

ANNEX 1 – D
WATER QUALITY IMPROVEMENT PLAN
FOR EXISTING WATER SUPPLY
(XEATZAN BAJO)

ANNEX 1 – D

**WATER QUALITY IMPROVEMENT PLAN
FOR THE EXISTING DRINKING WATER
(XEATZAN BAJO)**

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D. WATER QUALITY IMPROVEMENT PLAN FOR THE EXISTING DRINKING WATER (XEATZAN BAJO)

1. Background

In Xeatzan Bajo Model Area, there was a communal potable water system, which uses spring water for drinking purpose without any treatment. The operation and maintenance of water supply system was duly managed by the water committee, but it was detected that the water quality was not suitable to drink directly in the result of water sampling test. Thus a water treatment facility, i.e., a sterilizer with hypo-chloride sodium, was required.

2. Objectives

The main objectives of the project are to improve health condition of the community residents through improvement of drinking water quality by installation of sterilizer.

3. Components and Schedule

The work components are summarized as follows;

- Installation of the sterilizer (including a protection house) : 1 set
- Calibration of the equipment
- Capacitation for using the equipment

Item	2001					2002												
	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12	
1) Purchase of equipment																		
2) Installation of sterilizer																		
3) People education																		
4) Monitoring																		

4. Monitoring Results

Indicators for Evaluation and Monitoring Methods

<i>Item</i>	<i>Frequency</i>	<i>Data collector</i>
1) Users of improved water.	Every 3 months	Dev. Committee
2) Operation status of sterilizer.	Monthly	Dev. Committee
3) Number of diarrhea patient.	Every 3 months	Dev. Committee
4) Simple water quality test.	Every year	FIS

4.1 Users of sterilized water

After installation of the equipment, an interview survey has been conducted to some users in the community in order to know status of using the treated water. In result, no any user quitted using the treated potable water because of a taste and smell.

4.2 Operation status of sterilizer

Before commencement of the water purification, a capacitation to the operators, the pump committee and the development committee members has been made in order to give skills and knowledge for using and maintaining the sterilizer. It seems that this capacitation has been finished successfully and all the attendants learned all the skills and knowledge. However time has not passed so long after commencement of the treatment, thus actual operation and maintenance works could not be observed at site yet.

4.3 Number of diarrhea patient

After commencement of the water treatment, time has not passed so long, thus actual effect could not be observed at site yet. However a certain tendency of decrease of the number of water born disease patients is anticipated based on a sample analysis in the case of a sterilizer installed in Palestina. The details should be referred to the description of water quality project in Palestina .

4.4 Simple water quality test

Water quality before the water treatment were checked and existences of colon bacillus in the water has been confirmed again. Detail should be referred to Table D1. In terms of quality of the sterilized water with the equipment is under process of examination and conclusion will be filed in the Draft Final Report.

5. Problems Encountered and Countermeasures

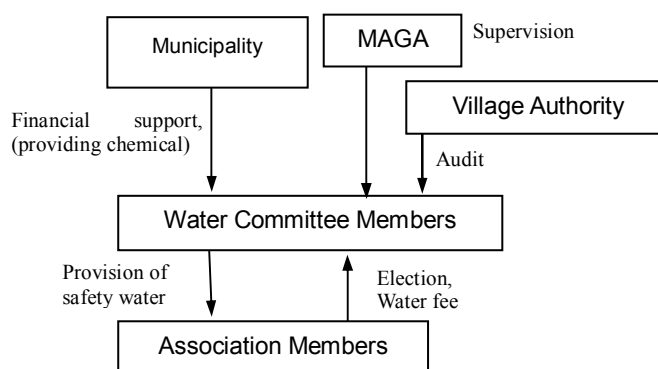
5.1 Breakdown of pump for drinking water system

Problems: It was encountered that a pump for drinking water system was broken down and could not send water to a distribution tank at all in February 2002. According to the village authority and development committee, a repairing works would be done soon. However, coupled with an internal problem in the pump committee, the repairing work was not started so long. It was in November 2002 that the pump was repaired.

Countermeasures: In planning stage, a condition of all the water supply facilities should be checked beforehand.

6. Organizations Concerned for Management of Further Activities

The relations of the organizations/groups concerned for management of further activities are shown in the figure below.



7. Observed Impacts

7.1 Assistance and positive involvement of Municipality to the Project

In terms of obligation of water purification in rural drinking water system, the Ministry of Public Health and Social Assistance clearly stipulated by the law, i.e. Article 87 of “theCodigo de Salud (Decreto 90-97) in December 1999”, that the Municipalities have responsibility on it. However it is fact that, in general, the municipalities had not put a lot of attentions to it and the realization of water purification was behind.

Recently, coupled with the strong instructions of the Ministry of Health, the

Municipalities gradually start to get involved with the water treatment. In the project, the mayor of the municipality of Patzun promised in writing their positive involvement and a financial assistance for the operation of the sterilizer, specially purchasing a chemical of Hypochloride-sodium. With this assistance, the community people were released from a burden of increase of water charge for the sterilization.

TABLES

Table D1 Result of Bacteriologic Water Quality Test**Xeatzan Bajo (Sampling location: a faucet of elementary school)**

	Unit	Result		Standard	
		before PJT	after PJT	AML ^{*1)}	PML ^{*2)}
Colon bacillus fecal	ufc ^{*3)} /100ml	11	<2	ND	ND
Colon bacillus total	ufc/100ml	17	<2	<2	ND
Contain aerobic total	ufc/ml	8	0	ND	ND

Panyebar (Sampling location: a faucet of private house)

	Unit	Result		Standard	
		before PJT	after PJT	AML	PML
Colon bacillus fecal	ufc/100ml	0	<2	ND	ND
Colon bacillus total	ufc/100ml	140	<2	<2	ND
Contain aerobic total	ufc/ml	56	0	ND	ND

Palestina (Sampling location: a faucet of elementary school)

	Unit	Result		Standard	
		before PJT	after PJT	AML	PML
Colon bacillus fecal	ufc/100ml	2	<2	ND	ND
Colon bacillus total	ufc/100ml	140	<2	<2	ND
Contain aerobic total	ufc/ml	20	74	ND	ND

*1: AML = Acceptable Maximum Limit (regulation of COGUANOR for portable water NGO 29001)

*2: PML = Permissible Maximum Limit (ditto)

*3: ufc = units of formation of colony

ATTACHMENTS

INSTITUTO DE FOMENTO MUNICIPAL - INFOM- LABORATORIO DE AGUA

Telefax 472-3499

INFORME DE ANÁLISIS FÍSICOQUÍMICO Y BACTERIOLÓGICO DE AGUA MUESTRA No. 1147-02

INFORMACIÓN DE LA MUESTRA

Interesado: EQUIPO DE ESTUDIO JICA	Temperatura in situ (°C): ---
Punto de muestreo: Salida del equipo de bombeo	pH in situ: ---
Fuente: Xeatzán bajo	Conductividad (µS/cm): ---
Municipio: Patzún	Cloro residual (mg/L): ---
Departamento: Chimaltenango	Sólidos disueltos (mg/L): ---
Fecha de captación: 23-10-02	Salinidad (%): ---
Hora de captación: 14:00	Fecha de recepción laboratorio: 24-10-02
Técnica de preservación: Refrigeración	Hora recepción laboratorio: 9:30
Responsable de captación: Sr. Murakami (Persona ajena al Laboratorio INFOM)	

RESULTADOS

ITEM	PARÁMETROS FÍSICOS	UNIDADES	LMA	LMP	RESULTADO
1	Color aparente	Unidades Pt-Co	5.0	35.0	17
2	Color verdadero	Unidades Pt-Co	Nsc	Nsc	17
3	Conductividad	µS/cm	100	750	190
4	Olor en frío	Organoléptico	No rechazable	No rechazable	Inodora
5	Olor a 60 °C	Organoléptico	No rechazable	No rechazable	Inodora
6	pH (laboratorio)	Unidades pH	7.0 - 7.5	6.5 - 8.5	7.0
7	Sólidos disueltos totales	mg/L	500.0	1000.0	96
8	Sólidos en suspensión	mg/L	Nsc	Nsc	<1
9	Temperatura de análisis	°C	15.0 - 25.0	34	18
10	Turbiedad	UNT	5.0	15.0	<0.5
ITEM	PARÁMETROS QUÍMICOS	UNIDADES	LMA	LMP	RESULTADO
11	Acidez	mg/L CaCO ₃	Nsc	Nsc	2.0
12	Alcalinidad debida al bicarbonato	mg/L CaCO ₃	Nsc	Nsc	76
13	Alcalinidad debida al carbonato	mg/L CaCO ₃	Nsc	Nsc	0
14	Alcalinidad debida al hidroxido	mg/L CaCO ₃	Nsc	Nsc	0
15	Alcalinidad total	mg/L CaCO ₃	Nsc	Nsc	76
16	Dióxido de carbono	mg/L CO ₂	Nsc	Nsc	1.5
17	Dureza total	mg/L CaCO ₃	100.000	500.000	80
18	Manganeso total	mg/L Mn	0.050	0.500	<0.1
19	Sulfatos	mg/L SO ₄ ⁻²	100.000	250.000	<7
20	Hierro total	mg/L Fe	0.100	1.000	0.12
21	Nitratos	mg/L NO ₃	Nsc	10	19
ITEM	PARÁMETROS BACTERIOLÓGICOS	UNIDADES	LMA	LMP	RESULTADO
22	Coliformes fecales	NMP/100 mL	Nsc	Nsc	11
23	Coliformes totales	NMP/100 mL	Nsc	< 2	17
24	Conteo aeróbico total	UFC/mL	Nsc	Nsc	8

* LMA = limite máximo aceptable, LMP = limite máximo permisible

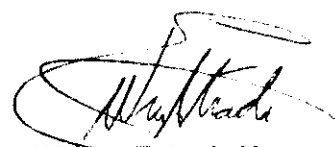
Nsc = no se contempla en la norma

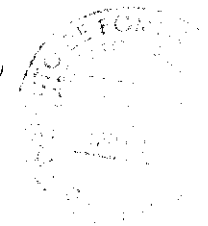
OBSERVACIONES

- Los límites máximos aceptables y permisibles corresponden a la Norma COGUANOR para agua potable NGO 29001 (Ac. Gubernativo No. 986-1999) publicada en el Diario de Centro América el 4 de febrero de 2000.
- De acuerdo a los resultados obtenidos, **el agua NO cumple con los requerimientos bacteriológicos establecidos en la Norma COGUANOR 29001.**
- La concentración de Nitratos es mayor que la del límite máximo permisible. Los nitratos están relacionados principalmente con la presencia de materia orgánica. Se recomienda verificar la limpieza del sistema de almacenamiento y distribución de agua.




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INSTITUTO DE FOMENTO MUNICIPAL - INFOM - LABORATORIO DE AGUA

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INFORME DE ANÁLISIS FÍSICOQUÍMICO Y BACTERIOLÓGICO DE AGUA MUESTRA No. 1147-02

INFORMACIÓN DE LA MUESTRA

Interesado: EQUIPO DE ESTUDIO JICA, QUETZALTENANGO	Temperatura in situ (°C): ---
Punto de muestreo: Salida del equipo de bombeo	pH in situ: ---
Fuente: Xeatzán bajo	Conductividad (µS/cm): ---
Municipio: Patzún	Cloro residual (mg/L): ---
Departamento: Chimaltenango	Sólidos disueltos (mg/L): ---
Fecha de captación: 23-10-02	Salinidad (%): ---
Hora de captación: 14:00	Fecha de recepción laboratorio: 24-10-02
Técnica de preservación: Refrigeración	Hora recepción laboratorio: 9:30
Responsable de captación: Sr. Murakami (Persona ajena al Laboratorio INFOM)	

RESULTADOS

ITEM	PARÁMETROS FÍSICOS	UNIDADES	LMA	LMP	RESULTADO
1	Color aparente	Unidades Pt-Co	5.0	35.0	17
2	Color verdadero	Unidades Pt-Co	Nsc	Nsc	17
3	Conductividad	µS/cm	100	750	190
4	Olor en frío	Organoléptico	No rechazable	No rechazable	Inodora
5	Olor a 60 °C	Organoléptico	No rechazable	No rechazable	Inodora
6	pH (laboratorio)	Unidades pH	7.0 - 7.5	6.5 - 8.5	7.0
7	Sólidos disueltos totales	mg/L	500.0	1000.0	96
8	Sólidos en suspensión	mg/L	Nsc	Nsc	<1
9	Temperatura de análisis	°C	15.0 - 25.0	34	18
10	Turbiedad	UNT	5.0	15.0	<0.5
ITEM	PARÁMETROS QUÍMICOS	UNIDADES	LMA	LMP	RESULTADO
11	Acidez	mg/L CaCO ₃	Nsc	Nsc	2.0
12	Alcalinidad debida al bicarbonato	mg/L CaCO ₃	Nsc	Nsc	76
13	Alcalinidad debida al carbonato	mg/L CaCO ₃	Nsc	Nsc	0
14	Alcalinidad debida al hidróxido	mg/L CaCO ₃	Nsc	Nsc	0
15	Alcalinidad total	mg/L CaCO ₃	Nsc	Nsc	76
16	Dióxido de carbono	mg/L CO ₂	Nsc	Nsc	1.5
17	Dureza total	mg/L CaCO ₃	100.000	500.000	80
18	Manganeso total	mg/L Mn	0.050	0.500	<0.1
19	Sulfatos	mg/L SO ₄ ²⁻	100.000	250.000	<7
20	Hierro total	mg/L Fe	0.100	1.000	0.12
21	Nitratos	mg/L NO ₃ ⁻	Nsc	10	19
ITEM	PARÁMETROS BACTERIOLÓGICOS	UNIDADES	LMA	LMP	RESULTADO
22	Coliformes fecales	NMP/100 mL	Nsc	Nsc	11
23	Coliformes totales	NMP/100 mL	Nsc	< 2	17
24	Conteo aeróbico total	UFC/mL	Nsc	Nsc	8

* LMA = límite máximo aceptable, LMP = límite máximo permisible

Nsc= no se contempla en la norma

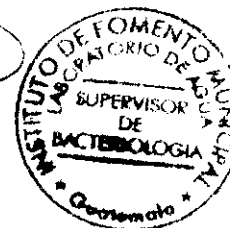
OBSERVACIONES

- Los límites máximos aceptables y permisibles corresponden a la Norma COGUANOR para agua potable NGO 29001 (Ac. Gubernativo No. 986-1999) publicada en el Diario de Centro América el 4 de febrero de 2000.
- De acuerdo a los resultados obtenidos, **el agua NO cumple con los requerimientos bacteriológicos establecidos en la Norma COGUANOR 29001.**
- La concentración de Nitratos es mayor que la del límite máximo permisible. Los nitratos están relacionados principalmente con la presencia de materia orgánica. Se recomienda verificar la limpieza del sistema de almacenamiento y distribución de agua.



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INFORME DE ANÁLISIS FÍSICOQUÍMICO Y BACTERIOLÓGICO DE AGUA MUESTRA No. 1300-02

INFORMACIÓN DE LA MUESTRA

Interesado:	EQUIPO DE ESTUDIO JI
Punto de muestreo:	Brote de nacimiento
Fuente:	Xeatzán Bajo
Municipio:	Patzún
Departamento:	Chimaltenango
Fecha de captación:	29-11-02
Hora de captación:	12:27
Técnica de preservación:	Refrigeración
Responsable de captación:	Héctor G

QUETZALTENANGO-	Temperatura in situ (°C):	--
	pH in situ:	--
	Conductividad (µS/cm):	--
	Cloro residual (mg/L):	--
	Sólidos disueltos (mg/L):	--
	Salinidad (%):	--
	Fecha de recepción laboratorio:	29-11-02
	Hora recepción laboratorio:	15:15

nez (Persona ajena al Laboratorio INFOM)

RESULTADOS

ITEM	PARAMETROS FISICOS
1	Color aparente
2	Color verdadero
3	Conductividad
4	Olor en frío
5	Olor a 60 °C
6	pH (laboratorio)
7	Sólidos disueltos totales
8	Sólidos en suspensión
9	Temperatura de análisis
10	Turbiedad

UNIDADES	LMA	LMP	RESULTADO
Unidades Pt-Co	5.0	35.0	<1
Unidades Pt-Co	Nsc	Nsc	<1
µS/cm	100	750	200
Organoléptico	No rechazable	No rechazable	Aromático
Organoléptico	No rechazable	No rechazable	Aromático
Unidades pH	7.0 - 7.5	6.5 - 8.5	7.0
mg/L	500.0	1000.0	100
mg/L	Nsc	Nsc	4
°C	15.0 - 25.0	34	18
UNT	5.0	15.0	0.9

ITEM	PARAMETROS QUÍMICOS
11	Acidez
12	Alcalinidad debida al bicarbonato
13	Alcalinidad debida al carbonato
14	Alcalinidad debida al hidroxido
15	Alcalinidad total
16	Dióxido de carbono
17	Dureza total
18	Manganeso total
19	Sulfatos
20	Hierro total
21	Nitratos

UNIDADES	LMA	LMP	RESULTADO
mg/L CaCO ₃	Nsc	Nsc	1.5
mg/L CaCO ₃	Nsc	Nsc	73
mg/L CaCO ₃	Nsc	Nsc	0
mg/L CaCO ₃	Nsc	Nsc	0
mg/L CaCO ₃	Nsc	Nsc	73
mg/L CO ₂	Nsc	Nsc	1.3
mg/L CaCO ₃	100.000	500.000	90
mg/L Mn	0.050	0.500	<0.1
mg/L SO ₄ ²⁻	100.000	250.000	<7
mg/L Fe	0.100	1.000	0.10
mg/L NO ₃	Nsc	10	22

ITEM	PARAMETROS BACTERIOLÓGICOS
22	Coliformes fecales
23	Coliformes totales
24	Conteo aeróbico total

UNIDADES	LMA	LMP	RESULTADO
NMP/100 mL	Nsc	Nsc	<2
NMP/100 mL	Nsc	<2	<2
UFC/mL	Nsc	Nsc	0

* LMA = límite máximo aceptable, LMP = límite máximo permisible Nsc= no se contempla en la norma

OBSERVACIONES

- Los límites máximos aceptables permisibles corresponden a la Norma COGUANOR para agua potable NGO 29001 (Ac. Gubernativo No. 96-1999) publicada en el Diario de Centro América el 4 de febrero de 2000.
- De acuerdo a los resultados obtenidos, el agua CUMPLE con los requerimientos bacteriológicos establecidos en la Norma COGUANOR 29001.
- La concentración de Nitratos es mayor que la del límite máximo permisible. Los nitratos están relacionados principalmente con la presencia de materia orgánica. Se recomienda verificar la limpieza del sistema de almacenamiento y distribución de agua.



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PROYECTO DE MEJORAMIENTO DE LA CALIDAD DE AGUA PORTABLE

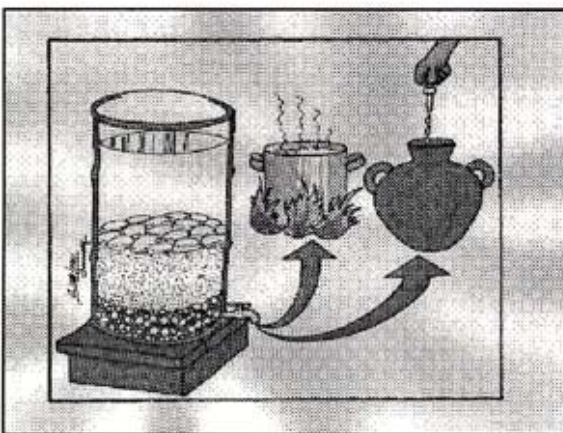
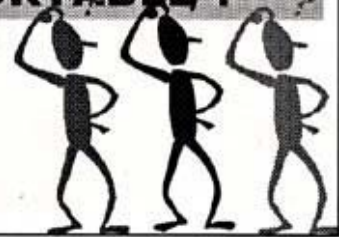


JAPÓN

Asistencia técnica para el Desarrollo



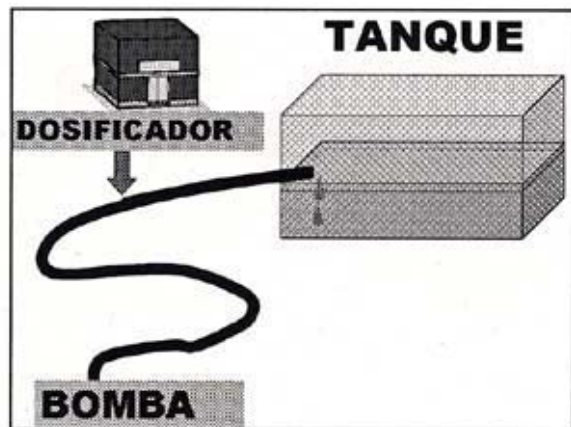
¿ POR QUE NESECITAN EL TRATAMIENTO DE AGUA PORTABLE?



¿ COMPONENTES DEL PROYECTO?



DOSIFICADOR DE HIPOCLORITO DE SODIO



CONSTRUCCION :



¿ QUE CANTIDAD DE HIPOCLORITO VAN A ECHAR EN EL AGUA ?





AGUA



**SOLO 1 GOTTA
DE CLORO**



**El Tratamiento es
RAY**

**MUNI O COMUNIDAD
COMPRARA CLORO**

FIN

ANNEX 1 –E
COFFE PRODUCTION
IMPROVEMENT PLAN
(PANYEBAR)

ANNEX 1 – E

COFFEE PRODUCTION IMPROVEMENT PLAN (PANYEBAR)

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E. COFFEE PRODUCTION IMPROVEMENT PLAN (PANYEBAR)

1. Background

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.

2. Objectives

The main objectives of the project are to improve the productivity of coffee in the Panyebar model 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. 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.

3. Components and Schedule

The project component during Phase-I consists of the following items:

- 1) Establishment of an organization of project beneficiaries, including preparation of its bylaws and management guidelines.
- 2) Construction of two vinyl houses, one of 420 m², to be used for coffee seedlings production, and one of 375 m², to be used for avocado and peach seedlings production.
- 3) Construction of two water tanks, with capacity of 2 m³ each, for storing water to irrigate the seedlings.
- 4) Procurement and distribution among beneficiaries a total of 2,500 seedlings of coffee, 500 seedlings of avocado, and 300 seedlings of peach.
- 5) Procurement of equipment and materials for management of green houses, and
- 6) Implementation of training program for all project beneficiaries.

The project component during Phase-II consists of providing training in the following technologies:

- 1) Grafting of avocado seedlings;
- 2) Preparation of compost;
- 3) Technology of coffee post-harvest management;
- 4) Marketing of seedlings of avocado and peach;
- 5) General market of citrus fruits.

Item	2001					2002													
	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12		
1) Providing greenhouse and input materials						■													
2) Operation											■								
3) Marketing of seedlings (planting season)																		■	
4) Training and monitoring ◆ technical training monitoring					◆	◆	◆	◆	◆		◆		◆	◆	◆	◆	◆	◆	

4. Monitoring Results

The items to be monitored are indicated in the Table below:

Item	Frequency	Data Collector	Target
1) Number of renewed coffee tree	To be monitored at the end of rainy season (September)	Coffee growers' Association	Over 70 % of renewed coffee trees
2) Number of participants in training program	After training course end	Coffee growers' Association	Participants rate is over 70 %.
3) Result of nursery operation	To be monitored at the end of rainy season (September)	Coffee growers' Association	Over 70 % of scheduled seedling production
4) Sale of seedlings	To be monitored at the end of rainy season (September)	Coffee growers' Association	Over 70 % of fruits seedlings sold

The results of project monitoring are summarized as follows:

4.1 Number of renewed coffee trees:

JICA provided 2,500 coffee seedlings as grant to the project beneficiaries organization; those seedlings were distributed by the organization among 55 farmers that gave labor for constructions and participated in training activities. The seedlings were planted for renewing old coffee when the newly planted seedlings have grown. Monthly survey made by the Study Team indicates that almost all the coffee seedlings were transplanted to the coffee farms and are growing in good conditions. Planting of the coffee seedlings that are being grown in the greenhouse, for renewing coffee trees, will be done during the next raining season, beginning in May 2003.

4.2 Number of participants in training programs and in construction

Eleven formal training among 12 formal training were provided by REINSA to the organized farmer's beneficiaries. Participation rate averages 27%, ranging from 15 to 49%. The total number of participants in each training activity was as follows: Details are presented in Table E1. 55 beneficiaries participated for the construction of the green houses and its participation rate is 68%. The total number of participation days is 175 man-days, being 3.2 days for each participant. Details are presented in Table E1.

Training Activity	Phase-I						Phase-II				
	1	2	3	4	5	6	1	2	3	4	5
No. Participants	39	23	25	12	29	25	27	14	15	15	15
% of total Beneficiaries	48.8	28.8	31.3	15	36.3	31.3	33.8	17.5	18.8	18.8	18.8

Note: One training activity has not been done yet.

4.3 Result of nursery operation

At the end of Phase-II field work, the conditions of operation of greenhouses were as following:

Coffee Seedlings: Among 5,500 young seedlings of coffee, about 770 seedlings (14% of the total seedlings) died mainly because of inadequate watering and/or some farmers used a mixture of soil with high proportion of relatively fresh manure. At the end of November, there is a total of 4,730 seedlings of coffee in the greenhouse; most of the coffee seedlings are growing in good conditions but about 15 % of seedling have grown deficiently.

Avocado Seedlings: Among 2,220 of seeds planted, 420 seeds (19% of the total of seeds) were not germinated. Remainders (1,800) have grown well and were grafted in two different dates; a first group of 1,200 avocado seedlings was grafted on October 10; from the 1,200 seedling grafted, there are 1,105 seedlings (96.7 %) in good conditions. A second group of 600 avocado seedlings was grafted on November 15.

Peach Seedlings: There are about 1,700 seedlings of peach in very good condition in the sand bed; these seedlings will be soon transferred to plastic bags.

4.4 Selling of seedlings of coffee, avocado and peach

The sell of seedlings is postponed until the beginning of raining season in year 2003, because present dry conditions do not allow the transplant of seedlings in

the field. It is expected that most seedlings in the greenhouses during this first year of operation be sold in Panyebar community. With regard to information on regional market demand of seedlings of coffee, peach and avocado, the member of coffee association has contacted and requested regional office of ANACAFE and PROFRUTA.

5. Problems Encountered and Countermeasures

In the period of plan formulation, it was identified that there were no community lands that were available for the construction of the greenhouses. After consultation among the association members, some landowners offered his land to the association for use of greenhouses without charge. Then, it was verbally agreed among the association and landowners that lands for the greenhouse areas were used for the association without charge. However, at the beginning of implementation of the project, landowners refused use of their lands for the association. As a result, the association agreed that the association should pay land rental charge. And such negotiations of lands make construction of green houses postpone. To avoid this problem, contract with written document was prepared.

Sixty-eight % of the total beneficiaries participated in the construction of green houses. The number of participation days per person averages 3.2, ranging from 11 at maximum to 1 at minimum. The number of the members of the association who participated in voluntary labor for 1 or 2 days occupies about 45% of the total members of the association. This situation delayed the construction process. It is considered that such low participation rate resulted in the followings.

- 1) In the Panyebar model area, three pilot projects consisting of (1) coffee production improvement project, (2) rehabilitation plan for drinking water system and (3) plan for reducing workload in the mountain area through coffee processing were implemented in the same time. The beneficiaries of this coffee production improvement project are concurrently the members of the other two projects. Physically, they could not participate more often in this project.
- 2) During the implementation, further two municipality projects such as the bridge construction and road improvement had been implementing in the same time in the community by the budget of municipality. In these projects, labor fee at a rate of Q25/day/man was given and considerable number of members took part in these projects.

- 3) During the implementation of rehabilitation plan for drinking water system, municipality determined to pay labor fee at a rate of Q20/day/man for construction since substantial delay of the progress of implementation brought about owing to serious low participation of voluntary labor. Such situation is considered to become one of the causes of low participation.
- 4) The construction period coincided with the period of coffee harvesting period and land preparation of maize.
- 5) It is considered that beneficiaries in the community need to go out to find some work as labor for obtaining necessary income.
- 6) The members of the association comprise not only the persons who are aggressive for implementations of this project but also the persons not aggressive.

It is considered that the low participation rate for training activity also resulted from the same causes mentioned above.

In the operation of seedlings of coffee and avocado in the green house, 55 members give irrigation water to these seedlings that allocated to each member. Since some members did not perform irrigating to the seedlings, considerable coffee seedling died. Fertilizer and agricultural chemicals were applied to the seedlings according to the recommendation of REINSA. However, since diagnostics of disease and deficiency of microelement are very difficult, it is needed that a specialist should give identification of diseases. For solving problems, the association received such technical services from the regional office of ANACAFE after consultation with ANACAFE.

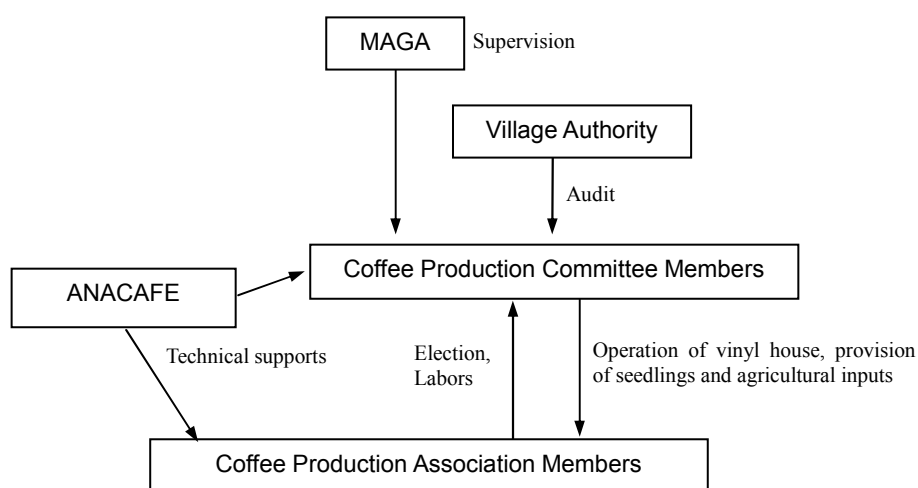
During the formulation of the project, the committee of drinking water verbally agreed to permit the supply of water for irrigating the seedlings in the greenhouses. But at the moment that water was requested, the water committee refused to comply with the promise. To solve this problem, the municipal mayor of San Juan la Laguna made an agreement for providing water through sending trucks as it is needed.

Cold treatment of about 1,000 seeds of peach was done in the refrigerator during the period from July 7 to 27. And seeds of peach were directly planted into the plastic bag with soil, in the greenhouse on July 28; but all these seeds did not germinated.

After consultation among beneficiaries, Reinsa and Study Team, it was decided that replanting of peach seeds should be performed. About 4,600 seeds of peach were purchased. Germination was performed in two methods: (1) 2,300 seeds were planted in sand bed without cold treatment and (2) 2,300 seeds were planted in sand bed with cold treatment. The group of seeds in case 1 was planted on October 2 and only a low number of seeds had germinated until November 15. In case 2, amount of 2,300 seeds of peach were put into refrigerator from September 12 until October 26 and those seeds were planted in a sand bed on October 26. It was estimated that a high percentage (about 75%) of these seed was germinated.

6. Organizations Concerned for Management of Further Activities

The relations of the organizations/groups concerned for management of further activities are shown in the figure below.



7. Project Impacts

This project is expected to produce its main impacts in the middle-term, within 3 to 4 years from now.

All the participants in the training activities showed interest in the contents of training program as there were combinations of theoretical and practical methodologies, so that farmers will apply the knowledge in their field. As a result of training activities, there is a high interest on the part of beneficiary farmers for engaging in production of organic coffee, as they could get higher and more stable prices in the future.

TABLES

**Table E1 Participation Rate of Construction and Training
in Coffee Production Increase Project in Panyebar (1/2)**

Name	Labor days for construction	Training in Phase-1						Training in Phase-2					
		Kind of training						Kind of training					
		1-A	1-B	1-C	1-D	1-E	1-F	2-A	2-B	2-C	2-D	2-E	2-F
1 Manuel Alfredo Gonzales Puac	4	1	1	1	1	1		1	1	1		1	
2 Pablo Macedonio Ppuac Cua	3	1	1	1	1								
3 Humberto Ixcamparic Mus	4	1	1	1	1	1	1						
4 Alfonso Puac y Puac	8	1	1	1	1	1	1			1	1	1	
5 Rafael Gozalez Monroy	1					1	1	1					
6 Fredy Puac Ajche	4							1	1	1	1	1	
7 Jorge Castro Ramirez	1					1							
8 Maria Tzic Saso	2	1				1	1	1					
9 Manuela Lucia Mazariegos Chavez	0						1	1	1	1		1	
10 Jose Natareno Gonzalez	3	1											
11 Ana Garcia Gonzalez	1	1				1		1		1	1		
12 Julia Tzoc	0												
13 Maria Dolores Escun de Loeon	3								1				1
14 victorino Puac Cua	0	1											
15 Ernesto Gonzalez Puac	2					1		1					
16 Ricardo Benjamn Gonzalez Puac	1					1		1	1				1
17 Jose Efrain Gonzalez Puac	1							1					
18 Angelino Ixcol Tzic	1							1					
19 Juan Julian Puac y Puac	4	1	1	1	1	1	1						
20 Benbenato Santos Saloj	1	1	1	1	1			1	1				
21 Carlos Puac Vasquez	1	1					1			1	1	1	
22 Pedro Chavez Pech	3	1		1									
23 Sostenes Bleriano Escun	9	1	1	1	1	1	1	1	1	1	1	1	
24 Pablo Pedro Jorge	11	1	1	1	1			1					
25 Juan Ixcamparic Mus	4	1		1		1							
26 Bernandino Pech Chavez	3			1									
27 Francisca de Leon Itamer	1					1	1	1	1	1	1	1	
28 Rolando Escun de Leon	7	1	1	1		1	1				1		
29 Julia Victoriana Puac Ajcac	4	1				1	1	1	1	1	1		
30 Cecilia De leon Mendoza	2												
31 Pablo Pech Tzo	2	1	1			1							1
32 Aurelio Roberto Escun de Loeon	0												
33 Dominga Eleorora Escun de Leon	1					1					1		
34 Manuel tzic Saso	5		1	1	1	1	1						
35 Moises Puac Ixcamparic	3				1	1		1	1	1	1		
36 Vitalino Puac Ixcamparic	0												
37 Juan Tzic Saso	4	1						1					
38 Federico Tzic Choror	5	1			1		1	1			1		
39 Tomas Gregorio Puac Menchu	2	1	1				1	1					
40 Simona Tzic Choror	2	1	1			1	1	1	1	1	1		
41 Jose Tzic Saso	8	1	1	1	1	1	1	1		1			
42 Abraham Ache Puac	4												
43 Jose Tzic Choror	2	1											
44 Silverio Puac Vasquez	2					1							
45 Andres Abelino Tzoc	3	1		1			1						
46 Diego Sului Jorge	5	1	1	1				1	1	1	1	1	
47 caarlos Modesto chan	2		1	1			1						
48 Pablo Tzic Choror	1	1		1		1							
49 Rposa Chavajay Gonzalez	4						1	1					1
50 Emilio Saloj Menchu	3	1	1										

**Table E1 Participation Rate of Construction and Training
in Coffee Production Increase Project in Panyebar (2/2)**

	Name	Labor days for construction	Training in Phase-1						Training in Phase-2					
			Kind of training						Kind of training					
			1-A	1-B	1-C	1-D	1-E	1-F	2-A	2-B	2-C	2-D	2-E	2-F
51	Vicente Cristobal Chavez Pech	4	1		1		1	1						
52	Rolando Puac Ixcamparic	0												
53	Guillermo Tzic Saso	0					1	1						
54	Oswaldo Ixcamparic Chavez	2	1											
55	Rolando Gabino Puac Perez	0												
56	Martina toc Ambrocio	0		1										
57	Germa Puac Menchu	0												
58	Dionicio Vicente Puac Velasquez	5	1	1	1		1	1	1					
59	Elva Isabel Puac Perez	2	1				1		1				1	
60	Jose Ismael Ixcamparic Mazariegos	2	1				1							
61	Ana Puac Yac	3												
62	Mauel Chacom	2												
63	Maunel chavajay Chocoy	0	1											
64	Sebastiana Chan Ajche	0												
65	Santa Rosalia Menchu A	1	1				1	1						
66	Cornelio Jorge tzic	3	1					1	1	1	1	1		
67	Miguel jorge Cum	4		1	1									
68	Magdalena Dionicia Yax	0		1										
69	Sant tax Tacam	0		1										
70	Maria Elizabet Zului	0		1										
71	Angel Sului Choror	0			1									
72	Agustin Chavajay Perez	0			1									
73	Lucso Ignacio Pac B	0			1									
74	Jeronimo Mull Pech	0	1		1									
75	Juana Ajcac Romero	0												
76	Rosalia Rebeca Puac	0												
77	Jose Garcia Velasquez	0												
78	Francisco Chacon Soc	0												
79	Jose Aju Canajay	0	1											
80	Toribio de Leon Ixtamer	0	1											
	Total number of	175	39	23	25	12	29	25	27	14	15	15	15	
	Participation rate(%) for training	69	48.8	28.8	31.3	15.0	36.3	31.3	33.8	17.5	18.8	18.8	18.8	

1-A: Organization

1-B: Varieties of seeds, Selection of seeds, Preparation of seedling of coffee

1-C: Varieties of seeds, Selection of seeds, Preparation of seedling of peach and avocado

1-D: Management of operation of green houses

1-E: Management of cultivation of coffee, avocado and peach

1-F: Management of coffee tree

2-A: Grafting technology of peach

2-B: Preparation of compost

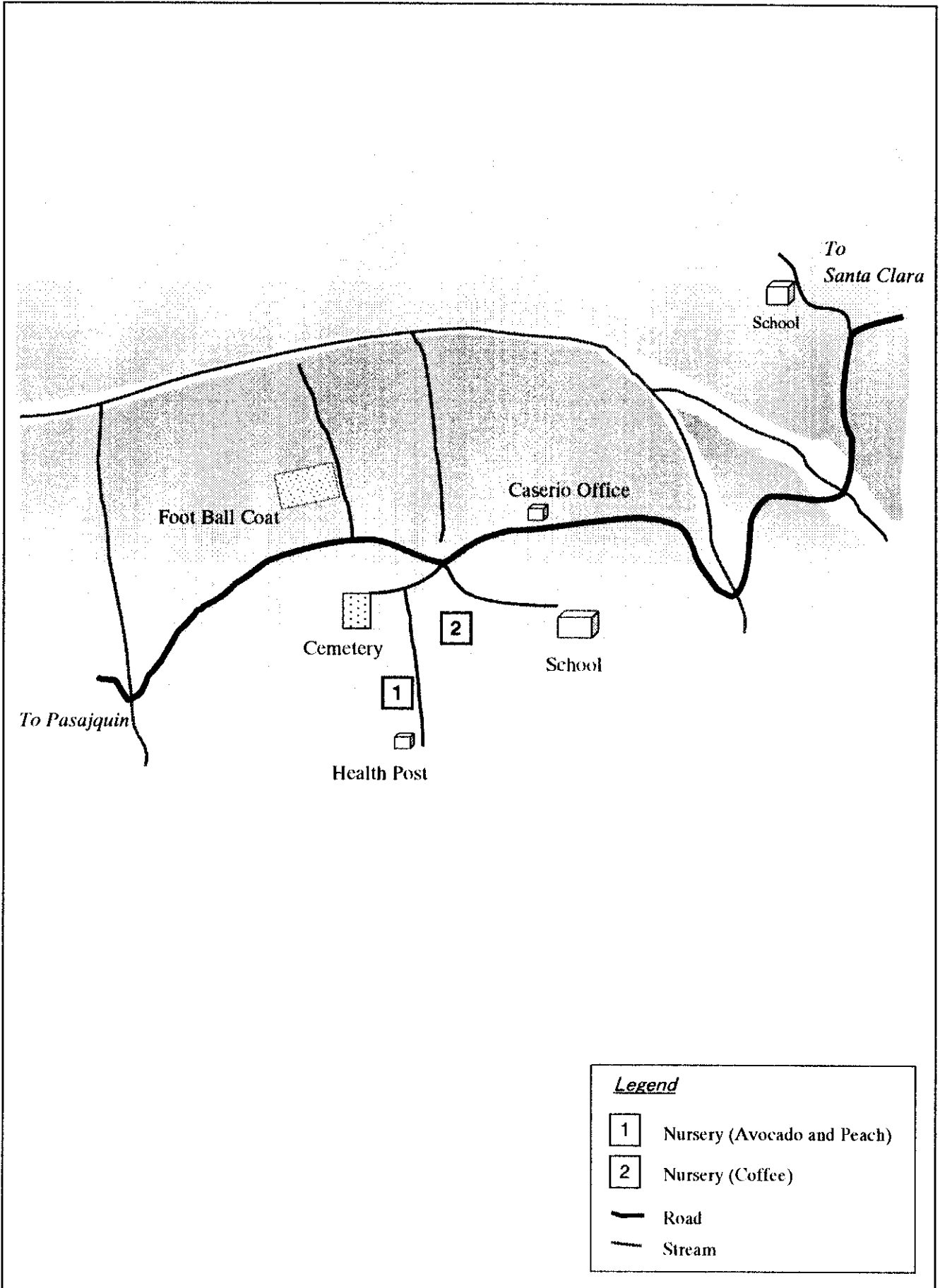
2-C: Planning of marketing of seedling of coffee, avocado and peach

2-D: Postharvest technology of coffee

2-E: Grafting technology of avocado

2-F: Marketing of citrus

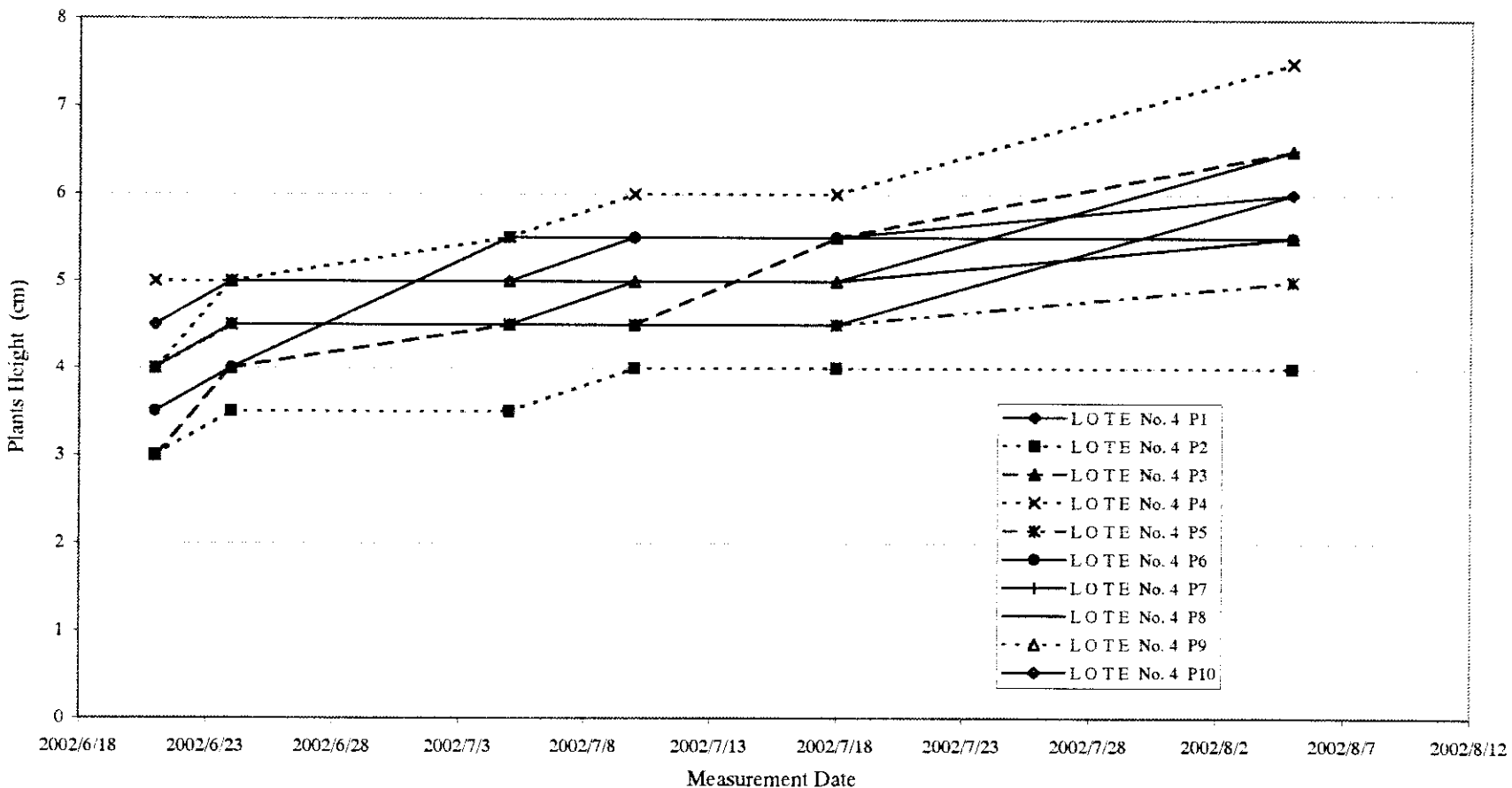
FIGURES



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

Japan International Cooperation Agency (JICA)

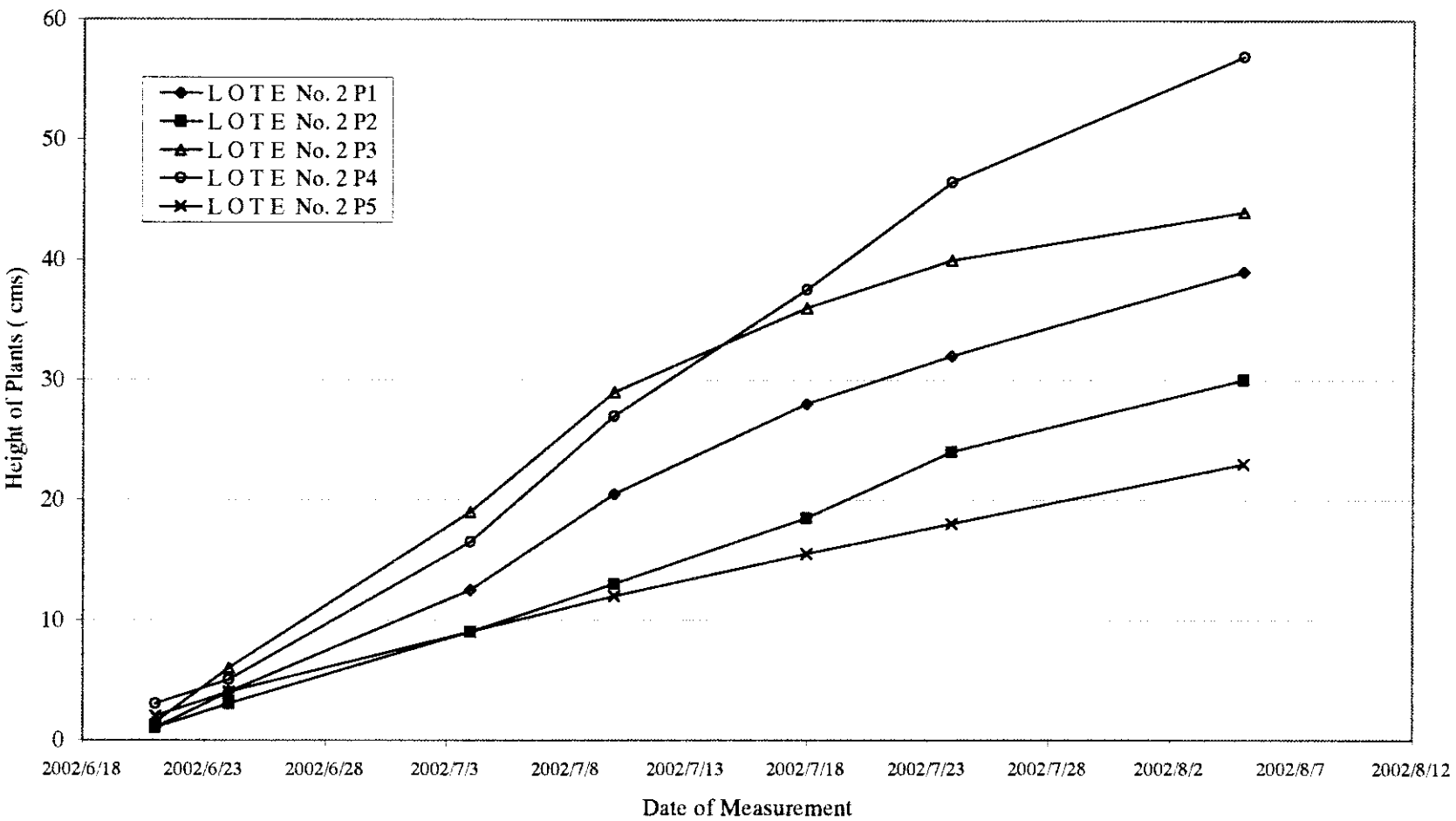
Figure E1
Location of Greenhouses in Panyebar
Model Project Area



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

Japan International Cooperation Agency (JICA)

Figure E2
Variation of Growth of Coffee Seedlings



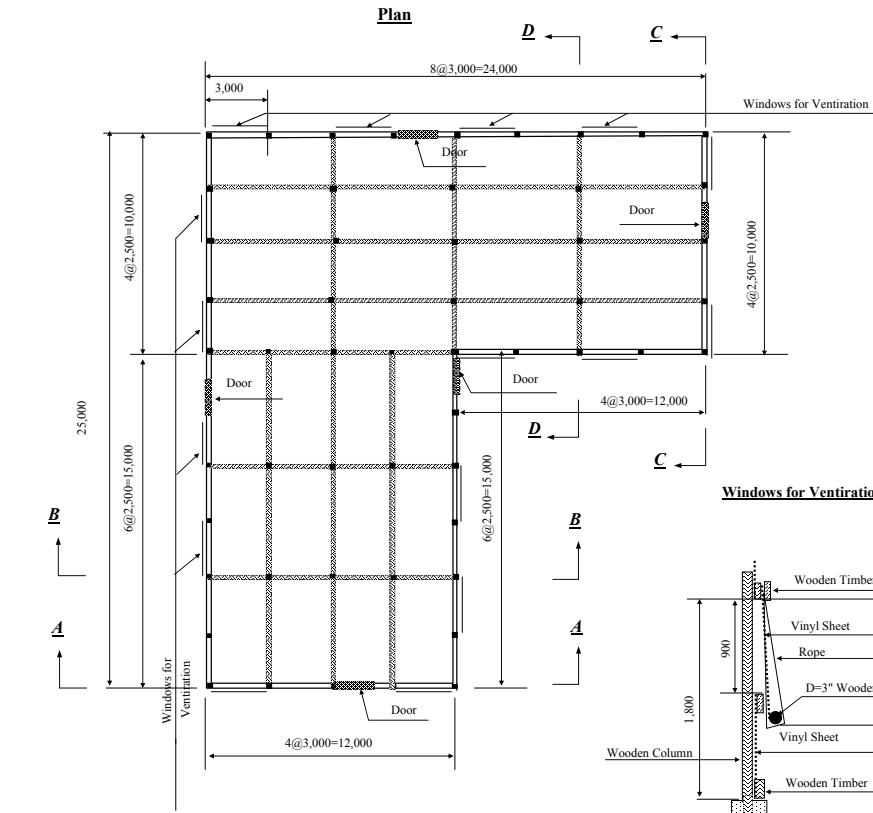
THE VERIFICATION STUDY OF MASTER PLAN ON
SUSTAINABLE RURAL DEVELOPMENT FOR THE
REDUCTION OF POVERTY
IN THE CENTRAL HIGHLAND REGION

Japan International Cooperation Agency (JICA)

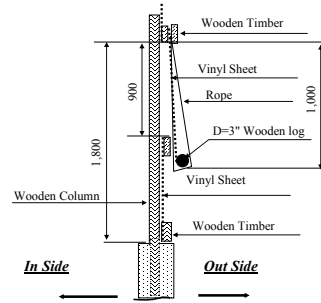
Figure E3
Variation of Growth of Avocado Seedlings

ATTACHMENTS

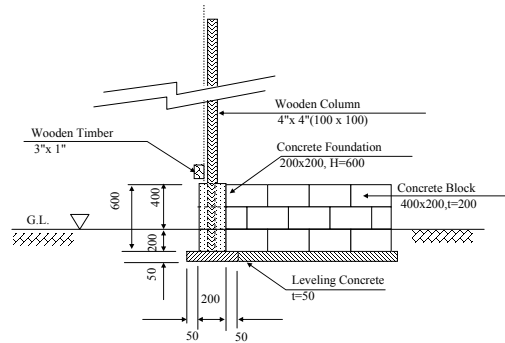
Plan of Vinyl House A



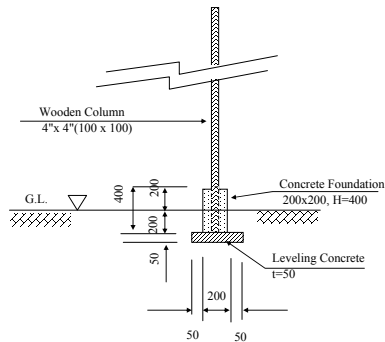
Windows for Ventilation



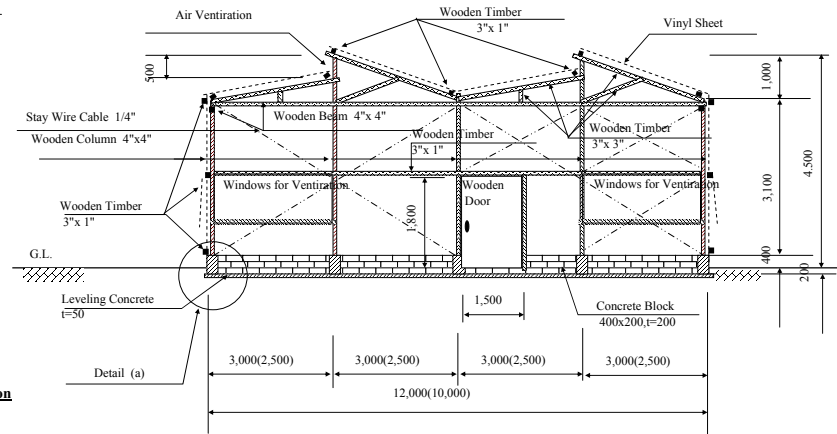
Detail (a)



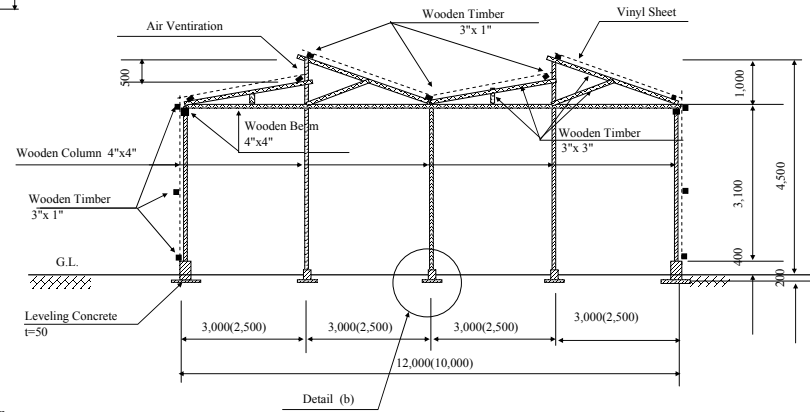
Detail (b)



Section A - A(C-C)

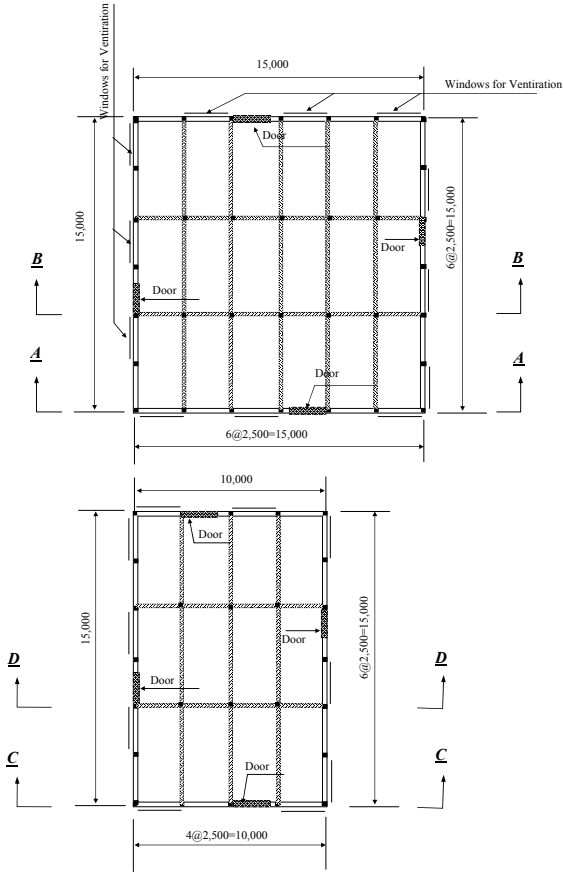


Section B - B(D-D)

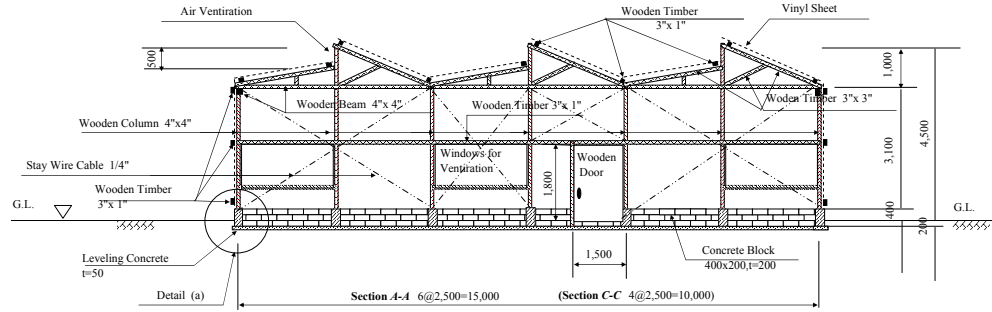


Plan of Vinyl House B

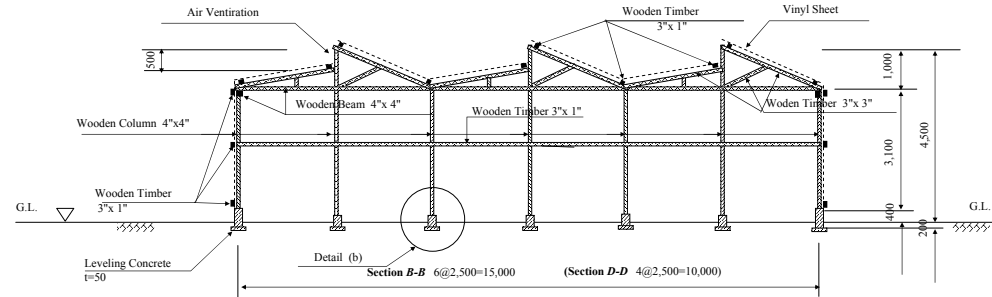
Plan



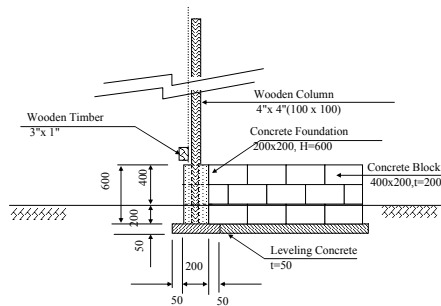
Section A - A(C-C)



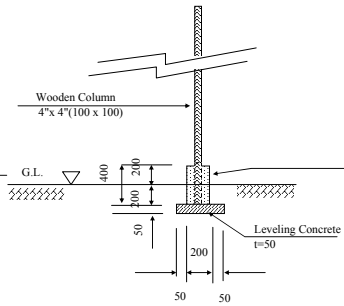
Section B - B(D - D)



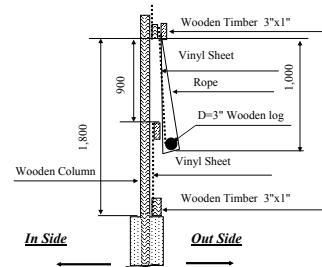
Detail (a)



Detail (b)



Windows for Ventilation



ANNEX 1- F
PLAN FOR REDUCING WORKLOAD
IN MOUNTAINOUS AREA THROUGH
COFFEE PROCESSING
(PANYEBAR)

ANNEX 1 – F

PLAN FOR REDUCING WORKLOAD IN THE MOUNTAINOUS AREA THROUGH COFFEE PROCESSING (PANYEBAR)

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5. Problems Encountered and Countermeasures.....	F-4
6. Organizations Concerned for Management of Further Activities.....	F-4
7. Observed Impacts.....	F-4

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Attachment

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F. PLAN FOR REDUCING WORKLOAD IN THE MOUNTAINOUS AREA THROUGH COFFEE PROCESSING (PANYEBAR)

1. Background

Most of the land used for agriculture production in the Panyebar model area was coffee cultivation on very steep slopes.. During harvest period, coffee farmers and labors should walk up the very steep lands carrying heavy loads (bags of 45 kg) of harvested fresh coffee beans. It is known that 100 kilograms of fresh coffee bean are reduced up 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.

2. Objectives

The objective of the project is to install 4 units for depulping and drying coffee nearby farm sites with the main purpose of reducing the workload of farmers in carrying coffee beans.

3. Components and Schedule

(1) Project components

- Procurement and installation of 4 units of coffee pulping machines with gasoline operated motors.
- Procurement and provision of 80 plastic tanks for fermenting pulped coffee, 4 weight-measuring scales and 600 m² of vinyl for drying pulped coffee.
- Procurement and provision of materials for construction of 4 protection houses, one for each pulping machine.
- Construction of protection houses by project beneficiaries.
- Establishment of organization of project beneficiaries, including preparation of its statutes and management guidelines.
- Training to beneficiaries.

Item	2001					2002											
	08	09	10	11	12	01	02	03	04	05	06	07	08	09	10	11	12
1) Ordering of Machines					■												
2) Installation of facilities					■	■	■										
3) Training Activity						■	■										
4) Monitoring								▲					▲				

4. Monitoring Results

The Items to be monitored are summarized below.

Item	Frequency	Data Collection
1) Construction of pulping house	Weekly	Coffee Growers Association
2) Operation of pulping machines	Weekly	Coffee Growers Association
3) Reduction (20%) from coffee bean (uva) weight to pergamino	Monthly	Coffee Growers Association
4) Price of coffee (10% increase from uva to pergamino)	Monthly	Coffee Growers Association
5) Collection of pulping fee	Monthly	Coffee Growers Association

The pulping machines were installed on February 7, 2002, when most of the coffee had been harvested already. The harvest of coffee in this season was done one month earlier than normal years, because weather conditions during this season.

On February 7, the contractor with participation of majority of project beneficiaries tested the four pulping machines at the site. The result of testing indicates that the capacity of installed pulping machines varies from 13 to 32 quintals per hour; the ratio between weight of pulped wet coffee beans over weight of fresh coffee beans was 0.6. After drying the pulped beans, the ratio between weight of pulped and dried coffee beans over weight of fresh coffee beans was 0.2. (See Table F1)

Coffee farmer's beneficiaries of the project began the operation of two pulping machines immediately after delivery. Some 17 beneficiaries (or 21% of the total beneficiaries) used pulping machines and processed about 105 quintals of coffee.

An interview survey was made for 10 beneficiaries among said 17 beneficiaries in November 2002 by JICA Study Team to identify reduction of workload, reduction of coffee bean weight, price of coffee, etc.

All respondents recognized that the workload for transporting the coffee fresh beans had been reduced significantly owing to a result of weight reduction after milling the coffee beans and short distance from farms to the machines installed. 90 % of interviewed farmers said that they have observed change in the workload of women; this because they have to carry less weight. All respondents said that the pulp of coffee without any treatment was returned to the farm as organic material for improving soil fertility.

During the harvest season from November 2001 to February 2002, the price paid to farmers for fresh coffee beans varied from Q35 to Q50 per quintal; and the price of dried pulped coffee beans (pergamino) varied from Q250 to Q350 per quintal. As a result, it was concluded that value of pergamino to be produced from one quintal of uva ranged from 1.4 to 2.9 times of the price of uva, averaging at 1.8 time of the price of uva. During this latest interview, only 22 % of interviewed farmers said that they are forced to sell part of their coffee as fresh beans, because verbal contract with middle man who provides fertilizers to them. (See Table F1)

Pulping fee was set at Q 1.4/qq, which comprise fuel, lubricants, spare parts, operator's wage and others. Because of the inadequate timing of installation of the pulping machine, only 2 machine had been used and 105 qq of coffee had been depulped during monitoring period. At those 2 pulping house, the collection of pulping fee was recorded by the operators and all the users had paid their charge according to the records.

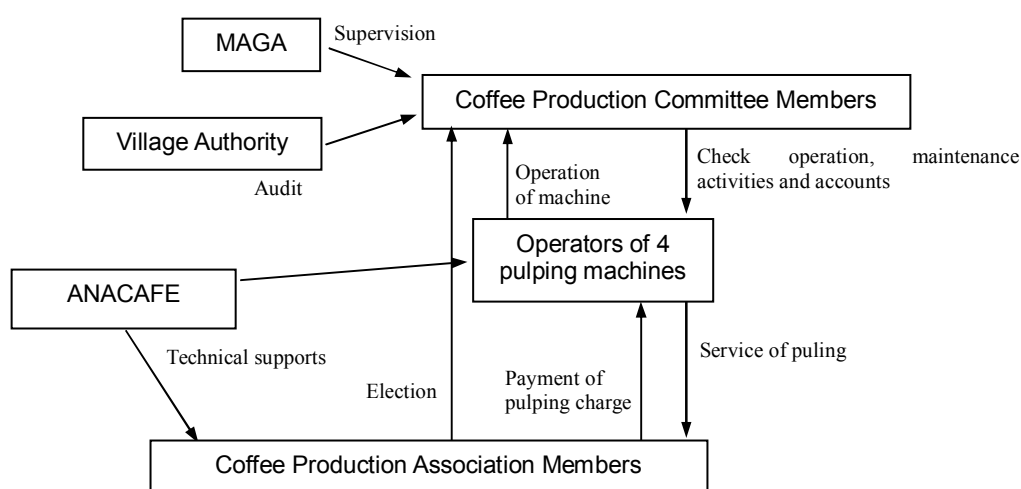
5. Problems Encountered and Countermeasures

During the operation stage, the beneficiaries of the model project reported some difficulty in pulping the coffee beans; this was because part of the pulp came out of the machine mixed with the beans. The farmers said that this was due to inadequate calibration of the machines. The countermeasure taken was to bring the specialist from ANACAFE for providing training on calibration of the pulping machines. The specialist from ANACAFE explained that the problem was mainly caused by the inadequate harvest of coffee bean made by the beneficiary

farmers; grains of very poor quality were mixed with good grains, and this caused inadequate functioning of the machines. The ANACAFE specialist explained to the farmers how the coffee beans should be harvested and classify adequately. Detailed explanation on maintenance and calibration of the pulping machines were made.

6. Organizations Concerned for Management of Further Activities

The relations of the organizations/groups concerned for management of further activities are shown in the figure below.



7. Observed Impacts

This model project caused several positive impacts, as follows:

It is recognized due to the installation of pulping machines near the farms that workload of the family members that usually, after a whole day harvesting coffee, in the afternoon walk up steep slopes carrying the harvested coffee beans, in very heavy loads (bags of more than 45 kg), workload should be reduced as a result of this project.

Another important impact from this model project is that the considerable increase of income is expected due to added value because changing from uva to pergamino. Value of pergamino to be produced from one quintal of uva increases to 1.8 time of the price of uva.

Until the implementation of this project, farmers had to sell their coffee the same day of harvest; now because of the project, after pulping and drying their coffee beans, beneficiary farmers can keep the dried coffee beans in their houses and wait for several months, even year, to get better price. This is a very important advantage in these periods of low prices and low demand of coffee.

Another impact is that most of the project beneficiaries used to borrow money in advance from middlemen; the money borrowed should be paid with the delivery of part of cherry coffee beans at harvest time. The project beneficiaries expressed that for the next harvest (December 2002 to February 2003) they will not borrow money in advance, because they prefer to pulp their coffee and sell it at higher price as a result of added value by pulping and drying the coffee. The organization of small coffee farmers and the increase in motivation of farmers to improve the quality of their coffee, is another socioeconomic impact brought about by the implementation of this project.

TABLES

Talbe F1 Conversion Rate and Price of Coffee with Pulping Machine

Number of farmers	Fresh bean (Uva) (qq) a	Dry bean (pergamino) (qq) b	Reduction Rate c=b/c	Price of uva (Q/qq) d	Price of pergamino (Q/qq) e	Value(Q) of pergamino to be produced from 1 qq of uva f	g=f/d
1	1.25	0.25	0.20	-			
2	4.00	1.00	0.25	45	300	75.0	1.67
3	4.00	1.00	0.25	35	350	87.5	2.50
4	6.00	1.50	0.25	30	350	87.5	2.92
5	9.00	1.80	0.20	50	350	70.0	1.40
6	2.00	0.50	0.25	50	350	87.5	1.75
7	5.00	1.00	0.20	50	350	70.0	1.40
8	2.00	0.40	0.20	45	300	60.0	1.33
9	14.00	3.00	0.21	50	350	75.0	1.50
10	6.00	1.50	0.25	50	350	87.5	1.75
			0.23	45	339	77.8	1.80

F-T-1

Data source: the results of JICA Study Team

ATTACHMENTS

Figure. Layout of Protection House of Coffee Puling Machine

