.

### (d) Technical Support

Basic operation skill will be transferred to the Water Committee by the local company at the time of installation. MAGA will be in charge of coordination between community and local company and other support such as management and administrative matters in cooperation with JICA Study Team.

### (e) Monitoring and Evaluation

Monitoring indicators and organizations in charge are summarized as below.

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Users of improved water.	- Every 3 months	- Dev. Committee	- FIS	- Study Team	- Number of present users does not reduce.
- Operation status of sterilizer.	- Monthly	- Dev. Committee	- FIS	- Study Team	- Operation is constantly performed.
- Number of diarrhea patient.	- Every 3 months	- Dev. Committee	- FIS	- Study Team	- Present number of patient decreases.
- Simple water quality test.	- Every 3 months	- FIS	- FIS	- Study Team	- No colon bacillus is detected.

#### a) Number of users of improved water

Purpose: To check people's understanding on necessity and usefulness of improved potable water.

Target: Number of improved water users will not be less than the total beneficiaries of present water supply system.

Method: The Water Committee will collect data every 3 months by interviewing beneficiaries. Interview will be simple one that simply asking whether the beneficiaries use it or not.

#### b) Operation Status of Sterilizer

Purpose: To check whether the sterilizer (hypo-chlorinate dispenser) is properly maintained.

Target: The sterilizer is continuously in operation. In other words, hypo-chlorinate should be continuously replenished and injected into the

potable water. If hypo-chlorinate is run out of and not replenished, it means the target is not attained. As the supplemental indicator for this point, payment rate of O&M cost should be monitored and it should be above 90% of total number of beneficiaries.

Method: As to the operation of sterilizer, the Water Committee will go to the water tank and check operation condition of the sterilizer every month. Regarding payment rate, the Water Committee will check account book and calculate the payment rate every month after the fee collection.

c) Number of visiting patients at the Health Post

Purpose: To check the effect of water quality improvement in terms of reduction of diarrhea.

Target: Number of visiting patients of diarrhea will be reduced. Specific percentage is not fixed as the target because of complexity of the causes for diarrhea.

Method: Water Committee will check the number of visiting patients of diarrhea at health post every 3 months. Data source would be the record of diarrhea patients at the health post.

d) Simple Water Quality Test

Purpose: To check the water quality in terms of colon bacilli.

Target: No colon bacilli will be detected in the drinking water after 3 months of the installation of sterilizer.

Method: FIS Sololá office will check water quality with simple water quality test kit for every 3 months. In this test, presence of colon bacilli in drinking water is simply checked at several points in the community. Sampling points would be at water tank and 2 to 3 points at beneficiaries' houses. Precise points will be decided at implementation stage.

#### 8.4.4 Plan for Reducing Workload in the Mountain Area through Coffee Processing

##### (1) Project Background and Objectives

Most of the land used for agriculture production in the Panyebar model area present very steep slopes. Coffee is the main crop in Panyebar. During harvest period, coffee farmers and labors spend the day picking up coffee beans, and in the afternoon farmers walk up the very steep lands carrying heavy loads (bags of



45 kg) of harvested fresh coffee beans. Among farmers and labors that carry heavy loads of coffee beans there are young and old women.

Until now, farmers in Panyebar sell fresh coffee beans to middlemen, who transport fresh beans mostly to San Juan la Laguna for depulping and drying. It is known that 100 kilograms of fresh coffee bean are reduced to 20 kilograms of dried up coffee bean after depulping and drying. Therefore, if coffee beans are depulped and dried nearby the farms, the workload of farmers will be reduced significantly.

The objective of the project is to install 6 units for depulping and drying coffee nearby farm sites with the main purpose of reducing the workload of farmers in carrying coffee beans.

## (2) Basic Plan

### Basic Plan of Coffee Processing for Workload Reduction Project

Type of depulping machine	6 units manually operated of “Ecological” type, work with very small quantity of water
Coffee depulping capacity	From 1 to 35 qq. per hour; (5 qq. per hour manually).
Estimated area of coffee	About 40 manzanas
Estimated Amount of Coffee	About 4,800 quintals per year
Number of beneficiaries farmers	80 small coffee farmers of Panyebar Model Area
Number of working days	69 net working days per harvest season
Water requirement for washing	Average requirement 1,400 liters/day.
Area of drying yard	A total area of 600 m <sup>2</sup> .
Facilities	Depulping machine : 6 units Drying yards : individually by each farmer using vinyl sheets Water Supply : each farmer provides its water

### (2-1) Basic Plan ; Selection of Beneficiary Farmers

The basic concept for demarcation of the project beneficiary areas and farmers is summarized below.

- The project should benefit the three “Caserios” of Panyebar, namely Chuacanac, Centro and Panacal, proportionally to the existing number of coffee farmers in each Caserio.
- A total number of 80 small coffee farmers, having on average about 0.3 ha of coffee, will be selected as beneficiaries. Farmers with coffee area larger than 1 ha are excluded as project direct beneficiaries. Four groups integrated by 15 to 25 coffee farmers will be organized.
- Priority should be given to the selection of farms located far down in the steep mountainous area.

## (2-2) Basic Plan ; Development Plan for Coffee Pulping Facilities

### (a) Capacity of Coffee Pulping Machine

The pulping machines are selected considering the number of beneficiary coffee farmers in each group. There are two groups integrated by 25 beneficiaries each group, including many women; 2 pulping machines manually operated are required for each of these two groups. The others two groups are integrated by 15 beneficiaries each; 1 pulping machines operated by hand is considered enough for each of these two groups.

### (b) Dimension of Coffee Drying Yards

The area required for drying yards is estimated at about 600 m<sup>2</sup> in total. Each beneficiary farmer will dry-up his own coffee around his house using plastic sheets. Estimated drying yard requirements are shown in Table 8.4.4 (1).

### (c) Water Supply

The pulping machine to be introduced in the Panyebar project area is the “Ecological” type, which requires a minimum amount of water. Water use is mainly for washing coffee beans after the fermentation process; Average requirement was estimated at 1,400 liters per day, as shown in Table 8.4.4 (1).

## (2-3) Basic Plan ; Support Service Plan

Appropriate management of coffee beans is required for attaining good quality coffee. Many coffee farmers in the project area do not have experience in processing coffee; therefore it is necessary to implement a training program since the beginning of project implementation. ANACAFE and INTECAP provide training program on post-harvest management to organized groups of coffee farmers. The project includes the cost for training activities.

## (2-4) Basic Plan ; Organization Development Plan

### (a) Farmers’ Participation and Obligation

Beneficiary farmers should participate in the project as indicated below.

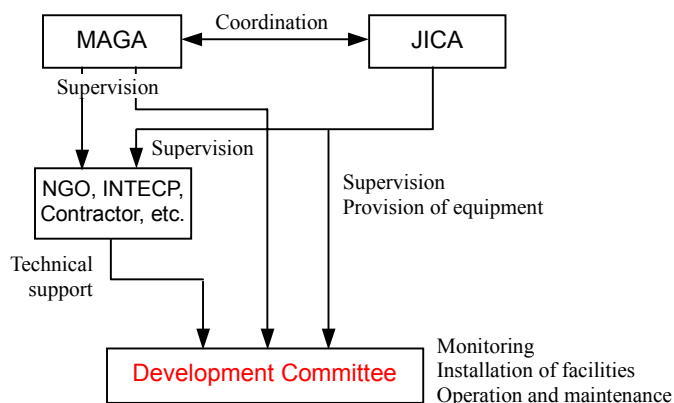
Stages	Activities/Items	Remarks
1) Construction stage*	Voluntary service as unskilled labor for construction works	Project facilities such as transport and installation of pulping machine, construction of protection houses, and related structures.
2) Operation period	Daily maintenance works	All the beneficiaries are obliged to attend the maintenance works as required. Schedule for usage and maintenance has to be prepared by farmers before the beginning of each coffee harvest season.

\*: The beneficiaries should provide voluntary works as unskilled labors, about 80 man-days, i.e.1 man-days for each beneficiary on average.

### (b) Basic Organization Plan

The total number of 80 beneficiary farmers will be organized into 4 groups varying from 15 to 25 farmers each. Each group of farmers will have its own coffee processing facilities. It is necessary to establish a system for operation and maintenance of coffee processing facilities. The definitive regulations and organization structure for project operation and maintenance should be discussed with the beneficiaries of the Project. The responsibilities and relations of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall Supervision	MAGA, JICA
2. Provision of Necessary Inputs	JICA
3. Construction of facility (warehouse)	Beneficiaries
4. Technical Support	NGO, Local Contractor, INTECAP, etc.
5. Operation and maintenance	Development Committee and Beneficiaries' Group
6. Monitoring	Development Committee (Beneficiaries' Group)



### (3) Project Works

The facilities to be installed in by the project are listed below:

#### Project Facilities

- 1) Pulping machinery : 6 units operated by hand.
- 2) Drying yards : plastic sheets, individually by each beneficiary.
- 3) Water supply system : provided individually at each beneficiary's house.
- 4) Housing for pulping machine : 4 sites of about 20 m<sup>2</sup> each.

### (4) Project Cost

The total cost for coffee processing project in Panyebar is summarized below.

Items	Quantity	Unit Price (Q/Unit)	Total Cost (Quetzals)
Pulping machine (hand operated)	6	8,470	50,820
Drying yard (vinyl sheets)	2	1,000	2,000
Plastic drum (fermentation)	50	125	6,250
Protection house	4	3,000	12,000
Weighing scale	1	2,300	2,300
Training activities	LS	-	2,000
Total cost			75,370

All the cost for project facilities, such as depulping machinery, housing for protection of pulping machinery, plastic for drying coffee, will be provided by JICA on a grant basis.

Apart from the above construction cost, the beneficiaries should provide voluntary work as unskilled labors.

### (5) Implementation Schedule

The period for installation for all project works is estimated to be about 2 months. The project implementation schedule is planned as shown below.

Work Item	Year 2001				Year 2002	
	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
Planning & preparation	■					
Purchase order	■					
Installation works			■	■		
Strengthening organization			■			
Operation & maintenance				■	■	■
Training activities			●	●	●	

### (6) Expected Benefits

The reduction of workload for carrying harvested coffee is a major benefit of this project. It is estimated that the total coffee carrying load will be reduced from 4,800 quintals of fresh coffee beans per year at present to 1,440 quintals (1/3) of

dry coffee beans per year. In addition to reducing workload, depulping and drying of coffee beans by farmers themselves imply others benefits such as: (i) selling price increase between 5 % to 12 % due to value added; (ii) coffee pulp can be easily returned to the farm as compost; and (iii) reduction of contamination of the Atitlan lake by reducing the amount of coffee processed in San Juan la Laguna.

The total project net incremental benefit will depend on the farm gate price of cherry coffee beans. The value added to coffee beans, due to pulping and drying, is estimated at about 5 % of the actual farm gate price of coffee beans without pulping. The present (year 2001) selling price of fresh cherry coffee is about 70 Quetzals per quintal. The project target for coffee processing is 4,800 quintals; therefore the total net project incremental benefit was estimated at 16,800 Quetzals per year.

The EIRR was calculated at 16.7 % as shown in Table 8.4.4 (2).

#### (7) Monitoring and Evaluation

The following table shows the indicators for evaluating the achievement of the project targets and the evaluation method.

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Installation of pulping machines.	- Weekly	- Dev. Committee	- MAGA	- Study Team	- Progress rate is over 90% of original schedule.
- Operation of pulping.	- Weekly	- Dev. Committee	- MAGA	- Study Team	- Processed production is 80% of total cherry production.
- Reduction of coffee beans.	- Monthly	- Dev. Committee	- MAGA	- Study Team	- Pulping coffee weight is 20% of raw cherry.
- Price of coffee.	- Monthly	- Dev. Committee	- MAGA	- Study Team	- Price of coffee sold is 110% of that of raw cherry.

## 8.5 Pachum

### 8.5.1 Reforestation Plan

#### (1) Background and Objectives

##### (a) Background of project

Totonicapán Province, where the project area of Pachum village is located, has a high rate of forest cover, estimated at 60 % of the province area; Totonicapán is one of the provinces with large forest coverage. However, big and small scale landslides have been generated in Pachum, and people need soil conservation measures through the plantation of trees, etc. Moreover, there are a lot of inclined lands, and the nutrients of the soil decrease by the erosion of

topsoil due to the rainfall in Pachum. Therefore, the yield of crops is very low (approximately 60 % of the average in Provinces) in Pachum.

(b) Current condition of the project area and main problems

The current condition of Pachum village is as follows.

- Big and small scale landslides have been generated, and danger to the local people who reside in the lower side is pointed out.
- The soil nutrients decrease due to soil erosion and outflow in the rainy season, and crops (maize and black bean) harvests are considerably lower than the average in the country.
- Agro-forestry is almost no practiced.
- As for the fruit tree cultivation, peach and apple are grown only on a small scale.
- Pines (white pine and red pine) constitute the majority of forest trees, and natural regeneration is also advanced. Besides, conifer trees such as fir and cedar, and alder etc. are grown.
- As for fuel consumed in life of local people, they depend it upon forest resources, but they do not take care of its conservation sufficiently.

(c) Justification

As consequence of the extraction of firewood and lumber from communal forest and of the stock farming with shepherding there to the present time, local people became aware of ravage of the forest, mainly in the head-board of basin of the river Pachum. However, they do not have basic techniques, knowledge and measures that are useful of the resolution of those problems. Accordingly, providing them with facilities of nursery, and trainings concerned with forestation can prompt them to participate in activities of reforestation and soil conservation. Moreover, that can contribute to improvement of their life condition in the future through improvement of agricultural productivity as an effect of a series of those activities, and through sale of seedlings or fruits that are produced in the community. And participants show their voluntaries for the project.

(d) Objectives of the project

The objectives of the project in Pachum are as follows.

- To implement reforestation activities in order to improve the forest and soil condition by promoting plantation and agro-forestry for local

people;

- To enhance understanding on the importance of forest and soil conservation by their awareness of environmental problems through trainings;
- To lead them to continue voluntary activities of the conservation, by acquirement of capacity for problem resolution and basic techniques for reforestation that are useful for increase of crop yield in the future.

## (2) Basic Plan

### (a) Basic concept

The size of the plan was decided to be of small scale, considering the number of MAGA staffs in Totonicapán office. In addition, the size of the nursery and the number of plantation was decided in such a matter that it does not become an additional workload to the local people, and that they can continue those activities ever after. As for principal activities, at the same time when nursery management and plantation are implemented, also training and environmental conservation education will be provided to the local people. And at the time of implementation, not only effect or benefit but also their charges and risks by the project should be explained to them. Participants on the project can discuss and decide some items related to the implementation according to necessity.

### (b) Target group

Target group of the project composes 48 households of sector 1 and 2 among 3 sectors in the community. They agreed to the participation on the plan.

### (c) Activities

#### 1) Nursery construction and management

Nurseries of a proper scale will be constructed in selected two places (sector 1 and 2). The following three points are the standard for selection of the nursery construction place:

- The nursery should be near to local people's homes;
- It is preferable that water can be secured in the nursery; and
- It is preferable that the nursery's place where duration of sunshine is long.

The size of the area for the nursery and greenhouse should be secured about 1.5 times larger than the area needed for nursery for planting 3,700 trees calculated on the basis of request by the local people. Since the diffusion of water supply is of about 80 % in Pachum, water for nursery will be secured

by conduction from existing tap to nursery.

2) Promotion of agro-forestry

Agro-forestry is implemented in Totonicapán municipality by various techniques. The main technique is a mixed planting with maize, the key grain, and fruit trees (peach). Also, mixed planting of tree (alder) and maize with high effect for soil improvement is possible and farmers' acceptance was good because this method increases of harvest of crops. Mixed planting of fruit trees (peach and avocado) and crops will be promoted in Pachum in consideration of elevation of the area (about 2,500 m.) and the local people's request.

3) Promotion of fruit tree plantation

Watering is necessary for the fruit trees after the plantation. In the case of fruit plantation in garden, local people can use the water remaining after their use. When fruit plantation is done in farmlands, the trees can serve as shade trees bringing about good effect on the growth of crops. Peach and avocado fruits can be obtained approximately three years after plantation; profits by those fruits will be expected for increase of income in the future.

4) Plantation for soil conservation

Grass plantation and check dam construction are contemplated as measures against landslide. The scale of landslides generated in Pachum is great and it is impossible to prevent them with limited budget. Therefore it is important to settle on the shelter plan for the local people. For areas subject to small-scale landslides, first plantation of grass (Pasto etc.) will be done, and next construction of terrace and drainage canal will be carried out. Tree plantation under the terrace can be more effective for soil conservation, when the terrace is constructed. Alder and sauce are used not only for soil improvement, but also for fuel wood and material for construction.

5) Plantation for watershed protection

In Pachum there are three river sources, one in each sector. The production of water is sufficient for the demand in the community at the present time. Plantation will be promoted in areas surrounding the river sources in consideration of increase of the volume of water used in each home or in each farmland with advances of communal development.

6) Plantation for securing fuel wood

Almost all houses in Pachum have a sauna called "Temascal", and the local people use it about 2-3 times a week. Firewood is only fuel used for



Temascal. The volume of firewood used for a Temascal each time corresponds to that one for a stove every day. Therefore, each family using Temascal gathers firewood every day at present. Thus, the project should promote the plantation of fuel wood to secure forest resources closely related to daily life of the local people.

7) Introduction of compost

There is other plan for implementation of the pilot project for poultry farming in Pachum. Compost will be manufactured by using the foul dung exhausted in that case, and it will be utilized for nursery. .

8) Various training for the local people

Necessary training will be given to the local people while implementing the nursery management. The main training items are as follows.

- Agro-forestry training
- Complete training nursery management (grafting, transplanting, and pest control, etc.)
- Training related to soil conservation activities (terrace construction, compost making, and simple construction, etc.)

Training will be done during 2-4 days per each time and 7 times in all according to growing process of seedlings.

9) Study tour to advanced activity areas

There are several environmental conservation projects implemented by some NGOs not far from Pachum. The local people of Pachum can understand activities of those projects and make themselves voluntary for the project by visiting the activity sites and directly talking with the people who are working for similar projects in other areas.

10) Implementation of environmental education in elementary school

There is an elementary school in sector 1 and its building is used as a place for meetings in Pachum. Environmental education will be implemented in classroom of this school, or by using some illustrations for students, visiting to nursery and practicing plantation. Alphabetization activities for women are not applied at present in the community. So, environmental education for them will be implemented in the training done 6 times in all as an activity in poultry farming project.

(c) Beneficiary

The assumed number of beneficiaries depends on the plantation scale and place. All the population of sector 1 and 2 in Pachum (132 householders) can be assumed to be beneficiaries for plantation in areas of communal forest, considering the character of the project. As for plantation of fruit trees (peach, avocado) in private areas, beneficiaries consist of 48 householders as participants on the project.

(3) Project Works

(a) Number of plantation and area

Number of plantation was decided allowing for capacity of implementation organization (Totonicapán office of MAGA), request and charge of the local people. Pines and alder are planted at a space of 2.5 m in communal or private forest. Fruit trees are mainly planted for agro-forestry. 8 trees of peach and 6 ones of avocado in all are planted in areas for agro-forestry of which each house have 2 cuerdas (approximately 0.09 ha), and in garden. Number of plantation and area are as follows.

Items	Number of plantation	Area
Pine (red and white), Alder	1,000 of each species	Total 1.875 ha
Fruit tree (avocado)	300	(4.800 ha)
Fruit tree (peach)	400	(4.800 ha)
TOTAL	3,700	—

4,000 seedlings will be produced in nursery, while 5,300 seedlings will be raised in consideration of the success rate of germination and graft.

Half number of each seedling for plantation will be purchased for following reasons.

- To make plantation succeed with high quality seedlings;
- To have the local people learn the difference between sold seedlings and produced ones;
- To save money for nursery management in the following year by selling a part of seedlings produced in nursery;

(b) Size of facilities

1) Seedbed

Seedbeds used for raising seedlings from seeding until germination are made of concrete blocks. A unit of seedbed (2.0 m x 1.6 m) is composed of 500

seedlings. 3 units are installed in each of sector 1 and 2. Cf. Figure 8.5.1(1).

2) Greenhouse

A greenhouse is constructed for production of fruit tree seedlings in each of sector 1 and 2. It has 40 m<sup>2</sup> (10.0 m x 4.0 m) of area to produce 1,000 seedlings. Cf. Figure 8.5.1(2).

3) Irrigation facilities

Existing tap is used, and a water tank (450 liters) is installed for reservation in each nursery. Water is conducted with vinyl hose from tap to the tank.

4) Storage

Storage for tools used for nursery and plantation works is constructed in each of sector 1 and 2. The size is 3.0 m wide by 3.0 m long and 2.4 m height. Cf. Figure 8.5.1(3).

(4) Project Costs

Project costs is as following.

Items	Sub total
Materials (nursery, seeds, seedling, etc)	49,200 Q
Trainings	86,600 Q
Transport	4,900 Q
TOTAL	140,700 Q

Table 8.5.1(1) shows of the detail.

(a) Sharing ratio

1) Cost covered by JICA

- Purchase of materials for nursery construction (nursery facilities and storage's etc.)
- Expense for seedlings, seeds and seedling bags
- Expense for farming tools
- Expense for transport
- Expense for various training
- Expense for study tours

2) Charge of local people

- Works for the nursery construction and management
- Plantation works
- Works for various simple constructions

(5) Implementation Plan

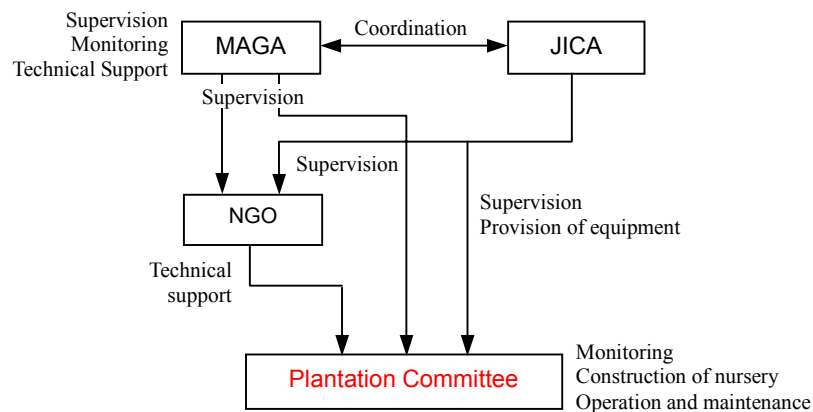
(a) Implementation schedule

The implementation period was scheduled to be 15 months from September 2001 to November 2002. Although it is possible to plant trees around September, from which the project will start, the plantation will not be implemented in principle in first year, but just before rainy season (April – June) in the next year, considering the limitation of schedule for purchase and production of seedlings. Refer to Table 8.5.1(2).

(b) Implementation organization

The plantation committee selected from each of sector 1 and 2 will organize the nursery management and activities for plantation in Pachum. In addition, MAGA staffs in Totonicapán office will give technical advice to local people, make regular round to the site and implement trainings. As for environmental education for students, it is necessary to ask teacher in school to collaborate on the project. The responsibilities and relations of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall Supervision	MAGA, JICA
2. Provision of material and seedlings	JICA
3. Construction of Nursery	Beneficiaries (under the supervision of MAGA or NGO)
4. Technical Support	MAGA or NGO
5. Operation and Maintenance	Plantation Committee
6. Monitoring	Plantation Committee and MAGA Provincial Office



An idea about the composition and function of the plantation committee is presented below:

- 1) Composition (members were selected from each of sector 1 and 2)
  - President (Representative): One person
  - Vice-President (Sub-representative): Two persons (one of them is woman)
  - Members (workers): Two persons

When a meeting is organized for all sectors except sector 3, two members or more from each sector should participate.

Working hours are assumed to be about one hour every day per worker, except for the busy season. The content of work is chiefly watering the seedling.

The above-mentioned members will be selected in top priority for the training. Moreover, it is possible that other local peoples also participate if necessary.

## 2) Functions

The assumed functions are as follows.

- Nursery management (Leader of the committee also has to work);
- Arrangement of meeting (Decision for area and species of plantation, etc);
- Recruitment of temporary workers as necessary for nursery or plantation works and collection of seeds.

A lot of workers are required in a short term for soil collection, soil putting, transplanting and plantation works.

- Decision of schedule and selection of participants for the training
- Fund reserve for nursery management

## (c) Operation and maintenance system

Fruit trees (peach, avocado) will be planted in this project. However, income should not be expected for those fruits within a period of pilot project. But one of the objectives of the project is continuing the organization and voluntary activities; operation and maintenance cost of nursery and activity cost at least must be made allowance to achieve the objective.

### 1) Management cost of nursery

Expenses related to management of nursery are mainly for purchase of

seedling bags, cutting grafts and chemical productions for pest control. The amount is estimated to 4,500-7,000 Q per year. And, as the durability of vinyl of greenhouse is of about 3 years, 800 Q should be counted for reparation every 3 years.

2) Fund reserve

Income by sale of a part of seedlings to the other community, which are produced in nursery, it will be estimated to 5,000 Q. The income will be saved for necessary expenses in the next year. Income could increase by selling seedling and cover the necessary expenses when the production scale can enlarge on and after the second year. In addition, participants will begin to save a small sum of money (0.50 Q) every month within a period of the project, in order to have them recognize that they take a lead in the project. 2 treasurers will be selected from plantation committee in each sector. With increase of the harvest and the income in the future, the sum to save can be reexamined and augmented through meetings under the leadership of plantation committee. Refer to Table 8.5.1(3) for detail.

	First year	Second year	Third year
Management cost of nursery	0 Q	- 4,220 Q	- 7,018 Q
Income by sale of seedlings	5,550 Q	8,600 Q	10,400 Q
Money saving by the local people	288 Q	288 Q	288 Q
<b>Total of management fund</b>	<b>5,838 Q</b>	<b>10,506 Q</b>	<b>14,176 Q</b>

But whether the plantation committee of each sector can continue the project in the future depends on the local people's intention and motivation. So it is important to implement various training programs for the local people to deepen their understanding of the importance of environmental conservation.

(6) Expected Benefits

The following effects will be achieved by the implementation of the activities above-mentioned.

- Nursery facilities are installed and seedlings can be produced more;
- Participants on the project learn the basic techniques necessary for seedling production;
- It is expected that various method of plantation contribute to improvement of soil and forest condition in the future;
- The income generation can be achieved in the future through implementation of fruit tree plantation;

- Balance of supply and demand of forest resources necessary for daily life can be kept through the firewood plantation;
- Knowledge and understanding of local people for environmental conservation are enhanced through the implementation of various training, study tour and environmental education, and the will to participate on the project get higher;
- Implementation of environmental education for students in school contributes to bringing up of the young generation which can succeed to the role of forest conservation; and
- Fund for management of nursery is secured, and it can be expected contribution to demand for seedlings around the community, by sale of produced seedlings.

## (7) Monitoring and Evaluation

### (a) Monitoring indicators

Monitoring of the achievement of the above-mentioned will be made based on the following indicators:

- Number of produced seedling, production cost and results of the marketing
- Number of plantation and the success rate
- Number of participants on trainings and plantation activities
- Hours of implementation of environmental education

Plantation committee implements the above-mentioned monitoring every 3 months through monitoring meeting (Internal monitoring). But at the internal monitoring, MAGA staffs in Totonicapán office must guide and confirm about contents and way of meeting with the committee. MAGA staffs in Totonicapán office and JICA implement meeting for external monitoring every 6 months with the committee and participants on the project (one person each householder).

### b) Evaluation system

MAGA staffs in Totonicapán office and JICA will be evaluate and confirm the monitoring results based on the above-mentioned monitoring indicators.

- Whether facilities and tools are installed as planned or not;
- Whether number of plantation was achieved as planned and whether 80 % of plantation was successful;

- Whether trainings are implemented as scheduled and whether 80 % of participants learned techniques of seedling production and plantation;
- Whether class related to environmental education is implemented about one hour a month, and whether environmental education is implemented for women at the same time of training concerning poultry farming;
- Whether number of participants on the project exceeded the planned one or not.

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Number of seedling production	- Every 3 months	- Pla. Committee	- MAGA	- Study Team	- Over 80% of seedling production.
- Number of plantation	- 1 time (August)	- Pla. Committee	- MAGA	- Study Team	- Over 80% of plantation.
- Number of participant on training and activities	- Every 3 months	- Pla. Committee	- MAGA	- Study Team	- Participation rate is over 80%

8.5.2 Layer-chicken Raising Plan for Women’s Group

(1) Background and Objectives

Pachum village, the target site, is in the remote isolated place. Crops grown by inhabitants are maize and frijol only for their own consumption. There is no other produce to exchange for money. In order to get money to live on, men go out of the village to peddle. Field tilling and livestock raising are entirely done by women remained home. It would be realistic to find the sustainable works in the village which make use of the habit of villagers specially women, who are familiar in raising livestock and domestic fowls.

On the other hand, in the rural village in Guatemala people rely much on eggs and chicken meat for their animal protein. In average villages, they consume about three dozen eggs/week/family. However, in this village, the consumption rate is one dozen/week/family, which is about 1/3 of other villages and the nutrition intake is extremely in short.

In this background, this project shall start the business of raising chickens for laying eggs and sell them mainly in the village by village women themselves. The purpose of this project is to increase the income of villagers and at the same time contribute to the improvement of nutrition intake of inhabitants.

(2) Basic Plan

(a) Basic policy

Group of village women shall engage in the raising chickens for laying eggs



for sales locally. The money earned by the sales shall be reserved as a revolving fund for next raising. Thus, the scale of business shall be increased step by step.

(b) Content of the project and its development plan

As a short/medium objective, about 200 chickens laying 150 eggs daily shall be raised to meet the demand of the village so that group raising techniques take roots among local inhabitants. For a long-term objective, about 600 chickens shall be raised including the ones to sell to markets in nearby villages and towns.

(3) Project Works

(a) Project scale

(i) Demand of egg

In Pachum, where there are 155 families and population of about 1,000 people, egg demand is about 200~250 eggs per day according the survey by MAGA. In this village almost all families raise chickens, total number is estimated to be about 500 chickens. However, their egg laying rate is rather low and total number of eggs laid per day is estimated to be less than 100. Considering the above mentioned supply condition, in Pachum, there is a need for 100~150 pcs of more eggs per day.

(ii) Number of chicken for laying egg to be raised

In the case of "WAREN" variety for egg laying, which is extensively raised here by the technical guidance of U.S.A., the egg laying rate is as high as 95 pcs./100 chickens. However, considering the raising condition of this village, the plan was made to raise 200 chickens to obtain 150 eggs per day.

(iii) Scale of chicken raising

From the above mentioned, it is judged appropriate to form four (4) chicken raising groups, each group raising 50 chickens and in total 200 chickens are raised.

(b) Raising plan

(i) Hen house

Small scale raising method, in which about 50 chickens in a hen house of 5 x 3m (15 m<sup>2</sup>) is considered optimum for the present technical level of the village.

(ii) Feeding plan

12 lbs. of compound feed shall be given daily for 50 egg-laying chickens. In

this plan, total quantity is expensive compound feed but it is expected that in future about 1/3 shall be replaced with the maize produced by local inhabitants, thereby a considerable expense shall be saved.

(iii) Duration of raising period

16 week old chickens are procured and they start laying eggs after 18 weeks. The egg laying rate reduces and after about 18 months they shall be replaced with young chicken of second generation.

(c) Sales plan

(i) Group sales

Each member of the group shall sell eggs to neighbors at the price of Q0.65/egg. And collect money. In this project, this kind of sales occupied the largest portion of total sales.

(ii) Sales at village shops

Consign sales to village shops at the price of Q0.70/egg.

(iii) Sales at market

Group members shall sell eggs at the market opened in nearby towns. The price will be Q0.75/egg. This kind of sales is tried for future market development, however, much is not expected from this kind of sales in the project.

(4) Project Cost

The total cost for the laying chicken raising project by village women groups is Q 73,100. This project cost does not include Q 2,600 for construction and transportation works borne by the beneficiaries. Details are shown in Table 8.5.2 (1).

(5) Implementation Plan

(a) Organization and implementation system

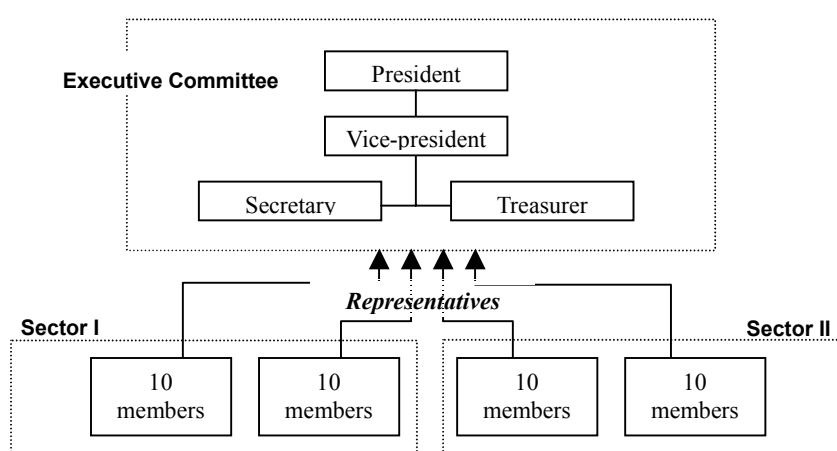
(i) Participants (Beneficiaries)

Basically, it is necessary for the beneficiaries to be literate and capable of understanding Spanish as they should attend the training class. Also they should be able to write diary, sales note, etc. and be able to make simple calculation works. Presently there are 40 applications and it is estimated that about 20 persons are literate out of 40 applicants. Considering this fact, it is necessary to make 20 literate persons be the core members in this project. A list is attached in Table 8.5.2 (2).

(ii) Group/Association

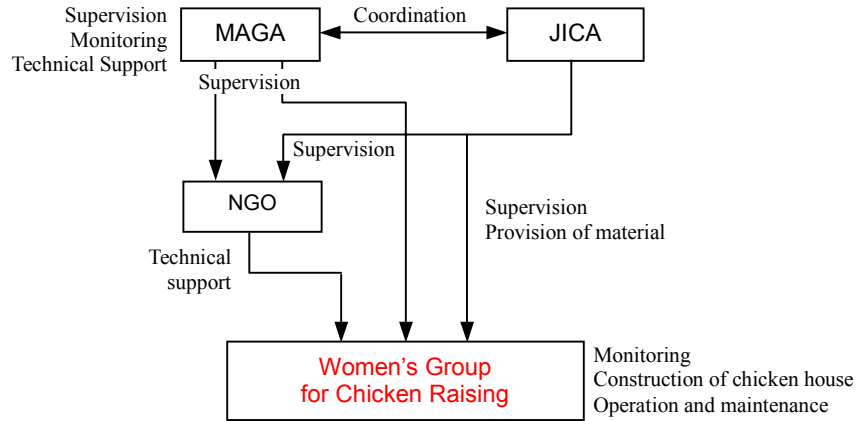
Women’s group in the village shall be formed. The function of the group is to jointly procure necessary inputs such as young chickens, feed, medicine, vitamin, and to jointly sell eggs. In order to execute this project, four raising groups were formed, each group has ten members. Since there are two sectors in Pachum, 2 groups will be formed in each sector.

Each group tentatively selected its representative members who will integrate the executive committee of the groups. Executive committee shall consist of 1) President, 2) Vice-president, 3) Secretary, and 4) Treasurer. The structure of the women’s group is illustrated below.



The responsibilities and relations of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall Supervision	MAGA, JICA
2. Provision of material	JICA
3. Construction of Chicken House	Beneficiaries (under the supervision of MAGA or NGO)
4. Technical Support	Administrative support: MAGA Technical Support: NGO
5. Operation and Management	Women’s Group
6. Monitoring	Women’s Group and MAGA Provincial Office



(b) Project support plan

The supporting system of the project is summarized in the table below.

Support	Organization	Contents
Administrative support	MAGA	<ul style="list-style-type: none"> <li>- Since this project is a assistant plan to be executed through MAGA as a supervisory organization, the field office of MAGA Tonicapán should be well acquainted with the situation of project site like chicken raising condition by village women, sales of eggs, etc. and take actions whenever problem arise.</li> <li>- To introduce specialists in various fields to raising groups to get technical transfer.</li> <li>- To give advises directly to village women whenever problems arise in the project site and seek an early solution.</li> </ul>
Technical guidance	NGOs	<ul style="list-style-type: none"> <li>- Modern raising practices of chicken,</li> <li>- Effective feeding</li> <li>- Disease diagnosis and its countermeasures,</li> <li>- Sales of eggs</li> <li>- Book keeping, accounting, Marketing</li> </ul>

(c) Trial balance sheet

Balance sheet estimated for the case of raising 200 egg-laying chickens in 18 months/cycle is shown in Table 8.5.2 (3).

(d) Increase of income

According to the above trial balance sheet, village women who engage in the execution of this project will be able to get an income of about Q 5 per day

(e) Increase of income by rationalization of management

(i) Reduction of raising expense by rationalization of management

In this project, it is possible to reduce the raising cost by planning following

rationalizations.

- In the feeding plan of this project, expensive compound feed is used. But a part of the feed may be mixed with maize or beans produced in the village. Thereby expenses can be reduced.
- The technical guidance fee may be reduced by participant worker's repeating experiences and quick learning of the raising method.
- If sales are increased by the increase of number of sales outlets in the nearby villages, markets in towns, etc. There will be a scale merits.

(ii) Revolving fund

In the trial balance sheet, some profits are deposited as a revolving fund after the 2<sup>nd</sup> year of business. However, because of the small scale of the project and small profit, it may take 3 to 4 years for preparation of inputs materials for the second generation unit.

(f) Implementation schedule

The implementation schedule for the project was planned as shown in Table 8.5.2 (4). A period of 18 months egg-laying is one cycle. After this first raising, the 2<sup>nd</sup> new generation should be commenced successively.

Due to security in the target site, access by Japanese experts is in a difficult situation. Therefore, hereafter the field office of MAGA Totonicapán will have to take a leadership and hopefully execute the project with the cooperation of local engineers or NGOs, etc.

(6) Expected Benefits

(a) Area and population

The area that will benefit from the project is Pachum, in Santa Maria Chiquimula, Totonicapán; the population that will directly benefit is about 1,000 persons or 155 families.

(b) Expected social and economic effect

(i) Current situation

Villagers have no means of cash income and are having difficulties in buying medicine when they become sick and also in letting their children to attend school. For this reason, most men, who are heads of the household, are compelled to go outside of the village to work.

(ii) Expected effect of the Project

Housewives who stay home will engage in the business of chicken raising. They will be able to get an additional income of Q 5 daily; though this income is small at the beginning, it increasing the income of beneficiaries. As the business proceeds and if some profits are gained, they shall be deposited for a fund for next cycle of chicken raising. Such system will be repeated and business should grow and new participants would increase and the family can live together. With the increase of egg production, it should contribute to the betterment of nutrition intake of the inhabitants.

(7) Monitoring and evaluation

(a) Monitoring index

In this project, 1) Condition of chickens being raised, for instance mortality, rate of laying-eggs; 2) sales of eggs, saving money by sale of eggs are set as the index of monitoring.

(b) System

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Raising condition. (mortality, rate of laying egg)	- Every 3 month	- Women's group	- MAGA	- Study Team	- Rate of laying egg is over 80% of 0.75 eggs per one chicken.
- Sales of eggs, saving money of egg sales	- Every 3 month	- Women's group	- MAGA	- Study Team	- Over 80% of planned amount of eggs sold.

8.5.3 Water Quality Improvement Plan for the Existing Drinking Water Supply

(1) Background and Objectives

a) Present situation

The micro basin of the project is located in the southeast of the municipality of Santa María Chiquimula. The water sources are located in the mountainous area in the south of the community, and water storage tanks are installed at each source. Water is distributed by gravity system through the distribution tanks that are installed at a high altitude point in the village.

Water treatment plant and hypo-chlorinate equipment for the distribution tank do not exist. As a result, there are many digestive, parasitic and skin diseases in this community.

b) Problems to be solved

In the communities, there are sanitary and health problems to be solved

because there is no the hypo-chlorinate equipment in the system. For this reason, the Drinking Water Committee is thinking to install hypo-chlorinate equipment of sodium type necessary for obtaining safe water for the beneficiaries. However, they do not have any idea about where to install this equipment neither its specifications.

c) Justification

It is necessary to use water correctly for a better life of each household. Water is used for drinking, washing hands and tooth, taking a shower, cooking the meals, washing clothes and cleaning the houses.

Water is thus indispensable for the daily life, but one must be careful about drinking water, as it is not always clean and free of impurities. It can be polluted and have microbes that are not visible. According to the water quality analysis conducted in the second stage of the study, microbes were founded in the samples taken from water tap in the houses in the community. Nevertheless, the majority of community people are drinking water without boiling, and it is regarded as one of the causes of digestive diseases.

With the installation of the hypo-chlorinate equipment, better quality of water and safer water service can be provided. As well, sanitary and health knowledge can be disseminated among the community people.

d) Objective

Stable supply of safe drinking water in Pachum.

(2) Basic Plan

The basic principle is that this plan should be a pilot project that can be extended to similar areas. Therefore, the providers of hypo-chlorinate equipment and the sodium liquid for hypo-chlorination should be selected from the local market. It is also important to consider the well-balanced collection of water charge including the maintenance cost of the equipment. The installation work will be undertaken by the supply company.

(3) Project Works

Drinking water is distributed by gravity system to the Sector I, Sector II and Sector III communities from three distribution tanks through the distribution tanks located at the top of the hill. With this pilot project, hypo-chlorinate equipment will be installed in the reserved tank and it can utilize the water pressure of the

reserved tank to inject the hypo-chlorinate liquid because the drinking water is conducted by the gravity.

The equipment will be provided by the Government of Japan through JICA, and the installation cost should be included in the equipment cost. However, the cost for workers (transportation of equipment and materials) and the civil works will be borne by the beneficiaries in the community. Therefore, the project cost estimated includes only the cost for equipment supply.

#### (4) Contents of the Project

##### (Equipment Provided)

- Hypochlorinate Dosing	2 sets	Q. 18,400
- Tank housing	2 sets	Q. 1,700
- Sodium hypochlorinate liquid, 55 gallons	2sets	Q. 1,000
- Installation cost	2 sets	Q. 10,000
- Sundry expenses for public meeting		Q. 4,000
- Estimated miscellaneous	2 sets	Q. 2,200
- Distribution tank 10m3	2 sets	Q. 193,900
Total		<u>Q. 231,200</u>
- Operation and Maintenance Cost (yearly)		Q. 3,300

The details are shown in Table 8.5.3(1)

#### (5) Implementation Plan

The work will be executed in the dry season (summer). Before starting the work, suppliers from the local market should supply the equipment and materials.

#### (6) Equipment Maintenance Organization and Collection of Water Fee

The plumber and the Drinking Water Committee in the community will execute the maintenance job. It is usually necessary to supply the hypochlorite liquid once every six months. After the installation of the dosing equipment the water fee will surely increase. The MSP personnel will train the Drinking Water Committee and the Committee will have to inform the beneficiaries (users) on the advantage, the objective, and importance of the project as to their health and the sanitation of their homes.

#### (7) Organization

Organization plan for the project is summarized in the table below and details are



explained in the following. Overall organization and support structure are illustrated in Figure 8.4.3(1).

Activity	Organization in charge
1. Installation	Local Company of Sterilizer
2. Education	Initial Stage & After Installation: Water Committee
3. O&M	O&M charge collection: Water Committee Simple maintenance work: Water Committee Medicine replenishment: Local Company
4. Technical Support	Simple technical transfer: Local company Management assistance: FIS & Study Team
5. Monitoring	Water Committee, FIS

(a) Installation Work

Installation of the equipment and replenishment of hypo-chlorinate will be made by a local company of sterilizer.

(b) People's Education

1) Initial Stage

In advance to installation of the equipment, it is necessary to provide education to the users of present water system. The objectives of this activity is to make people understand advantages and necessities of water quality improvement and to obtain consensus for installing the equipment. Without consensus, the installation is impossible, because all the users will be affected and have the obligation to pay charge for the O&M cost once it is installed. The Water Committee of the community will be in charge of education activity under the supervision of JICA Study Team. The education activity will be basically in the form of public meeting. The contents to be explained in the meeting would be as follows;

- a) General outline of the project
- b) Taste of water and influences to human bodies
- c) Advantages of improving water quality
- d) Obligations to be shouldered by the villagers (O&M cost)

As the results of the meeting, the list of beneficiaries will be prepared to show the agreement of users for the installation. It is expected, however,

that some of the water users will not attend the meeting by any reason. For these users, the Water Committee will visit them to make explanation and have to obtain their agreement.

## 2) After Installation

Although the consensus will be made during the initial stage, there might be users who don't pay charge or who don't use improved water. For these users, it would be necessary to make follow-up education. This will be conducted basically by the Water Committee at the time of charge collection. In addition to this, FIS provincial may give education regarding colon bacillus and necessity of improved water at the time of water quality test. Its contents will be 1) present water quality, and 2) influence of bacteria in the water.

### (c) O&M and charge collection

#### 1) O&M Charge Collection

Presently, in Pachum, Water Committee collects the water charge for drinking water. However, water charge is collected only in the case it is needed and, therefore, water charge collection is not constant under the present system. With this project, O&M cost of sterilizer should be collected constantly at least every 3 months which is period for hypo-chlorinate to be used up. Water Committee will be in charge of this and collect necessary charge (cost for replenishment of hypo-chlorinate) constantly.

#### 2) O&M Work

Maintenance work (replenishment of hypo-chlorinate) itself will be made basically by a local company based on the payment from the community. However, Water Committee will be in charge of simple maintenance work such as check of hypo-chlorinate.

### (d) Technical Support

Basic operation skill will be transferred to the Water Committee by the local company at the time of installation. MAGA will be in charge of coordination between community and local company and other support such as management and administrative matters in cooperation with JICA Study Team.

(e) Monitoring and Evaluation

Monitoring indicators and organizations in charge are summarized as below.

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Users of improved water.	- Every 3 months	- Dev. Committee	- FIS	- Study Team	- Number of present users does not reduce.
- Operation status of sterilizer.	- Monthly	- Dev. Committee	- FIS	- Study Team	- Operation is constantly performed.
- Number of diarrhea patient.	- Every 3 months	- Dev. Committee	- FIS	- Study Team	- Present number of patient decreases.
- Simple water quality test.	- Every 3 months	- FIS	- FIS	- Study Team	- No colon bacillus is detected.

a) Number of users of improved water

Purpose: To check people's understanding on necessity and usefulness of improved potable water.

Target: Number of improved water users will not be less than the total beneficiaries of present water supply system.

Method: The Water Committee will collect data every 3 months by interviewing beneficiaries. Interview will be simple one that simply asking whether the beneficiaries use it or not.

b) Operation Status of Sterilizer

Purpose: To check whether the sterilizer (hypo-chlorinate dispenser) is properly maintained.

Target: The sterilizer is continuously in operation. In other words, hypo-chlorinate should be continuously replenished and injected into the potable water. If hypo-chlorinate is run out of and not replenished, it means the target is not attained. As the supplemental indicator for this point, payment rate of O&M cost should be monitored and it should be above 90% of total number of beneficiaries.

Method: As to the operation of sterilizer, the Water Committee will go to the water tank and check operation condition of the sterilizer every month. Regarding payment rate, the Water Committee will check account book and calculate the payment rate every month after the fee collection.

c) Number of visiting patients at the Health Post

Purpose: To check the effect of water quality improvement in terms of reduction of diarrhea.

Target: Number of visiting patients of diarrhea will be reduced. Specific percentage is not fixed as the target because of complexity of the causes for diarrhea.

Method: Water Committee will check the number of visiting patients of diarrhea at health post every 3 months. Data source would be the record of diarrhea patients at the health post.

#### d) Simple Water Quality Test

Purpose: To check the water quality in terms of colon bacilli.

Target: No colon bacilli will be detected in the drinking water after 3 months of the installation of sterilizer.

Method: FIS Totonicapán office will check water quality with simple water quality test kit for every 3 months. In this test, presence of colon bacilli in drinking water is simply checked at several points in the community. Sampling points would be at water tank and 2 to 3 points at beneficiaries' houses. Precise points will be decided at implementation stage.

### 8.5.4 Plan of Extension of Improved Cooking Stoves and Sauna Baths “*Temascal*”

#### (1) Background and Objectives

According to the household survey, the diffusion of improved stoves in Pachum area is so low, only 2 %, and most inhabitants cook meals with open fire. Ethnical sauna bath is popularly used, called “*Temascal*”, in Pachum area. The general features of the existing *Temascals* are shown in Figure 5.3.6(1). The diffusion of *Temascals* in the area reaches almost 100%. Compared with that of electricity (28%), toilet (14%) and improved stove (2%), it is clear that the necessity of and villagers' concerns about *Temascal* are so high among the villagers. *Temascal* relates closely to the villagers' living condition in Pachum.

The consumption of firewood for *Temascals* in households is no less than 32 pieces a day, which expedites firewood consumption as well as cooking fire in house, such as 26 pieces a day. Taking into consideration hardship of firewood hauling on foot, reduction of firewood consumption by introducing improved *Temascal* and stove is an effective way to alleviate the heavy work in rural life.

The purposes of introducing improved stove and improved sauna bath are summarized below:

- Reduce the daily consumption of firewood in order to conserve the forest in the mountainous area.
- Mitigate heavy work of firewood transportation by the reduction of firewood consumption.
- Improve the villagers' health condition by the introduction of a comfortable and economical type of sauna bath.

(2) Basic Plan

- The final design of the improved stove and *Temascal* will be decided in consultation with the villagers after several experimental demonstrations. The recommended points to be improved in the design of *Temascal* are summarized in Figure 8.5.4 (1).
- Regarding the improved stove, the design of the present improved stove which is diffused in the country should be modified based on the villagers' opinions, such as the installation of a cooking oven under the combustion box of the stove.
- Improved stoves will be supplied to all the people who want to have them in Pachum community, on the other hand the improved *Temascal* will be furnished to a limited number of houses (approximately 40 houses) in consideration of villagers' opinions and demands.

### (3) Project Works

The number of facilities to be installed in the community*	[Improved stove] 130 nos. [Improved Temascal] 40 nos.
Required time for constructing new facility	[Improved stove] 1 day [Improved <i>Temascal</i> ] 1-4 days
Works or materials to be provided by the project	- Uncommon materials: such as cement, concrete blocks, chimney, iron top plate ( <i>plancha</i> ), reinforcement bar, door for combustion box, bricks, wood, nails, cal, gravel and so on. - Technical assistance: instruction on building-up - Capacity building and instruction on usage of the facilities
Works or materials to be provided by the beneficiaries	- Common materials: sands, local cohesive admixture made from sugarcane (called <i>Panela</i> ) and sun dried blocks ( <i>adobes</i> ) - Common labor: 1 person in each house for helping skilled labors. Transportation of materials from the center of village to their own house
Capacity building and lectures	Explanation of 1) Purpose of the project, 2) signification of forest conservation, and 3) usage of the facilities

\*: The final number of the improved Temascals and stoves would be changed in the implementation stage.

### (4) Project Cost

The project cost is summarized below and the details are given in Table 8.5.4 (1).

Items		Unit	Amount(Q.)
1. Improved stove	130*	no	114,400.00
2. Temascal	40*	no	31,200.00
3. Demonstration and capacitation	-	LS	20,400.00
*: The final number of the improved Temascals and stoves would be changed in the implementation stage.			166,000.00

Besides the above, the beneficiaries should prepare the materials mentioned in Table 8.5.4 (2) at their own expenses.

### (5) Implementation Plan

Implementation procedures for smooth and effective introduction of the improved facilities into the community are as follows;

- a) **Design and Demonstration**  
Design of several types of facilities for the experimental study. The old type and the several alternatives proposed by the project should be compared and demonstrated in front of the villagers in order to clarify their effectiveness. Based on the results of the experimental study and villagers' opinion, the definitive design will be decided.

- b) Actual construction in the community;  
Applying participation approach, the construction of the facilities will be assisted by the beneficiaries. The project will provide only 1) some materials required for the construction, and 2) instruction on constructing the facilities.
- c) Monitoring and Evaluation  
The monitoring and evaluation works will be carried out 3 months after the completion of construction of the facilities.

The general implementation schedule for the project is shown in the following table and detailed in Table 8.5.4 (3).

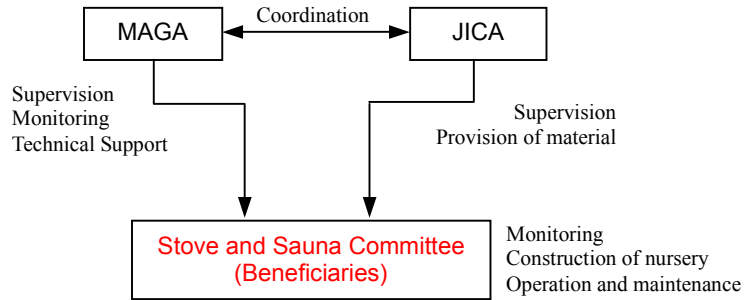
**Implementation Schedule**

Work Items	Months				
	1 <sup>st</sup> -3 <sup>rd</sup> months	4 <sup>th</sup> -6 <sup>th</sup> months	7 <sup>th</sup> -9 <sup>th</sup> months	10 <sup>th</sup> -12 <sup>th</sup> months	13 <sup>th</sup> -15 <sup>th</sup> months
Preparation, demonstration, experimental study and selection of final design	▨				
Construction works			▨		
Monitoring and evaluation	▨				▨

During the construction period, an ad hoc committee will be formulated to be in charge of the construction.

The responsibilities and relations of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall Supervision	MAGA, JICA
2. Provision of material	JICA
3. Construction of stove and material	Stove and Sauna Committee and Beneficiaries (under the supervision of MAGA)
4. Operation and maintenance	Beneficiaries
5. Monitoring	Beneficiaries and MAGA Provincial Office



## (6) Benefit and Effect

The following benefits are expected from the implementation of the project.

- Conservation of forestry and watershed
- Reduction of the burden of firewood hauling in mountainous area
- Reduction of respiratory diseases caused by smoke
- Reduction of the number of accidental skin burns of children around a cooking fire
- Improvement of the health conditions with more frequent bathing

Taking into account only the cost of firewood to be reduced by the introduction of improved facilities, EIRR was obtained at 78 % as shown below and detailed in Table 8.5.4 (4).

- Assumed reduction rate (%) of firewood consumption under the Project : 20%
- Total cost for firewood in a year
 

(without project condition)	Q. 410,200
(with project condition)	Q. 328,100
- Benefit of Project (saved cost for firewood) in a year : Q. 82,100
- EIRR: 78 %

## (7) Monitoring and Evaluation System

### (a) Monitoring Indicators

In order to monitor how the improved stoves and Temascals contribute to improving the communal life, i) the results of an attitude survey of villagers and ii) the consumed amount of firewood for a week before and after the project realization were selected.



## (b) Evaluation System

### Indicators for Evaluation and Monitoring Methods

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- People's impression on facility use.	- Before installation & 3 months after the installation.	- Villagers	- MAGA	- JICA Study Team	- Over 80% of beneficiary is perceptibly positive for facility use.
- Firewood consumption before and after the project.	- Before installation & 3 months after the installation.	- MAGA	- MAGA	- JICA Study Team	- Over 20 % reduction of firewood consumption at present.

## 8.5.5 Plan for Installation of Minimal Pharmacy Unit

### (1) Background and Objectives

#### (a) Background

In Pachum, drugs are not easily obtainable under the current situation. There exists neither public health facilities nor pharmacies except the services provided by CDRO (NGO). This organization working under a SIAS program gives free essential drugs only for children under 5 years old and pregnant women, although weekly consultation by a doctor is available for the whole population.

Consequently, the majority of village people are obliged to go to Santa Maria Chiquimula or San Francisco to receive health services and to purchase drugs. However, the drugs at public health services are often not sufficient in terms of quantity and variety while the drugs at private pharmacies are very expensive considering their economic situation.

#### (b) Objectives of Minimal Pharmacy Unit Project

1. Improving the accessibility to the cheaper drugs as well as first aid treatment, especially for those who are excluded from SIAS programs
2. Offering sufficient drugs in terms of variety and quantity for the whole population including those covered by SIAS programs.

### (2) Basic Plan

#### (a) Project Area and Covered Population

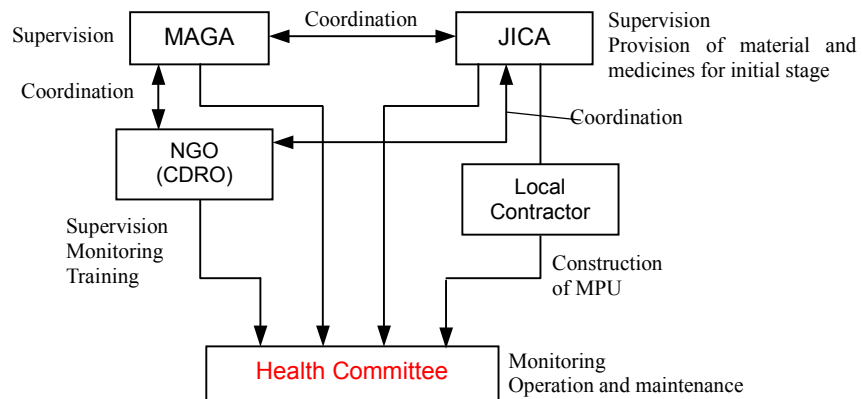
This project is to be implemented in Pachum, Santa Maria Chiquimula. Totonicapán, where the access to health facilities is not easy. A minimal Pharmacy Unit (MPU) will be installed inside the community of Pachum, and the point of installation was chosen in consideration of accessibility and convenience. This MPU is regarded as wholly covering the population in Pachum as well as the population in Aldea Xesana as it will be the nearest drug purchasing point for them.

(b) Project Plan

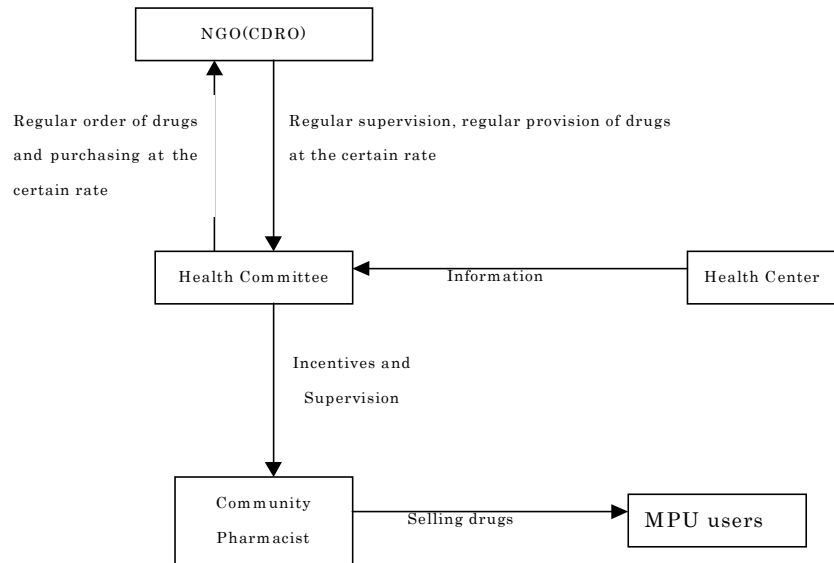
The main idea of this project is that by establishing a sustainable revolving drug fund system at MPU, cheaper and easily obtainable essential drugs as well as basic first aid treatment can be offered in a sustainable way to the population who do not benefit from public health services. The project will be managed by NGO working under SIAS programs (CDRO), and the community pharmacist trained by CDRO will be in charge of MPU. The health Committee will supervise the activities of MPU.

The overall responsibilities and relations of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall Supervision	CDRO, MAGA, JICA
2. Provision of medicines at initial stage	JICA
3. Construction of MPU	Local Contractor and Beneficiaries
4. Operation and Management	Health Committee
5. Training	CDRO
6. Monitoring	Health Committee and CDRO



The correlation between actors is mentioned below and the role/responsibility of each actor is shown in Table 8.5.5(1).



(3) Project Costs

Items	Cost
1. Trainings	Q.15,100
2. Initial Drug Input	Q.19,200
3. Equipment and Installation for MPU	Q.17,100
Total Cost	Q.51,400

A cost estimate for this plan is shown in Table 8.5.5(2).

(4) Implementation Plan

A working schedule is shown in Table 8.5.5 (3) and the details of the plan are mentioned below.

(a) Identification of the Role of each Committee Members

For the project implementation, 5 committee members will play an important role. They are President, Vice President, Secretary, Accountant, and Money Keeper. These 5 members need to be nominated from the existing health committee according to their respective specific capacities.

(b) Selection of Installation Site by Health Committee

MPU will be installed in communal land next to the school. The health committee and the community pharmacist selected the exact location.

(c) Selection of Community Pharmacist

One villager was chosen as a candidate community pharmacist to be in charge

of MPU. The minimum requirements are 1) able to read, write and calculate, 2) continuously stay in the village without migration or working outside the village, 3) willingness and interest in health activities, hopefully some experience in health activities.

(d) Training of Community Pharmacist

Training of the Community Pharmacist will be given by CDRO at the Training Center in Salcaja (between Quetzaltenango and Totonicapán) for two weeks. Two persons will be trained, one of them will be in charge of the MPU and the other will be kept as a back up, in case of drop out of the one in charge. The training program will include pharmaceutical issues and basic first aid treatment.

(e) Short training for Health Committee

All the members of the health committee need to be involved in revolving drug fund administration and to be given short training on administration method including drug stock control and monthly accounting administration.

(f) Installation of MPU

A small unit where the drugs can be stored and sold will be constructed in community land next to the school. It is located near to the house of the community pharmacist as it would be more convenient for him/her to cope with the patients at night-time. The construction design of MPU is shown in Figure 8.5.5(1).

(g) Purchasing and Provision of Initial Drugs and Equipment

Initial drug inputs (see Table 8.5.5(4)), which are already identified according to morbidity causes and other pharmaceutical information, will be purchased by CDRO. The selling price of drugs at MPU is approximately 133% of original purchasing price. As well, essential equipment including chairs, desk, shelf, money box, first aid kit and administrative materials will be installed.

(h) Starting up of MPU

After the training of the community pharmacist, MPU will start functioning.

The prices of first aid treatment to be specified by health committee. This benefit goes for purchasing necessary first aid material.

In the first day, the trainer from CDRO will attend MPU to give on the job

training to the community pharmacist.

Everyday, the amount and kinds of drugs sold, number of first aid treatment given and the remaining stock will be calculated and recorded by the community pharmacist.

(i) Regular Ordering and Purchase of Drugs through CDRO

CDRO will sell drugs to MPU with a 15% augmentation to the original price for their administrative and transportation cost. It will be sold at 133% of the original price at MPU, therefore a certain percent will be the benefit for MPU. Certain 10% of this benefit will be used as an incentive for the community pharmacist while the rest (8%) will be kept by the committee for future health activities or necessary spending for MPU. This percent of incentive needs to be revised 6 month after the starting of MPU, in proportion to the monthly benefit.

(j) Monthly Supervision of MPU by Health Committee

Every month, the amount and kinds of drugs sold, benefit gained and drugs in stock will be administered by the health committee. The loss or disappearance of drugs need to be avoided in order to make the revolving fund sustainable. Monthly incentive will be given to the community pharmacist. The rest of the benefit will be kept by the committee for future health activities.

(k) Monthly Supervision and Monitoring of Accounting and Stock Control by CDRO

Monthly financial administration and stock control by the health committee will be supervised by CDRO to keep the revolving drug fund system functioning in a sustainable way. This supervision continues for the first one year.

(l) Retraining of Community Pharmacist and committee members

Every six months in the first year, CDRO will undertake retraining of the community pharmacist and committee members in order to solve occurring problems concerning administration of MPU and provide new information.

(5) Expected Benefits

1. The population will spend less cost for purchasing drugs including drug cost, transportation cost, and opportunity cost (saving time).
2. The drugs are available everyday inside the community and during night-time.

3. First aid treatment can be received at the village level.

(6) Monitoring and Evaluation

The following table shows indicators for evaluating the achievement of the project targets and monitoring/evaluation method.

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Stock control and monthly accounting.	- Monthly	- Health committee	- NGO CDRO	- Study Team	- There is not discrepancy in record on drugs that are stocked and sold.
- Number of first aid treatment attended.	- Monthly	- Health committee	- NGO CDRO	- Study Team	
- Amount and use of money reserved by health committee.	- Three times per month	- NGO CDRO	- Study Team	- Study Team	- There is not discrepancy in financial statement of health committee.

## 8.6 Palestina de Los Altos

### 8.6.1 Project of Model Farm on Potato Production

#### (1) Background and Objectives

Productivity of potato in the target area is very low, only 15 qq/cuerda. Further, ex-farmhouse prices are low, only Q.20 to 30/qq, not even enough to cover production and labor costs. As a result, farmers live in very difficult conditions.

The low productivity of potato is due to the following reasons:

- Use of potatoes seeds infested by various virus and physiologically weak.
- Inadequate management of fertilizers; many farms are badly affected by repeated cultivation of same crop on the same ground.

Additionally, problems by pest, especially incidence of Blight (*Phytophthora infestans*) is very severe. Usually Antracol (typical preventive) is sprayed 7 to 8 times in one period of cultivation as counter measures. Environmental pollution as well as direct chemical damage on farmers who engage in spraying works are feared.

Extension activity under agricultural administration in this country has been ceased due to curtailment of national budget. Systematic extension work for the purpose of agricultural technology transfer is hardly functioning at present. With the above mentioned problems, most farmers can not improve productivity.

To solve those problems, a model farm will be installed with the help of leading

farmers, and improved technologies could be transferred to village farmers to contribute to the improvement in agricultural production.

(2) Basic Plan

(a) Basic policy

Establish a model farm at each community in collaboration with progressive farmers and grow potato with improved cultivation method such as standard farming practice recommended by ICTA, applying compost, IPM, and clean seeds which are directly effected to potato production. It aims at the transfer of technology with the efforts of farmer themselves.

(b) Technologies to improve productivity of potato

To improve the productivity of potato, the following two technologies will be displayed for enlightening to the farmers.

- Use of superior clean seeds of potato
- Improve the soil fertility and strengthen disease resistance of the crop by use of compost

(c) To reduce the excessive application of agricultural chemicals

To reduce the application of agricultural chemicals from 7 to 9 times at present to a maximum of 4 times, by adopting the Integrated Pest Management (IPM ) technology and prevent environmental pollution caused by the excessive use of chemicals.

(d) Overall goal

The present productivity of 15 qq/crd. will be improved to 20~25 qq/crd. in the short/medium-term objective, and to 30 qq/crd. as the long-term objective. The maximum number of chemical application will be 4 times.

(3) Project Works

(a) Demonstration of improved farming practices

Model Farms of 2 cuerdas will be established in five communities, for a total of 10 cuerdas of model farms to show improved practices on potato cultivation. The increase of potato production will be promoted through demonstrations of the following standard and improved farming practices that have important effects on potato production. The Model farms are composed of the following sections:

- (i) Section I
  - Demonstration: cultivating potato with standard farming practices recommended by ICTA.
- (ii) Section II
  - Demonstration: application of compost at 1kg/ m<sup>2</sup>, 2kg/ m<sup>2</sup>, 3kg/m<sup>2</sup>.
- (iii) Section III
  - Demonstration: farming practice applying IPM (resistant varieties and compost, spray of preventives is limited to 4 times)
- (iv) Section IV
  - Demonstration: Use of clean seeds (propagated by ICTA)

Each section will have an area of 1/2 cuerda and will be replicated in the 5 communities; the total area of each section will be 2.5 cuerdas (0.5 cuerdas/section x 5 communities).

(b) Transfer of farming technologies

(i) Training

Technical training will be done in the following subjects:

- Effective application of compost
- Control of pests and diseases
- Use of clean seeds
- Storage of potato seeds

(ii) Field Observation Days

Field observation days will be implemented for farmers to observe the demo-farm and have various explanation and discussion with potato experts invited from ICTA/INTECAP/NGOs.

The schedule for opening of the Field Observation Days is as follows:

- 1) At seeding time, 2) At furrowing time, and 3) At harvesting time

(4) Project Cost

(a) Required input materials

The requirements of input materials (seed, fertilizers, compost, chemical for pest control) for each model-farm are shown in Table 8.6.1 (1), (2), (3).

- (b) The total project cost is Q17,029.50 (including Q3,875.00 of local labor cost). The labor cost is borne by beneficiaries. Details of project cost are shown in Table 8.6.1 (4).



(c) Distribution of potatoes harvested in the Model Farms

The potatoes harvested in the model farms will be distributed as follows:

- The farmers that provide the land to be used as the model farm will get a portion of the production same as the average production that they get under present conditions without project;
- After giving to the farmer his share, the surplus of potatoes will be sold and the revenue from the sale will be used as a fund for carrying out next year's operation of demonstration farm. Suppose, the production was increased to more than 15 qq per cuerda, the increment in production from 10 cuerda land is estimated to worth about 7,500 Quetzals. With this amount, it may be possible to purchase necessary input materials for the operation of demonstration farms the next year.

(5) Implementation Plan

(a) Organization and system

(i) Project beneficiaries

The beneficiaries of the project are farmers who cultivate potato in the project area. The number of beneficiaries is estimated in approximately 210 farmers.

(ii) Farmers' group or association

A development committee shall be formulated for the five caseríos; the committee will consists of 3 sections, a board of directors, a potato section, and an irrigation section. The structure of the development committee is explained in Section 8.6.2 (5). The potato section of the development committee will be the executing body for the potato model farm, and this section will be in charge of administration and management of the project. In the potato section, one section chief, one treasurer, and 3 members will be selected. Since progressive farmers are the main actors under this project, it is necessary that they become as a bridge between others potato farmers and the development committee. In this sense, it is recommendable that progressive farmers are included as members of the potato section in the development committee.

The functions of the potato section in the development committee will be as follows:

- i) Administration on management of potato model farm  
Coordination for technical assistance in operating potato model farm, necessary administrative work for model farm, etc.

- ii) Management and administration of potato storage  
Controlling of potato storage and shipment, collection of O&M charge, payment of necessary cost to municipality and other organization, bookkeeping, operation of potato storage, etc.

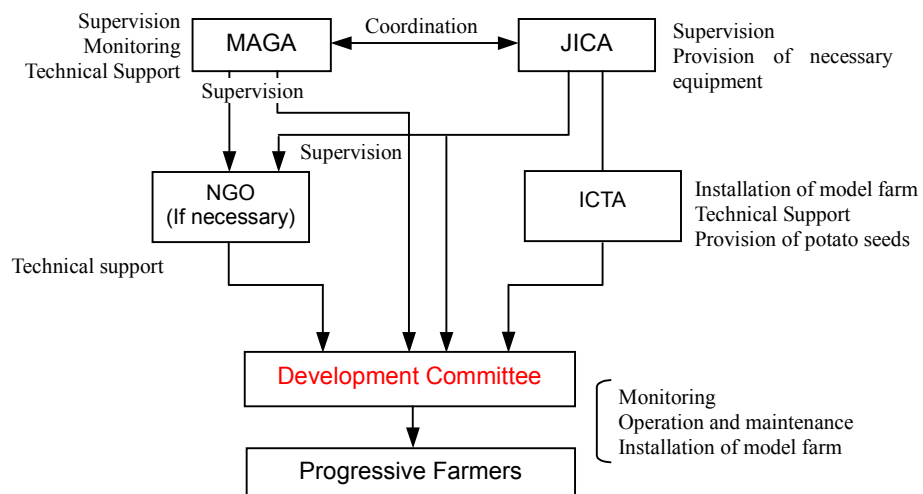
(b) Support from technical institutions

It would be wise to install the model farms adequately and effectively with the assistance from potato cultivation specialists of technical institutions such as ICTA, INTECAP, and NGOs. In this case, it is necessary to exchange documents regarding followings;

- 1) Agreement on technical cooperation with the institution, 2) Contents of guidance and technical transfer, and 3) Remuneration.

The overall responsibilities and relations of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall Supervision	MAGA, JICA
2. Provision of Potato Seed	JICA will provide through ICTA.
3. Installation of Model Farm	Progressive farmers and ICTA (or NGO)
4. Operation and maintenance of Model farm	Progressive farmers
5. Technical Support	ICTA or NGO
6. Monitoring	Development Committee, Progressive Farmers and MAGA Provincial Office



(c) Project schedule

The schedule for project implementation is shown in Table 8.6.1 (5). The

limit date for planting potatoes for the 2<sup>nd</sup> crop season of 2001 is August 15. Since the schedule of the project implementing mission to come to Guatemala is not certain at the moment, the implementation of the potato model farm has to be delayed until the 1<sup>st</sup> crop season of the year 2002 (April to May).

(d) Project sustainability

As mentioned above, the expected yield of potato should be greater than the average yield obtained by farmers in the project area under present conditions. Therefore, the executing committee will keep the amount of potatoes produced in excess of the present yield. The revenue from the sell of the excess potato will be used as a fund for next year's operation of potato model farm, as a revolving fund. Thus, the sustainability of this kind of the grass root operation by farmers can be expected.

(6) Benefit and Effect of the Project

(a) Area that will receive direct benefit from the project are indicated below

	Los Perez	Los Cabrerias	Los Diaz	Los Morales	Sector 1	Total
Area (cuerdas)	20 (230)	60	140	100	65	385 (230)
No. of Farmers	30	40	60	60	20	210

Notes: The number in bracket shows the area of potato cultivated outside of the target area  
The area of potato is 17 hectares within the project area, and 27 hectares outside of the project site.  
The total population in the 5 communities is about 1,500 people.

(b) Expected social and economic effect

(i) Current situation

- Agricultural productivity in Guatemala is low. The low agricultural productivity is an important cause of farmers' poverty.
- Many farmers strongly wish the transfer of new technology to improve productivity. However, there is not government agricultural extension system. Some NGOs are providing technical assistance, but with very limited coverage.

(ii) Expected effect of the Project

- This project will undertake enlightenment for the local farmers through demonstration of cultivation technology with the cooperation of progressive farmer in each community.
- The growth of extension activity by stimulating spontaneous activities by farmers themselves is expected.
- This project shall actually practice the agricultural extension trials mentioned above. If this activity diffuses to other areas, it should contribute greatly to the improvement of agricultural productivity in this country.

(7) Monitoring and evaluation system

The monitoring of this project shall be conducted in following manner:

(a) Monitoring index

The monitoring index for this project are:

- Growing condition and yield of potato
- Number of participants in the project and in field days.

(b) Monitoring system

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Potato growing condition.	- 45 day after seeding	- Dev. committee	- MAGA	- Study Team	- Over 130% of the present yield. - Participant rate is over 70%.
- Harvested quantity of potato.	- Harvesting time	- Dev. committee	- MAGA	- Study Team	
- Number of participants in training and field day.	- After meetings	- Dev. committee	- MAGA	- Study Team	

8.6.2 Potato Storage Plan

(1) Background and Objectives

Annual fluctuation of potato price at markets in Guatemala is very sharp. In ordinary years, the price lowers to 30 to 40 Q/qq during harvest season, but it soars to 90 to 120 Q/qq in off-season. In the case of the 2<sup>nd</sup> crop of the year 2000, that was harvested in October/November, the prices in the peak of harvesting season were only 20 to 25 Q/qq, but in February 2001, four months after, the prices soared to 90~120 Q/qq. The problem is that there is no storage facility in the producing area. If there were some means of storage, the quantity of potato sold on the market would be self-controlled and the price would be more stabilized. If the market could be controlled by executing this project, it would make way for farmers to increase their income.

(2) Basic Plan

(a) Basic policy

Storage test will be conducted at both, farmers level and farmers groups/ association level for the purpose of ① searching an effective means of long term storage, and ② to ascertain the acceptability of the quality of potato stored, thereby contributing to the improvement of potato marketing.

(b) Overall goal

Short/medium-term objectives of potato storage are one to two months storage at farmer's level and three to four months at low temperature storage facility. The long-term objective will be the stabilization of farmers' income. Farmers and farmers' group will have marketing adjustment function, store and ship the potato so that the ex-farmhouse price of the 1<sup>st</sup> crop season, and specially the 2<sup>nd</sup> potato crop season will be stabilized.

(3) Project Works

(a) Provision of model storage spaces:

Since this storage is conducted to release the potato for sales during the off-season of February/March when the potato price goes up, it shall store the potato harvested during the 2<sup>nd</sup> season in October/November.

(i) Small storage cellar to conduct storage test at farmer level.  
5qq, 10qq and 20qq of potatoes shall be placed in the storage cellars at farmer's yard and stored under natural temperature (5°C to 7°C) available in the project sites for 30 to 60 days.

(ii) Low temperature warehouse operated by farmers' group/association  
Facility to store potato in low temperature room (3 to 5°C) for a target of three to four months. Since the warehouse will be used to conduct corroborative tests, the capacity of the storage house is small 100 tons (250 m<sup>3</sup>), but provided with temperature, humidity and air control equipment.

(b) Tests to be conducted

During the tests using the storage facility, the following data shall be collected and recorded for future references:

- change of unit weight of potatoes
- change of temperature and humidity in storage space
- change in color and texture of inner portion of potato and its sugar content

The above tests are conducted by following technicians:

- At farmer level, potato experts from ICTA, INTECAP, or NGOs
- At low temperature warehouse, experts from a local Consultant.

(c) Technical training on potato storage

Training on storage know-how, specially practical training regarding operation

and management of the low temperature warehouse will be conducted by a local Consultant.

- effective operation of potato storage in off-season
- storage technology for each kind of vegetables and fruit to be handled

(d) Necessary facility and equipment to conduct tests

(i) Cellars at farmers level

Small (5qq), medium (10qq), and large (20qq) to be made at farmhouse yard, and measuring equipment for temperature, humidity and sugar content.

Drawings of potato storage in cellars are shown in Figure 8.6.2 (1)

(ii) Low temperature warehouse operated by farmers group/association

- Capacity : 2,000 bags (100 lbs. per bag, about 100 ton)
- Construction : Three sections for different storage conditions
- Temperature : 3 to 5°C / potato, 5 to 10°C / vegetables such as onion, snow-pea, tomato, etc
- Relative humidity : 80 to 95%
- Forced ventilation: mechanical forced ventilation
- Heat insulation construction
- Ancillary space : Reserve room of about 150 m<sup>2</sup> (for curing before storage)
- Operation control room
- Electricity (220Volts, 3phase, 60Hertz, 15 Kilo Volt Ampere, Transformer 13200V)

Conceptual drawing of low temperature warehouse is shown in Fig.8.6.2 (2)

(4) Project costs

(a)-1 Cost for Potato Storage in Cellars

The total cost required for various tests is Q. 16,080 (labor charge borne by beneficiaries are not included). Details are shown in Table 8.6.2 (1).

(a)-2 Cost of Low-temperature Warehouse

The total cost for building construction, machinery of refrigeration and its installation is Q. 617,600 (labor charge borne by beneficiaries are not included). Details are shown in Table 8.6.2 (1). In addition to the above, Q 22,000 is required for the training of organization.

(b) Bearing of expense by beneficiaries

In addition to cost borne by beneficiaries indicated above, also the cost for foundation of civil work, about Q 45,000 shall be borne by beneficiaries.

(5) Implementation Plan

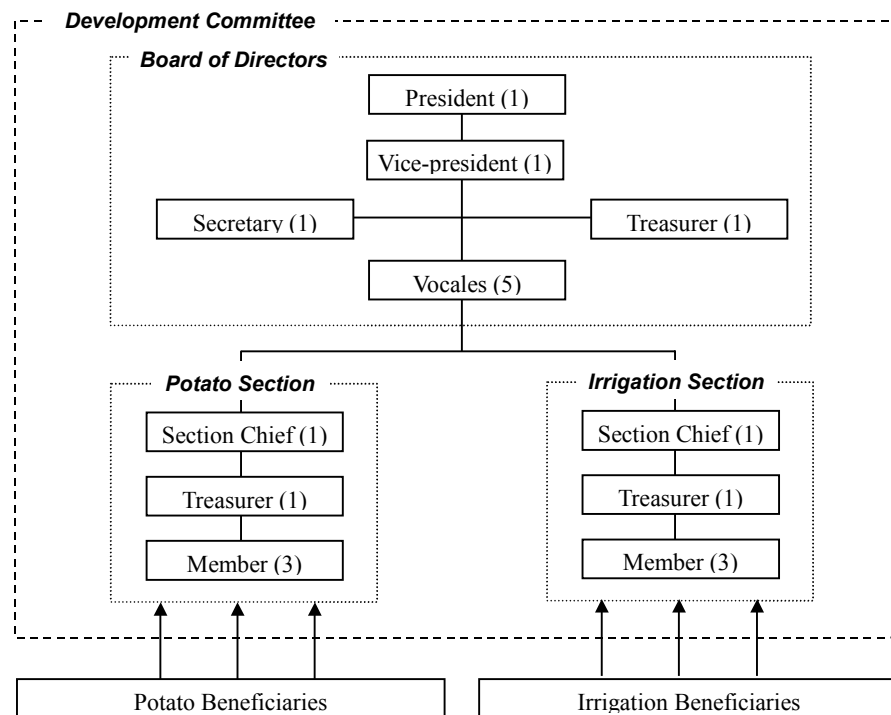
(a) Executing system and organization

(i) Project Beneficiaries

The beneficiaries of the project are farmers that cultivate potato in the project area. The number of beneficiaries is estimated at approximately 210 farmers.

(ii) Farmers' group/association

A development committee shall be formulated for the five villages (caseríos) and the committee will consist of 3 sections, a board of directors, a potato section, and an irrigation section. In the board of directors, a president, a vice-president, a treasurer, a secretary and vocals will be selected. The vocals have to be selected evenly from each community, that is, one representative from each community. The structure of the development committee is illustrated below.



Note: Parenthesis shows number of members to be assigned to the position.

Since several facilities will be established under the pilot projects planned in Palestina (irrigation facilities, potato storage), ownership of the facilities will be an issue to be clearly settled. For this reason, it is necessary to register the committee as civil association so that they will have legal power to

negotiate with other organizations over the ownership and users' right on the facilities.

For the potato storage project, the potato section will be the executing body and will be in charge of management of the facility. The function of the potato section of the committee will be as follows:

- i) Management and administration of potato storage  
Controlling of storing and withdrawing of potatoes, collection of O&M charge, payment of necessary cost to municipality and other organization, bookkeeping, operation of storage, etc.
- ii) Coordination with other organizations  
Coordination for technical and administration support from assisting organization such as MAGA, Municipality, NGOs, etc.
- iii) Administration on management of potato model farm  
Coordination for technical assistance in operating potato model farm, necessary administrative work for model farm, etc.

(iii) Ownership of the facility

Under the potato storage project, the ownership of the cold storage has to be clearly defined to avoid any conflict in the future. The ownership of the storage itself will belong to the Municipality. However, the development committee shall make contract with the Municipality for using the facility for certain period under the committee's management. For securing the users' right with this contract, it has to be the contract made between municipality and the committee as registered legal personality.

(b) Support plan

Supporting system for the project will be as indicated in the table below:

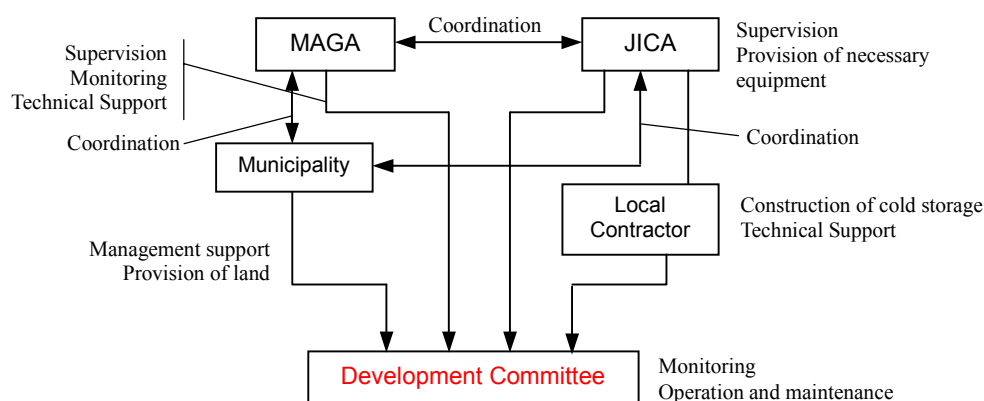
Support	Organization	Contents
Administrative support	Municipality MAGA	Administration of potato storage, such as control of storing and withdrawing of potato, book keeping, marketing, etc.
Provision of land	Municipality	Land necessary for constructing the cold storage shall be provided by the municipality.
Storage Operation	Local consultant	The potato storage especially storage technique for the low temperature warehouse is very specialized. Therefore, contract with the special consultant for the construction, installation of refrigerating machines and maintenance of the warehouse, and for the training of storage technique in order to perform the project steadily and soundly.

The overall responsibilities and relations of the organizations concerned are



shown in the table and figure below.

Activity	Organization in Charge
1. Overall supervision	Municipality, MAGA, JICA
2. Provision of material	JICA
3. Provision of land for storage	Municipality
4. Construction of storage	Local contractor and Beneficiaries (hand labor)
5. Operation and maintenance	Development Committee (Potato Section)
6. Technical support	Administrative Support: MAGA and Municipality Technical Support: Local contractor
7. Monitoring	Development Committee & MAGA Provincial Office



(c) Maintenance and management plan

Execute according to the storage technique for vegetable storage and the maintenance and management method of low temperature warehouse learned from the consultant.

(d) Storage plan

The operational schedule for low temperature warehouse is shown in Table 8.6.2 (3). Especially, it is recommended to release the potato mainly in February/March when the supply reduces and the price soars. The storage of vegetable and fruits shall be conducted as much as possible in April/September when the potato is not stored in order to prepare for future development.

- (i) Schedule of potato storage and testing of storage conditions
  - Storage of 2nd crop until March next year
- (ii) Storage of fruits
  - Fruits harvested mainly in May such as mango, orange, etc.
- (iii) Storage of vegetables
  - Vegetables mainly harvested in May, such as onion, carrot, etc.

(e) Storage and management plan

Operation plan of low temperature warehouse is shown in Table 8.6.2 (2). According to the trial balance sheet, the electricity costs are about 8% of the price of stored potatoes, the labor costs are about 9%, and other expenses (depreciation, tax, etc.) are about 5% of the price of stored potatoes.

(f) Storage fee

From the above mentioned expenses, about 25 to 30% of the price of the stored agricultural produce would be appropriate as storage fee

(6) Effect and Expected Benefits

(a) Area/no. of farmer that will directly benefit from the Project

	Los Perez	Los Cabrerias	Los Diaz	Los Morales	Sector 1	Total
No. of Farmers	30	40	60	60	20	210
Potato Area (cuerdas)	20 (230)	60	140	100	65	385 (230)
Maize Area (cuerdas)	150	80	150	200	30	610

Remark: The numbers in bracket show the area cultivated of potato outside of the project area that is cultivated by farmers that belong to the project area.

(b) Expected social and economic effect

(i) Current situation

There are many intermediaries involved in marketing agricultural produce in Guatemala. The market system is quite complicated. In this situation, a trading environment has been created in which farmers' prices are beaten down and the produce are sold dear to consumers. In the case of potato, price slump due to over supply at the time of harvest and only after 3 to 5 months the price jump 3 to 4 times due to scarcity. The price of potatoes is very unstable depending on the time, which is not good to farmers who produce them. It is not good to consumers either.

(ii) Expected effect of the Project

If storage capacity is strengthened and shipment from producing area can be adjusted, the price of potato would be stabilized. Further, if this facility can be used for multiple purposes, such as to store other vegetables and fruits when potato is not stored, also to store seed potatoes in future, this potato storage technology development project should be able to contribute greatly to the local development.

(7) Monitoring and evaluation

(a) Storage test and monitoring

Since this is a pilot project to conduct corroborative tests, the report shall

contain the result of each test and the storage in low temperature warehouse and also the results of test and monitoring mentioned below:

- Result of potato storage test
- Market acceptability of the quality of stored potatoes.
- Record of storing vegetables and fruits other than potato.

(b) System of conducting monitoring

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Potato price and its storage volume.	- Once a month after commencement of storage.	- Dev. Committee	- MAGA	- Study team	- Over 80% of planned volume of storage potato.
- Cost and profit of storage facilities operation.	- Once a month after commencement of storage.	- Dev. Committee	- MAGA	- Study team	- Financial statement is in the black.

8.6.3 Mini-irrigation Plan

(1) Background and Objectives

Agriculture production in Palestina Model Project area is at present under rainfed conditions. Present planted crops are potato and maize; During the participatory diagnostic, farmers identified the need for irrigation development and crop diversification as one of their high priorities.

There is a spring water source nearby the project area; water of that spring is been used only during 5-6 hours per day for supply of drinking water, and during the rest hours the water is not used. The objective of the project is to develop an irrigation system by pumping up water from the spring to benefit about 150 farmers. Because small land areas, climate and topographic limitations, irrigated crops will be grown mainly under vinyl houses.

(2) Basic Plan

The basic concept of the mini-irrigation project in Palestina is summarized below and detailed in Table 8.6.3 (1).

### Basic Plan of the Mini-Irrigation Project

Water resource	<i>Los Molinos</i> springs
Type of water delivery	Pumping up by a electric pump
Irrigation area	3.0 ha in net (for 150 plots ; 1 plot =0.02ha max.)
Number of beneficiaries	150 farmers in total (initial : 75 farmers)
Type of irrigation	Manual watering in 12 hours a day in vinyl house and open-air field
Target	Irrigated cultivation in/out vinyl house through out the year
Target crop	Tomato, pepper, carrot, French bean etc.
Daily operation of the system and maintenance works	Executed by the irrigation committee

#### (2-1) Basic Plan ; Demarcation of Irrigation Area

Basic concept of demarcation of the irrigation area is summarized below.

- From the economic and technical points of view, the maximum size of the irrigation plot to be distributed to one (1) farmer will be; 0.02 ha.  
The project initially provides a vinyl house, 0.01ha in extent, with the project fund. In a remaining 0.01ha beneficiaries can cultivate vegetables with irrigation water without vinyl house. . Afterwards the farmer can extend his vinyl house area up to 0.02 ha with his own fund.
- Two irrigable potential areas are designated by the project as shown in Figure 8.6.3 (1), one in Los Morales / Los Cabrera area and the other in Los Diaz area. The high-elevated lands are excluded from the irrigable potential areas in order to establish on economical water delivery system.
- Seventy five farmers should be selected as initial beneficiaries from 5 caserios in proportion to their village populations as shown below. Afterwards the number of beneficiaries can be increased up to 150.

Caserio	No. of Beneficiaries	
	Initial stage	In future
Los Cabrerias	13	26
Los Morales	19	38
Los Diaz	19	38
Sector I	5	10
Los Perez	19	38
Total	75	150

- Before starting the project, each irrigation area should be measured, approved and registered by the irrigation committee.
- To prevent damages by frost, all the farm plots will be located on east-facing slope.

## (2-2) Basic Plan; Farming Development Plan

### (a) Proposed Crops and Cropping Pattern

The crops proposed to be grown in vinyl houses are tomato and pepper. For irrigated open lands the potential crops are carrot, French bean, onion, lettuce, cabbage, snow pea, celery, and broccoli. The proposed cropping pattern is shown in Figure. 8.6.3 (2).

### (b) Proposed Farming Practices and Expected Crops Yield

Considering the small areas to be irrigated by each beneficiary farmer (200 m<sup>2</sup>), it is proposed that irrigation water is applied manually instead of using costly system, such as drip and sprinkler system. The proposed farming practices are described in Table 8.6.3 (2). The expected yield of tomato is 26.7 quintals per 100 m<sup>2</sup> of vinyl house with a growing period of 4 months. The expected yield of carrot under irrigated open lands is 250 dozens in 100 m<sup>2</sup> during 3 months.

### (c) Crop Budget

The estimated average cost of material farming input for one cropping season of tomato in 100 m<sup>2</sup> of vinyl house and carrot in 100 m<sup>2</sup> of open land is summarized as follows:

(Unit: Q/manzana)

Seeds	Fertilizers				Insecticides	Fungicides	Ropes	Water Charge	Total
	N	P	K	Compost					
50	20	14	26	175	175	155	100	235	950

Crop budgets for proposed crops and the proposed irrigation water charge are presented in Table 8.6.3 (3) and (4).

## (2-3) Basic Plan ; Agricultural Support Services

### (a) Extension Services

Vegetable production under irrigated condition is a new farming activity in the Palestina de Los Altos project area. There is no service for technical transfer for agriculture in the project area, therefore it is necessary to introduce such service for helping farmers in proper management of crops. It was planned to make arrangements with INTECAP and ICTA of Quetzaltenango for implementing a program of technical transfer as part of the irrigation project. Costs of transportation and training materials will be covered by the project.

(b) Agricultural Loan

Loan for acquiring farming inputs, for those farmers that need it, can be obtained by organized farmers' groups from BanRural at an annual interest rate of about 20 %. BanRural has some flexibility in lending money to organized groups of small farmers that do not have mortgage guarantee, for their purchase of agricultural inputs.

(c) Marketing of Agricultural Produce

Tomato is the main crop to be produced under irrigation in vinyl houses; about 6000 quintals of tomato are expected to be produced annually in the 75 vinyl houses to be initially constructed under the project. The local and regional markets cannot consume this large volume of tomato. Planting of tomato was planned in order to harvest a similar amount during 12 months of the year; this will allow to get a good average annual price.

Alternative marketing channels that can be used by the project beneficiary farmers of Palestina de Los Altos are: i) supply agreement with supermarket chains and fast-food chains; ii) supply agreement with NGOs engaged in marketing at national and export market levels; iii) direct sale by farmers of some part of tomato at local market; and iv) through the National Agriculture Exchange Market. Decisions and arrangement on marketing channels have to be made by beneficiary farmers as organized groups, not individually. An arrangement for marketing tomatoes and other vegetables should be made 2 or 3 months prior to start of planting.

(2-4) Basic Plan ; Irrigation Facilities Development Plan

(a) Water Source and Irrigation Water Requirement

(i) Water Source

Only the Los Molinos springs can provide a water source for the irrigation system in the area while other springs are not suitable in view of their discharges and topographic conditions. Presently the spring is utilized only by the rural water supply system. The average operation duration of the system is approximately 5-6 hours/day and the effective usage rate of the spring water is estimated at around 30 %. Detailed information on the springs is given in Table 5.4.1 (1) and Figure 5.4.1 (1).

(ii) Available Water and Design Discharge

The maximum available water from the *Los Molinos* springs for the project is defined at 43% of the spring discharge, i.e. 10.7 lit/s. (see Table 8.6.3 (5) for details). On the other hand the design discharge in the Project is set at 4.0

lit./s.

(iii) Irrigation Water Requirement

The irrigation water requirement in the Palestina area is 5.7 mm/day, 0.66 lit/sec/ha.

The potential evapotranspiration (ET<sub>o</sub>) was calculated by the Modified Penman method based on the meteorological data at the Labor Ovalle station in Quetzaltenango and used as that in the area.

Detailed calculation and the defined conditions are mentioned in Table 8.6.3 (6).

(2-5) Basic Plan ; Organization Development Plan

(a) Farmers' Participation and Obligation

The obligations of the beneficiaries are summarized below and the details are shown in Table 8.6.3 (1).

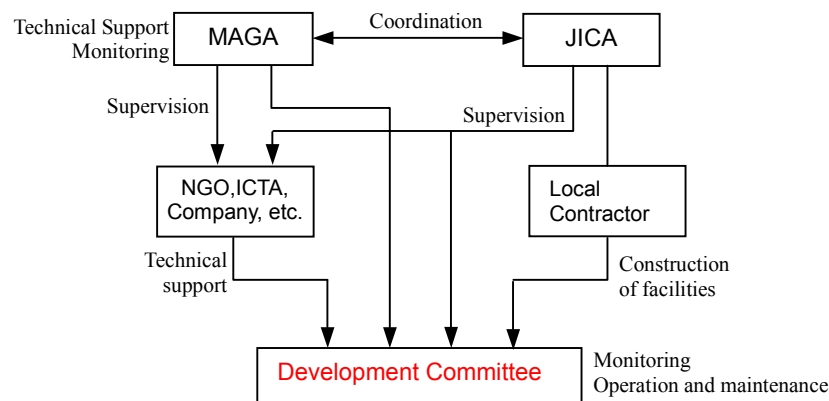
Stages	Activities/Items
1) Construction stage*	Voluntary service as un-skilled labors for the construction works
2) Operation period	Daily maintenance works
3) Cultivation period	Cost to be paid by the beneficiaries 1) All the agricultural farm input 2) Rental charge of vinyl houses

\*: The beneficiaries should provide voluntary work as unskilled labors, about 2,550 man-days, i.e. 5-6 man-days per month for each beneficiary on average (see Table 8.6.3 (7))

(b) Basic Organization Plan

The definitive regulations and organization structure should be discussed and decided with members of the irrigation committee. The basic concept of the organization plan proposed by the Study Team is described in Table 8.6.3 (8). The overall responsibilities and relations of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall supervision	MAGA, JICA
2. Installation of facility	Local contractor and Beneficiaries (hand labor)
3. Operation and Maintenance	Development Committee (Irrigation Section)
4. Technical support	Farming Practice and Marketing: Local consultant, ICTA, INTECAP, contract farming company, NGO, etc. Irrigation facility: MAGA Provincial Office
5. Monitoring	Development Committee & MAGA Provincial Office



### (3) Project Works

The initial beneficiaries total 75, however all the facilities were designed for 150 beneficiaries in consideration of further increase of the beneficiaries in near future. The facilities to be constructed in the project are listed below and detailed in Table 8.6.3 (9). The general feature of the proposed irrigation system are shown in Figure 8.6.3 (3).

All the facilities such as 1) vinyl houses, 2) the conveyance and distribution facilities for delivery of water from the springs to each farm plot, will be constructed with the project fund and owned by the municipality.

### (4) Project Cost

The total project cost for the mini-irrigation project in Palestina de Los Altos is Q.1,228,000 as detailed in Table 8.6.3 (10).

Apart from the above amount of construction cost, the beneficiaries should provide voluntary work as unskilled labors.

### (5) Implementation Plan

The construction period for the irrigation system was scheduled to be 4.5 months. The project implementation schedule was planned as shown in Table 8.6.3 (11)

### (6) Expected Benefits

The net project incremental benefit is estimated at about 16,300 Quetzals per year per 100 m<sup>2</sup> under vinyl houses, and 2,100 per year per 100 m<sup>2</sup> in open land irrigation.

IRR was calculated at 49.6 % as shown in Table 8.6.3 (12).



## (7) Monitoring and Evaluation

The following table shows the indicators for evaluating the achievement of the project targets in each stage. The evaluation method is also described below.

**Indicators for Evaluation and Monitoring Methods**

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- No. of beneficiary's attendants to the construction work.	- Everyday during construction period	- Irri. Committee	- MAGA	- Study Team	- Attendant rate is over 80%.
- Progress of construction works.	- Every half month	- MAGA/PJT staff	- Study Team	- Study Team	- Progress rate is over 90% of original schedule.
- Total benefits.	- Before and after 1st crop season	- MAGA/PJT staff	- Study Team	- Study Team	
- Collection rate of the water charge.	- Every month	- Irri. Committee	- MAGA	- Study Team	- Collection rate is over 80%.

### 8.6.4 Water Quality Improvement Plan for the Existing Drinking Water Supply

#### (1) Background and Objectives

##### a) Present situation

The micro basin of the project is located in the south of the municipality of Palestina de Los Altos, which includes 5 villages namely: Los Morales, Los Cabrera, Los Diaz, Sector I and Los Perez. The water source is located in the mountainous area in the west of Los Morales. It has a collector ditch and a water storage tank installed in a flat basin. The water from fountains is captured and stored in the tank, pumped up to the second pump house through 6-inch iron galvanized pipe and then pumped up to the reserve tank located on the top of the hill in the southern part of the Los Diaz. These pumping houses will be equipped with 75 HP turbine pump with a total head of 160m, operated by electricity. It means that the reserve tank is located at a height of 320m from the fountain area. Water is distributed by gravity through the distribution tanks installed at the high elevated point in the village.

According to the results of interview with the plumber, in charge of the water supply system, these pumps are operated 7 hours a day and the maintenance and operation cost are paid from the water charge.

Above all, there are no water treatment plant and hypo-chlorinate equipment in the distribution tank. As a result, many digestive, parasitic and skin diseases can be found in this community.

##### b) Problems to be resolved

There are sanitary and health problems to be solved in the community because there is no hypo-chlorinate equipment in the system. For that reason, the

Drinking Water Committee is thinking to install hypo-chlorinate equipment of sodium type necessary for obtaining safe water for the beneficiaries. However, they do not have any idea about where to install this equipment neither its specifications.

c) Justification

It is necessary to use water properly for better life of each household. Water is used for drinking, washing hands and tooth, taking a shower, cooking the meals, washing clothes and cleaning the houses.

Water is indispensable for the daily life, but one must be careful about drinking water, as it is not always clean and free of impurities. It can be polluted and have microbes that are not visible. According to the water quality analysis conducted in the second stage of the study, microbes were founded in the samples taken from water taps in the houses in the community. Nevertheless, the majority of community people are drinking water without boiling, and it is regarded as one of the causes of digestive diseases.

With the installation of hypo-chlorinate equipment, better quality of water and safer water service can be provided. As well, sanitation and health knowledge can be disseminated among the community people.

d) Objective

Stable supply of safe water in the communities of Palestina de Los Altos

(2) Basic Plan

The basic principle is that this plan should be a pilot project that can be extended to similar areas. Therefore, the providers of the hypo-chlorinate equipment and the sodium liquid for hypo-chlorination should be selected from the local market. It is also important to consider the well-balanced collection of water charge including the maintenance cost of the equipment. The installation work will be undertaken by the supply company.

(3) Project Works

Drinking water is distributed by gravity system to Los Morales, Los Cabrerias, Los Diaz and Sector I from two distribution tanks through a reserve tank located at the top of a hill in the south of Los Diaz. For Los Perez, the water is distributed from the reserve tank directly.

Under this pilot project, hypo-chlorinate equipment will be installed on the reserve tank and it can utilize the water pressure of the reserved tank to inject the hypo-chlorinate liquid because the drinking water is conducted by gravity.

The equipment will be provided by the Government of Japan through JICA, and the installation cost should be included in the equipment cost. However, the cost of workers (transportation of equipment and the materials) and civil works will be borne by the beneficiaries of the community. Therefore the estimated project cost only includes the cost of equipment supply.

(4) Contents of the Project

(Equipment Provided)

- Hypochlorinate Dosing	3 sets	Q. 27,700
- Tank housing	3 sets	Q. 2,500
- Sodium hypochlorinate liquid, 55 gallons	3sets	Q. 1,200
- Installation cost	3 sets	Q. 15,000
- Sundry expenses for public meeting		Q. 4,000
- Estimated miscellaneous	3 sets	Q. 3,300
- Distribution tank (Los Morales)	1 sets	Q. 96,900
Total		<u>Q. 150,700</u>
- Operation and Maintenance Cost (yearly)		Q. 3,500

The details are shown in Table 8.6.4(1)

(5) Execution Program

The work will be executed in the dry season (summer). Before starting the work, the supplier from local market should supply the equipment and materials.

(6) Equipment Maintenance Organization and Collection of Water Fee

The plumber and the Drinking Water Committee in the community will execute the maintenance job. It is usually necessary to supply the hypochlorinate liquid once every four months. After the installation of the dosing equipment the water fee will surely increase. The MSP personnel will train the Drinking Water Committee and the Committee will provide the beneficiaries (users) with educational programs on the advantage, the objective, and importance of the project as to their health and the sanitation of their homes.

## (7) Organization

Organization plan for the project is summarized in the table below and details are explained in the following. Overall organization and support structure are illustrated in Figure 8.4.3(1).

Activity	Organization in charge
1. Installation	Local Company of Sterilizer
2. Education	Initial Stage & After Installation: Water Committee
3. O&M	O&M charge collection: Water Committee Simple maintenance work: Water Committee Medicine replenishment: Local Company
4. Technical Support	Simple technical transfer: Local company Management assistance: FIS & Study Team
5. Monitoring	Water Committee, FIS

### (a) Installation Work

Installation of the equipment and replenishment of hypo-chlorinate will be made by a local company of sterilizer.

### (b) People's Education

#### 1) Initial Stage

In advance to installation of the equipment, it is necessary to provide education to the users of present water system. The objectives of this activity is to make people understand advantages and necessities of water quality improvement and to obtain consensus for installing the equipment. Without consensus, the installation is impossible, because all the users will be affected and have the obligation to pay charge for the O&M cost once it is installed. The Water Committee of the community will be in charge of education activity under the supervision of JICA Study Team. The education activity will be basically in the form of public meeting. The contents to be explained in the meeting would be as follows;

- a) General outline of the project
- b) Taste of water and influences to human bodies
- c) Advantages of improving water quality
- d) Obligations to be shouldered by the villagers (O&M cost)

As the results of the meeting, the list of beneficiaries will be prepared to show the agreement of users for the installation. It is expected, however, that some of the water users will not attend the meeting by any reason. For these users, the Water Committee will visit them to make explanation and have to obtain their agreement.

## 2) After Installation

Although the consensus will be made during the initial stage, there might be users who don't pay charge or who don't use improved water. For these users, it would be necessary to make follow-up education. This will be conducted basically by the Water Committee at the time of charge collection. In addition to this, FIS provincial may give education regarding colon bacillus and necessity of improved water at the time of water quality test. Its contents will be 1) present water quality, and 2) influence of bacteria in the water.

### (c) O&M and charge collection

#### 1) O&M Charge Collection

Presently, in Palestina, Water Committee collects the water charge for drinking water. By utilizing this system, Water Committee will collect necessary charge (cost for replenishment of hypo-chlorinate) together with the water charge.

#### 2) O&M Work

Maintenance work (replenishment of hypo-chlorinate) itself will be made basically by a local company based on the payment from the community. However, Water Committee will be in charge of simple maintenance work such as check of hypo-chlorinate.

### (d) Technical Support

Basic operation skill will be transferred to the Water Committee by the local company at the time of installation. MAGA will be in charge of coordination between community and local company and other support such as management and administrative matters in cooperation with JICA Study Team.

### (e) Monitoring and Evaluation

Monitoring indicators and organizations in charge are summarized as below.

### Indicators for Evaluation and Monitoring Methods

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Users of improved water.	- Every 3 months	- Dev. Committee	- FIS	- Study Team	- Number of present users does not reduce.
- Operation status of sterilizer.	- Monthly	- Dev. Committee	- FIS	- Study Team	- Operation is constantly performed.
- Number of diarrhea patient.	- Every 3 months	- Dev. Committee	- FIS	- Study Team	- Present number of patient decreases.
- Simple water quality test.	- Every 3 months	- FIS	- FIS	- Study Team	- No colon bacillus is detected.

#### a) Number of users of improved water

**Purpose:** To check people's understanding on necessity and usefulness of improved potable water.

**Target:** Number of improved water users will not be less than the total beneficiaries of present water supply system.

**Method:** The Water Committee will collect data every 3 months by interviewing beneficiaries. Interview will be simple one that simply asking whether the beneficiaries use it or not.

#### b) Operation Status of Sterilizer

**Purpose:** To check whether the sterilizer (hypo-chlorinate dispenser) is properly maintained.

**Target:** The sterilizer is continuously in operation. In other words, hypo-chlorinate should be continuously replenished and injected into the potable water. If hypo-chlorinate is run out of and not replenished, it means the target is not attained. As the supplemental indicator for this point, payment rate of O&M cost should be monitored and it should be above 90% of total number of beneficiaries.

**Method:** As to the operation of sterilizer, the Water Committee will go to the water tank and check operation condition of the sterilizer every month. Regarding payment rate, the Water Committee will check account book and calculate the payment rate every month after the fee collection.

#### c) Number of visiting patients at the Health Post

**Purpose:** To check the effect of water quality improvement in terms of reduction of diarrhea.

Target: Number of visiting patients of diarrhea will be reduced. Specific percentage is not fixed as the target because of complexity of the causes for diarrhea.

Method: Water Committee will check the number of visiting patients of diarrhea at health post every 3 months. Data source would be the record of diarrhea patients at the health post.

#### d) Simple Water Quality Test

Purpose: To check the water quality in terms of colon bacilli.

Target: No colon bacilli will be detected in the drinking water after 3 months of the installation of sterilizer.

Method: FIS Quetzaltenango office will check water quality with simple water quality test kit for every 3 months. In this test, presence of colon bacilli in drinking water is simply checked at several points in the community. Sampling points would be at water tank and 2 to 3 points at beneficiaries' houses. Precise points will be decided at implementation stage.

### 8.6.5 Municipality Community Health Service Plan

#### (1) Background and Objectives

##### (a) Health related problems found in this area

- Lack of health education including prevention of common diseases and FP.
- Dependency on health volunteers without financial incentives, resulting in high drop-out rate and discontinuity of community health activities.
- Lack of essential drugs in quantity and variety (Health Center, Health Post, and Municipal Pharmacy) while the drugs sold by private pharmacies are very expensive
- Not easy access to drugs purchase and health services

##### (b) Objectives of Municipal Community Health Service Plan

- Better access to cheaper drugs and more varieties of drugs at the municipal pharmacy by introducing PROAM drugs
- Better access to cheaper drugs as well as first aid treatment at the village level by selling PROAM drugs at the Minimal Pharmacy Unit located inside the villages.

- Offering sustainable and regular health education program by community health promoters in co-operation with the Health Center.

(2) Basic Plan

(a) Project Area and Covered Population

This project will cover 5 caserios in Palestina de Los Altos. Regarding accessibility to public health facilities and accessibility from near-by villages, Sector 1 and Los Cabrera were finally selected as MPU installation site through the discussion with the Municipality, Health Center and Municipal Pharmacy. MPU in Sector 1 is to cover Los Perez and Los Diaz while MPU in Los Cabrera is to cover Los Morales (the latter can also cover aldea Carmen).

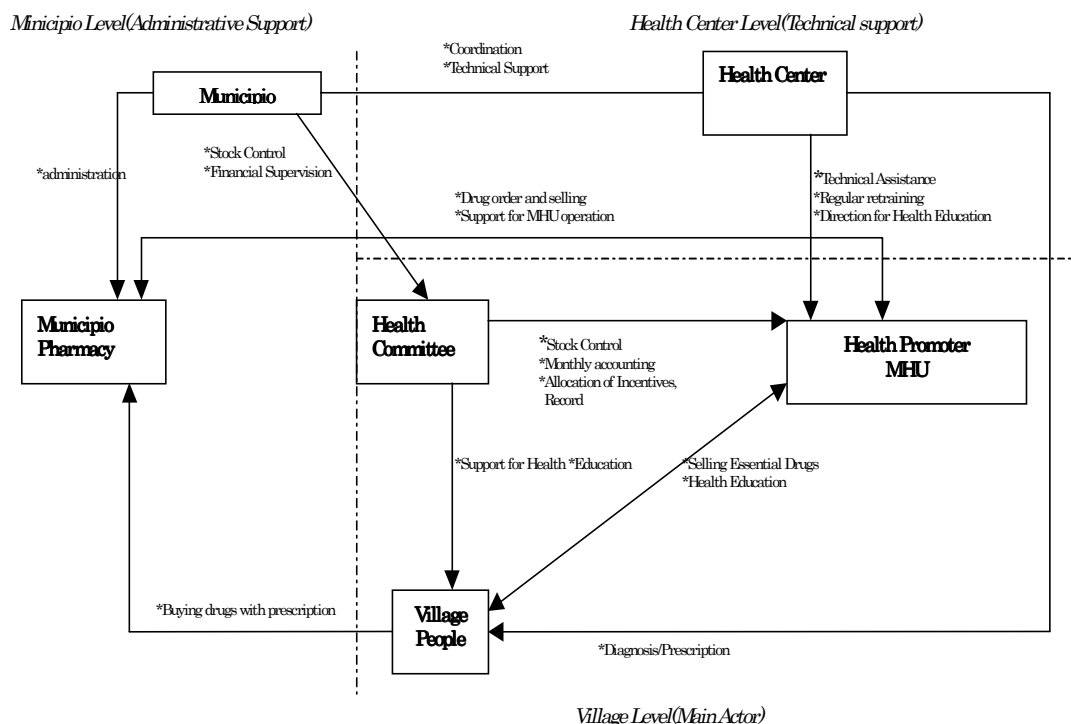
(b) Project Plan

The basic idea of this project is that by introducing PROAM drugs in the Municipal Pharmacy, much cheaper drugs will be available at the municipality level, and then they can be distributed to two Minimal Pharmacy Units (MPU). With this drug distribution structure, a sustainable revolving drug fund system can be established.

For each MPU, a health committee is already formed and one community health promoter is already selected who will be in charge of selling of essential drugs and giving first aid treatment at MPU, as well as for regular health education. Part of the profit from the sales of drugs will go to these promoters as incentives.

The project will be managed jointly by the municipality, municipal pharmacy and health center. The role and responsibility of each actor are specified in Table 8.6.5(1) and the correlation between the actors is shown below.





**Correlation between the actors for Municipal Community Health Activity Project**

(3) Project Costs

The project cost was calculated as shown in the following table and detailed in Table 8.6.5(2).

Items	Cost
1. Training	Q.38,100
2. Initial Drug Input	Q.23,000
3. Equipment and Installation for MPU	Q.30,900
Total Cost	Q.92,000

(4) Implementation Plan

A working schedule is shown in Table 8.6.5(3) and the details of the plan are described below.

- (a) Organizing two health committees (one for Los Perez, Los Diaz and Sector1, the other for Los Morales and Los Cabrera)

The committee members include a president, a vice president, an accountant, a secretary and a money keeper. The health committee is already organized by the people in charge of health activities in the Municipality and study team.

- (b) Selecting community health promoters

One health promote was selected for each MPU, therefore in total there will be

two promoters.

The requirements for health promoter are:(1) Staying in the village through out the year (no migration or work outside the community); (2) Being literate and able to calculate; and (3) Being willing and interested in working as promoter and preferably having experience as promoter. Their selection is also already done by the municipality, health committee and study team.

(c) Training of staff

A woman from staff of the Municipality will be in charge of the Municipal Pharmacy. The training will aim at acquiring a license of auxiliary pharmacist which entitles her to purchase drugs from PROAM. The training will be held in Quetzaltenango twice a year (in March and August) and the course will be organized by CEGIMED.

The training period will be 200 hours in total (for four months at maximum). The detailed schedule will be decided according to the disposability of the participants. Requirements for the candidate are: (1) more than 18 years old ; (2) termination of 6th grade in primary school ; (3) interest in and availability for health activities. Two persons were selected and will be trained, one who will be in charge of Municipal Pharmacy and the other one will be keep as a backup, in case of drop out for any cause of the one in charge. The contents of the training are shown in the Table 8.6.5(4).

(d) Training of community health promoters

The training will aim at acquiring knowledge for giving health education and first aid treatment as well as for dealing with drugs.

The training period is 5 days by the Health Center for general health matters, and 10 days by a professional pharmacist for pharmaceutical matters. It is necessary to inform the trainer of the exact training schedule at least one and a half months beforehand. Four persons will be trained, two of them will be in charge of the 2 MPUs and the others will be kept as a back up, in case of drop out of the ones in charge. The training contents are shown in Table 8.6.5(4) for the Health Center and professional pharmacist.

(e) Training of health committee members on administrative methods

Training will be given by a professional pharmacist for one day on administrative management of MPU and accounting methods.

(f) On the job training in Municipal Pharmacy for two days

The community health promoters will attend the Municipal Pharmacy for learning how to sell the drugs practically.

(g) Application to PROAM with all relevant documents

See the requirement list of PROAM in Table 8.6.5(5). All the necessary documents will be prepared by the Municipality and the Municipality itself applies to PROAM

(h) Purchase of essential equipment for MPU

For each MPU, essential equipment including table, chairs, shelves, money box, administrative materials, health education materials and first aid kits will be supplied.

(i) Installation of MPU

MPU will be installed in a communal land next to the school. The exact location was selected by the Health Committee. An agreement confirming that the equipment and the building belong to the community needs to be provided.

(j) Purchase of drugs from PROAM

Varieties and amount of drugs to be purchase for initial inputs are shown in Table 8.6.5(6). They deal with ten principal causes of illness in the area. The drugs identified complies with the Botequine drug list by PROAM, except several drugs from the Venta Social list. Initial drugs will be purchased by the auxiliary pharmacist of the Municipal Pharmacy together with JICA Study Team members.

(k) Transportation of initial equipment and drugs to MPU

(l) Starting up of MPU

The selling price will be 133% of the original price. The price of first aid treatment needs to be specified by Health Committee and benefit therefore will be used for purchasing necessary equipment for first aid treatment.

Everyday, the promoters shall calculate and record the amount and kinds of drugs sold, number of first aid treatments and remaining stock and record them.

Overuse, self-treatment and re-sale shall be avoided. Therefore the amounts of drugs should be supervised carefully by the Health Committee as well as the

Municipality. In addition, the health promoters have to send to the Health Center these patients whose symptom is severe or does not disappear after a few days. In the first day, the auxiliary pharmacist will preferably be present at MPU for helping promoters.

(m) Monthly health education with support from Health Center

The community health promoters will give monthly health education to the population in the communities. The number of participants, topics covered and the issues discussed should be recorded by the health promoters or a secretary of the Health Committee. And support will be given by Health Center.

(n) Monthly accounting and stock control, allocation of incentives for promoters by Health Committee.

The incentive can be 15% of the benefit. This amount should be revised according to the sales benefit. The rest of the benefit (13%) should be kept by the money keeper for future health activities and for renewal of drug stock in case of drug price increase. An example of future health activities is family planning method dissemination through APROFAM program.

(o) Municipality's monthly supervision of accounting of MPU by Health Committee

Accounting and stock control records should be supervised every month by the people in charge in the Municipality.

(p) Health promoter retraining by Health Center, when necessary

The purpose of retraining is to cover new issues of health education and to provide new health information. Transportation fee for promoters will be paid from the committee budget.

(q) Quarterly orders and purchases drugs by Municipal Pharmacy from PROAM.

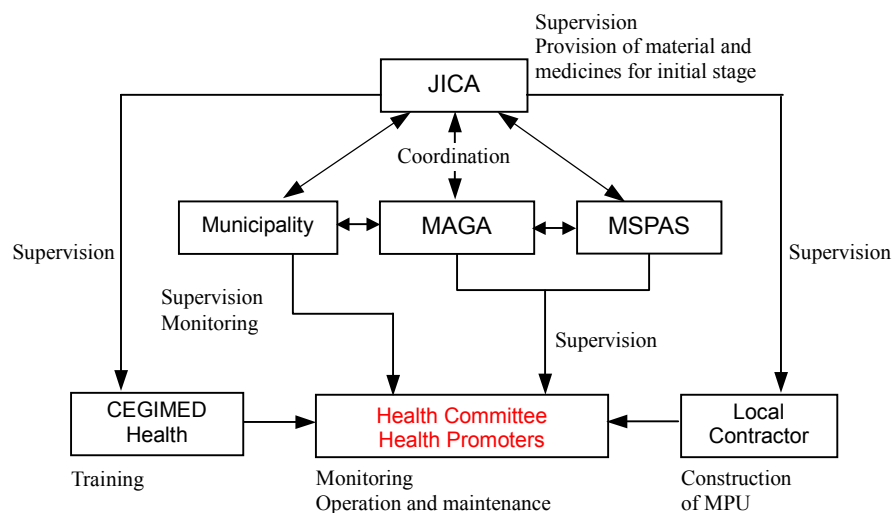
The selling price is 133% of the original price. It is indispensable to inform PROAM in advance of the amounts and kinds of drugs the Municipal Pharmacy would like to buy.

(r) MPU will place orders and purchase drugs from the Municipal Pharmacy.

The purchasing price is 105% of the original price.

The overall responsibilities and relations of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall supervision	Municipality, MSPAS, MAGA, JICA
2. Provision of medicines at initial stage	JICA
3. Construction of MPU	Local contractor and Beneficiaries
4. Operation and Management	Health committee Municipality Pharmacy
5. Training	Auxiliary Pharmacist: CEGIMED Health Promoter: Health Center
6. Monitoring	Health Committee and Municipality



#### (5) Expected benefits

1. The population will spend less cost for purchasing drugs including opportunity cost (saving time).
2. The drugs are available at the village level.
3. First aid treatment can be received at the village level.
4. Regular health education enhance health related knowledge of the population which may lead to more healthy lives and living condition through prevention of common diseases
5. Drop out of promoters can be avoided by offering certain amount of incentives coming from the revolving drug fund, and community health activities can be more sustainable.

#### (6) Monitoring and Evaluation

The following table shows indicators for evaluating the achievement of the project targets and monitoring/evaluation method.

### Indicators for Evaluation and Monitoring Methods

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>	<i>Aggregation</i>	<i>Decision Maker</i>	<i>Target</i>
- Drug sales and stock control.	- Monthly	- H. Committee	- Municipality	- Study Team	- There is not discrepancy in record on drugs that are stocked and sold.
- Health education participants.	- Monthly	- H. Committee	- Health center	- Study Team	
- Amount and use of money reserved by health committee.	- Monthly	- Municipality	- Municipality	- Study Team	- There is not discrepancy in financial statement of health committee.
- Participation of health center in education session.	- Every 3 months	- Municipality	- Study Team	- Study Team	- Participant rate is 80% for local people.

#### 8.6.6 Plan for Migrant People to the Coastal Area

##### (1) Background and Objectives

###### (a) Background

In Palestina de Los Altos, the household's land downsizing problem has been pressurizing many farmers to migrate to the south in order to search for alternative land to cultivate crops for self-consumption or alternative sources of income. The majority of the farmers go to Mazatenango and Retalhuleu between April and December every year.

###### (b) Current Situation

Those who migrate to fincas in Mazatenango and Retalhuleu, generally speaking, must live in huts with no safe water sources, toilets nor any health services available near by. It is reported that villagers suffer from diarrhea, intestinal infections and other water related illnesses together with pesticides related-illness and presumably tropical diseases.

###### (c) Problems to be solved

The living condition of the migrants should be improved and the following points should be urgently looked at:

- 1) Quality of drinking water
- 2) Inappropriate use of pesticides and the hazard to the human body
- 3) Tropical disease such as Malaria and Dengue
- 4) Excretion
- 5) Lack of opportunity to receive training on the subjects mentioned above.

###### (d) Justification

The access to safe drinking water is the basic need of human beings. The knowledge of appropriate use of pesticides, tropical disease management, better management of simple toilets is also critical for those who migrate in

order to protect themselves from any serious health problems. The training on the issues mentioned above can improve the living and health conditions of the emigrants in their destination.

(e) Objectives

- 1) Reduction of the water born illness by introducing the use of water filters.
- 2) Reduction of the pesticide-use related illness by introducing the appropriate use of pesticides through training
- 3) Reduction of the Malaria/ Dengue by training on how to prevent the illness
- 4) Strengthening of the knowledge and skills of training of the Health Center personnel in Palestina de Los Altos on the subjects related to water, pesticides, tropical diseases and simple toilet management
- 5) Strengthening of knowledge of primary school teachers on the subjects mentioned above and improvement of teaching materials by providing appropriate materials.

(2) Basic Plan and Project Works

Problems of living and environmental conditions are different among places in the coastal lands that migrants work. In the first place, a base-line survey will be carried out for sample farmers to identify the destination of the migrant people and problems on health, sanitation, agricultural chemical contamination, etc in the destination.

With respect to training programs to be carried out, trainees in the programs will become not only migrant peoples but also staff of the Health Center, school teachers and health promoters in the communities. In the training programs, it is planned to foster staff of the Health Center, school teachers and health promoters as trainers.

Training programs concerning safe drinking water, use of pesticides, tropical diseases, and toilet management will be given to migrant peoples so as to give basic knowledge about health control in the destination places before their leaving for the destination places. Training programs will be held in the municipality office, Health Center and churches. In addition, equipment and materials will be given to migrant people.

For implementation of this Pilot Project, a committee of the migrant peoples to the coastal area will be set up.

(a) Baseline survey

This research will identify the following points by interviewing 50 people in more than 10 households in the migration destination.

- Who goes where/ general living and working conditions
- Problems related to water, pesticides, tropical diseases and others
- Available health services
- Other significant problems
- Record of illnesses during the period of Aug-Sep. 2001.

(b) Training programs

Training programs consist of three, Level A, level B and Level C. The programs are shown in the following table and details are shown in Table 8.6.6(1).

Level (Language)	Trainers	Trainees	No. of Trainees	Terms
Level A (Spanish)	NGO	Health Center personnel →Auxiliary nurses →Other personnel School Teachers	20	Lectures 2h × 4 themes Practice 3h × 4 themes
Level B (Mam)	NGO with Auxiliary Nurses	Community health promoters in five caserios. Each of them will be in charge of one the four themes of 1) -4) listed above	20	① 5 days standard trainings to be a health promoter ②5h × 4 themes
Level C (Mam)	NGO with Auxiliary nurses Community health promoters	Migrants in five caserios Trainings are given in the municipality office and/or churches.	200	Teachings 2h × 5 themes Practices 2h × 5 themes

(c) Provision of teaching materials

Materials of training programs are shown below:



Level (Language)	Trainee	No. of Trainee	Provision of teaching materials ( number to be provided)
Level A (Spanish)	Health personnel →Auxiliary nurses →Other personnel School Teachers	20	Textbooks ( 20) Teaching materials,( 6) Sets of materials which are given at level C ( 6)
Level B (Spanish & Mam)	Community health promoters in five caserios	20	Teaching Materials(20) Sets of materials which are given at level C ( Unit 20)
Level C (Mam)	Migrants in five caserios. Basically the trainings are given to household unit.	200	- A set of water filter (200) - A set of pesticide precaution set(200) - A set of repellent plants' seeds (200) - A set of simple toilet (200)

#### (d) Provision of Materials

Equipment and materials necessary for migrant people in the coast will be provided by JICA and listed below; Equipment and materials are illustrated in Figures 8.6.6 (1) to 8.6.6 (4).

Theme	Action to be introduced	Materials to be provided
1) Safe drinking water	Water filter	Water tank with a tap and a lid
2) Use of pesticides	Alternative protection set	Thin body suit, mask and gloves
3) Tropical disease	Repellent plants	Seeds of plants
4) Toilets management	Simple toilets	Materials for construction of toilet

#### (3) Project Cost

The project cost was estimated to be Q394,000 as shown below and details are shown in Table 8.6.6 (2).

Kinds	Estimated Cost	Particular
Equipment and materials	Q 264,000	Water filter, Precaution sets etc.
Training cost	Q 116,000	Including monitoring/baseline survey
Teaching materials	Q 18,000	Textbooks
	Q 394,000	

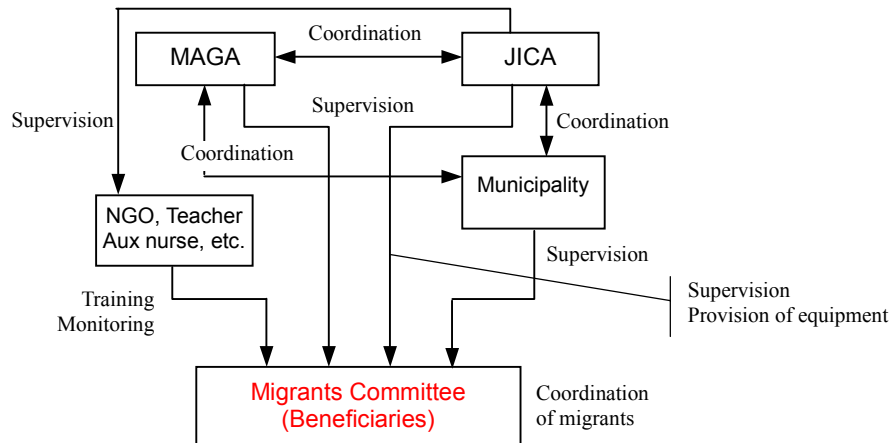
#### (4) Implementation Plan

The project implementation will be carried out as shown below.

Implementation schedule																	
Item	2001					2002											
	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1) Selection of NGO	■																
2) Base-line survey		■	■														
3) setting up committee		■	■														
3) Training for staff HC and school teachers				■	■												
4) Training for health promoters					■	■											
5) Training for migrant peoples						■	■	■									
7) Provision of equipment/materials								■									
6) Monitoring														○			

The overall responsibilities and relations of the organizations concerned are shown in the table and figure below.

Activity	Organization in Charge
1. Overall supervision	Municipality, MAGA, JICA
2. Provision of material	JICA
3. Training	NGO, Auxiliary nurse, Teacher
4. Coordination with migrants	Migrant workers committee
6. Monitoring	NGO



(5) Expected Benefit

a) Number of beneficiaries

The kinds of beneficiaries and the numbers of beneficiaries from this Pilot Project are expected as shown below:

Beneficiaries	Number of beneficiaries
Migrants	200 households
Community health promoters	20 persons
School teachers	10 teachers
Health Center staff	10 persons

## b) Benefits

After finishing training programs, it is expected that the migrant peoples should receive technical knowledge on health control in the coastal lands and apply proper management for their health control. Also provision of equipment and materials (simple water filter equipment, precaution materials against pesticides contamination, seeds of repellent plant and simple toilet) will prevent the migrant people from diseases and contamination of agricultural chemicals. As a result, it is expected that morbidity rate of the migrant people should decrease.

In addition, training programs will play an important role in rural health education for community people.

## (6) Monitoring and Evaluation

The following table shows indicators to achieve the project targets and monitoring/evaluation method.

**Indicators for Evaluation and Monitoring Methods**

<b>Item</b>	<b>Frequency</b>	<b>Data collector</b>	<b>Aggregation</b>	<b>Decision Maker</b>	<b>Target</b>
- Use condition of water filter and toilet.	- 2 times/15 months	- NGO	- NGO	- JICA Study Team	- Over 80% of migrants use equipment.
- Use condition of materials for agri. chem. contamination.	- 2 times/15 months	- NGO	- NGO	- JICA Study Team	- Over 80% of migrants use materials.
- Growing condition of repellent plants.	- 2 times/15 months	- NGO	- NGO	- JICA Study Team	- Over 80% of migrants use repellent plants.
- Number of morbidity.	- 2 times/15 months	- NGO	- NGO	- JICA Study Team	- 15% reduction of morbidity for man about 10 <sup>th</sup> diseases.

Monitoring will be carried out on the above four indicators for same 10 sample households selected in the baseline survey that is performed in September 2001. Monitoring survey will be undertaken by NGO. JICA Study Team will do evaluation of the results of monitoring survey.

## 8.7 Implementation of Pilot Projects

The proposed organization is shown below. The JICA Study Team will be responsible for overall management of implementation of Pilot Projects in corporation with MAGA. The formulated 18 Pilot Projects cover various fields of development and work components, including (i) environmental and conservation plan (ii) plans for increasing income generation and improvement plan for living conditions. With exception of the Pilot Projects in an agricultural field that

MAGA will implement, participation of other organizations relevant to the implementation of Pilot Projects in other fields is essential. Therefore, it is proposed to establish a steering coordination committee of representatives from relevant organizations.

The committee headed by a representative of MAGA. The member of the committee will consist of representatives from SEGEPLAN, MSPAS, ICTA, FIS, INTECAP, JICA/JOCV office, governors of the four provinces (Chimaltenango, Sololá, Totonicapán and Quetzaltenango), four relevant municipalities (Patzun, Panyebar, Santa Maria Chiquimula, and Palestina de Altos) and JICA Study Team.

Provincial offices of the organizations that participate in a steering committee will make supervision of project implementation and monitoring for Pilot Projects. The results of supervision and monitoring will be submitted to the JICA Study Team.

With respect to farmers' organization for implementation of project, as mentioned in chapter 7, farmer's participation also becomes one of the most important factors in the case of implementation of Pilot Projects. The basic concept for farmers' participation composed of following three components.

- (1) Participation in project implementation
- (2) Farmers' sharing of construction cost
- (3) Operation and maintenance of project by farmers themselves

For each Pilot Project, development committee will be made for participation in construction work and O&M work after construction of Pilot Project. In set up of development committee, existing development committee, if any, will be used as much as possible.

With regard to cost sharing, it is planned that the government of Japan will provide a grant for main facilities, training costs and technical guidance. Farmer side bears provision of labor force and lands necessary for construction of facilities, cost for farm inputs, irrigation facility on farm level and O&M cost of Pilot Project. It is planned that cost necessary for farm inputs, irrigation facility on farm level, and medicines at first cultivation stage will be loaned to beneficiary farmers with no or very low interest rate . After construction of Pilot Project, each development committee will manage it.

Though implementation period of each Pilot Project is different, total period of implementation and monitoring of Pilot Projects will be 15 months. After 15 months, it is expected that monitoring work of each Pilot Project should be also continued

