ANNEX 1 – J
POTATO STORAGE PLAN
(PALESTINA)

ANNEX 1 - J

POTATO STORAGE PLAN (PALESTINA)

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J. POTATO STORAGE PLAN

1. Background

Palestina area is one of the typical potato production areas in Quetzaltenango province. Annual fluctuation of potato price at markets in Guatemala is very large. In ordinary years, the price lowers to 30 to 40 Q/quintal during harvest season, but it soars to 90 to 120 Q/quintal in off-season. If there are some means of storage, the quantity of potato sold in the market would be self-controlled and the price would be more stabilized. If this project could control the market, it would make way for farmers to increase their income.

2. Objectives

The main objectives of the project are as follows:

1) To search an effective means of long-term storage of potatoes by simple storage at level
2) To ascertain the acceptability of quality of stored potato in the potato markets

3. Components and Schedule

The project components consist of the following items.

1) Establishment of simple storage facilities at farmer's level, three types of potato silos, named ICTA type, Japanese Type -I and Japanese type-II. Each type of potato silo was made with 2 amounts of potato stored, 10 and 20 quintals; the experiment was made in 2 caserios of Los Cabreras and Los Diaz
2) Monitoring of storage and potato conditions at 15 days interval
3) Technology transfer to potato farmers, both in the field at the time of conducting the project and through lecture with explanation of project results.

The implementation schedule is shown below:

Component	2001			2002										
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Construction of simple storage														
Training														
Monitoring														

4. Monitoring Results

The items monitored during the project implementation were as indicated below:

Item	*Frequency*	*Data Collector*
1) Potatoes Price and Storage Status	At beginning and end of storage	NGO / Farmers
2) Cost and Profit of Storage Operation	At the end of storage period	NGO
3) Sugar contents (% Brix)	Every 15 days	NGO
4) Temperature inside silos	Every day	NGO / Farmers

4.1 Potatoes price, storage status, cost and profit

The selection of location was finished by December 20, being the caserios Los Diaz and Los Cabrera selected for installation of the project. The elevation where the project was implemented is about 2,600 m.a.s.l. The location sites are indicated in Figure J1. The characteristics of three types of potato storage are shown in Figure J2. The potatoes stored were bought from 4 different local farmers at market price. The potato varieties used were Dia 71 and Loman.

The results of potato storage implemented at caserio Los Diaz are summarized as follows, and details are presented in Table J1.

Type of Silo	Storage Capacity of Silo	Potato Variety	Amount Discarded before Storing*	Actual Weight of Potato Stored	Weight suitable for consumption after storage	% of Potato damaged during Storage	Appearance of Potato
	(qq)		(qq)	(qq)	(qq)	%	
Japanese I	10	Dia 71	0.0	10.0	9.3	7.0	Good
Japanese II	10	Dia 71	0.3	9.7	8.6	11.3	Good
ICTA	10	Dia 71	0.0	10.0	9.0	10.0	Good
Japanese I	20	Dia 71	0.8	19.2	18.4	4.2	Regular
Japanese II	20	Dia 71	0.0	20.0	10.8	46.0	Bad
ICTA	20	Dia 71	0.5	19.5	19.0	2.6	Good

*The reasons for discarding some potatoes before storing were due to bacteria and/or insect damages.

Type of Silo	Purchasing Price of Potato (Q/qq)	Potato Total purchase cost (Q)	Material Cost (Q)	Total Cost Of Material and Potato (Q)	Consumable Amount of Potato (qq)	Selling Price* (Q/qq)	Total sold amount (Q)	Net Return (Q)	Net return (Q/qq)
	(1)	(2)	(3)	(4)=(2)+(3)	(5)	(6)	(7)	(8)=(7)-(4)	(9)
Japanese I	55	550	35.0	585.0	9.3	100	930	345.0	34.5
Japanese II	55	550	86.0	636.0	8.6	100	860	224.0	22.4
ICTA	55	550	90.7	640.7	9.0	100	900	259.3	25.9
Japanese I	55	1,100	70.0	1,170.0	18.4	100	1,840	670.0	33.5
Japanese II	55	1,100	151.0	1,251.0	10.8	100	1,080	-171	-8.5
ICTA	55	1,100	157.5	1,257.5	19.0	100	1,900	642.5	32.1

* at February 28, 2002

The results of potato storage implemented at caserio Los Cabreras are summarized as follows, and details are presented in Table J1.

Type of Silo	Storage Capacity of Silo	Potato Variety	Amount Discarded before Storing*	Actual Weight of Potato Stored	Weight suitable for consumption after storage	% of Potato damaged during Storage	Appearance of Potato
	(qq)		(qq)	(qq)	(qq)	%	
Japanese I	10	Dia 71	0.0	10.0	9.01	9.92	Good
Japanese II	10	Dia 71	0.0	10.0	8.08	19.20	Bad
ICTA	10	Dia 71	0.0	10.0	9.15	8.5	Good
Japanese I	20	Loman	2.44	17.56	16.61	5.41	Good
Japanese II	20	Loman	0.42	19.58	18.91	3.42	Good
ICTA	20	Loman	0.88	19.2	18.33	4.13	Good

*The reasons for discarding some potatoes before storing were due to visible bacteria and/or insect damages.

Type of Silo	Purchasing Price of Potato (Q/qq)	Potato Total purchase cost (Q)	Material Cost (Q)	Total Cost Of Material and Potato (Q)	Consumable Amount of Potato (qq)	Selling Price* (Q/qq)	Total sold amount (Q)	Net Return (Q)	Net return (Q/qq)
	(1)	(2)	(3)	(4)=(2)+(3)	(5)	(6)	(7)	(8)=(7)-(4)	(9)
Japanese I	55	550	35.0	585.0	9.01	100	901.0	316.0	31.6
Japanese II	55	550	86.0	636.0	8.08	100	808.0	172.0	17.2
ICTA	55	550	90.7	640.7	9.15	100	915.0	274.3	27.4
Japanese I	100	2,000	70.0	2,070.0	16.61	100	1,661.0	- 409.0	-20.5
Japanese II	100	2,000	151.0	2,151.0	18.91	100	1,891.0	- 260.0	-13.0
ICTA	100	2,000	157.5	2,157.5	18.33	100	1,833.0	- 324.5	-16.2

* at March 11, 2002

Based on the analysis of data presented above and on Table J1, and the data on variation of potato selling periods and prices as shown in Figure J3, it could be concluded that potatoes stored inside of rustic silos for up to 70 days can maintain good appearance for local market, and that farmers can obtain important increase in benefit from selling their potatoes at time of better market prices.

The negative returns indicated in the above tables (4 results of negative net return out of 12 storage tests) can not be attributed to the type of silo used, but are due to the quality of stored potatoes and the type of potato variety stored. In the case of potato silos made in caserio Los Díaz, the cause of potato damage during storage

was the presence of bacteria in the potatoes. In the case of silos made in caserio Los Cabreras, the causes of negative return were the presence of bacteria in the potatoes and mainly because potatoes of variety Loman were bought at high price and sold at the same price. As potatoes of variety Loman are brought to the selling point from several places and the supply of this variety of potato is during longer period, there are less chances to get timing of better prices. Selling periods and prices of potatoes at La Cumbre, near the project area, are shown in Figure J3.

The cost of construction of a Japanese type I silo is much less than the other two types of silos tested. Considering that woods, vinyl and chimney materials used on ICTA type and Japanese types II silos can be used during 5 years and twice a year, the total cost of materials was divided by 10 for calculating the annual cost of materials used on this two types of silos. Even this type of calculation, the cost of Japanese type I silos is only 40 to 50 % of the annual cost of materials for ICTA type and Japanese types II silos. The total initial investment required for the construction of a 10 quintals ICTA type and Japanese types II silos are about 12 times higher than the cost of a Japanese type I silo.

4.2 Temperature and sugar content

The values of daily temperatures measured inside the silos are shown in Figure J4 (1). The sugar content (% Brix) of potatoes measured every 15 days is shown in Table J2. The results of measurement of sugar content of stored potatoes show not significant change in % Brix during the 70 days of storage. There was not significant difference in sugar content between different types of silos. There was not significant change in specific weight (grams/cm^3) of potatoes during the 70 days of storage.

Technology transfer was conducted by participation of farmers on project implementation. Also, seminar presenting the results of potato storage, operation and management of storage, quality control, and marketing was held on March 7, 2002.

5. Problems Encountered and Countermeasures

Farmers in the project area produce potato at small scale, therefore due to the relatively large amount of potato required for establishing the three types of silos in two caserios (180 quintals of potatoes), it was necessary to get potatoes from 4 different farmers. The conditions of those potatoes bought for storing in the silos were quite different regarding presence of bacterial infection, insects damage and

physiological age of potatoes. From the 180 quintals of potatoes bought, some 5.3 quintals (2.9%) were discarded before storage due to poor conditions of potatoes, such as bacterial or insect damages.

The different quality of potatoes stored, mainly the presence of the bacteria *Ralstonia solasenarum*, was the major cause of the large percentage of potatoes damage during the storage period in all types of silos, specially in the Japanese type II silo.

The potatoes bought from one of the farmers was harvested several weeks after completion of the physiological maturity of the potato plant; This farmer left the potatoes stored in the soil for several weeks prior to harvest, therefore potatoes were physiological old and with larger presence of damages from the insect *Scrobipalpopsis solanivora*.

The recommendations for reducing damage of potatoes during storage period are: a) Potatoes should be harvested at ripping time, do not leave potatoes in soil longer than normal growing period; b) to make selection of potatoes prior to storage, eliminating potatoes with visible damages from bacteria or insects; c) to avoid injure to the potatoes during transportation and storing; d) application of bactericide and insecticides to the potatoes and the soil prior to storing the potatoes; e) silos should be located at a fresh site, avoiding direct incidence of strong sunshine.

The price of potato increases from February and becomes the highest at June when the supply of potato is low according to retailed price in Quetzaltenango market as shown in Table J3. La Cumbre, the main market in Palestina model area and its surrounding areas, shows a same tendency of an annual fluctuation of potato price. In La Cumbre, the highest quality of potatoes, especially for Loman varieties, is required because potatoes are for the international markets, mainly for El Salvador and Honduras. Though the storing period of Loman potatoes at Los Cabrera was short, being 45 and 60 days, the stored potatoes did not meet quality requirement of buyers at La Cumbre. As a result, net return became negative. It may be concluded that the proposed rustic storing technology (small storage cellar method) could not sufficiently meet potato quality for market requirement. For increasing potato quality of Loman variety, it is considered that introduction of warehouses installed with facilities that store potato in low temperature room (3 to 5℃) should be essential.

On the other hand, Dia variety indicates good net return.

It may be concluded on the problems and countermeasures that the followings should be recommended.

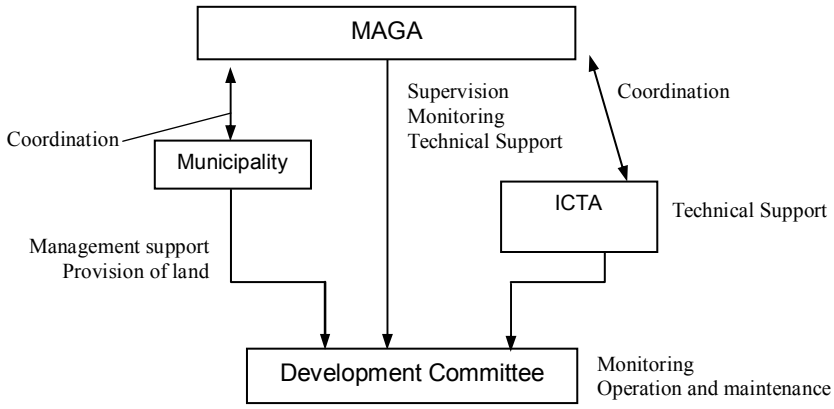
1) At present farmers in the Palestina model area and its surrounding areas cultivate potatoes twice a year. However, it is considered that introduction of the proposed rustic storing technology (small storage cellar method) should not be feasible for storing of potatoes to be harvested in the 1st crop season (July) due to the low price of potatoes.

2) It is recommended that introduction of the proposed rustic storing technology (small storage cellar method) should be applicable to cultivation of not Loman variety but Dia variety in the 2nd crop season (generally middle to end of November)

3) If use of Loman variety is performed in the 2nd crop season, construction of warehouse with facilities that store potato in low temperature room (3 to 5℃) should be essential.

6. Organizations Concerned for Management of Further Activities

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



7. Observed Impacts

The economic results that were achieved from this project show that, if rustic storing technology (small storage cellar method) is properly managed, it could produce significant impact on increasing the income of small-scale potato farmers. In the case of potato silos made in caserio Los Díaz, the net return from storage operation range from Q22.2 per quintal (40.7 % increase of income) up to Q34.5 per quintal (62.7 % increase of income).

Farmers expressed interest in use of rustic silo technology. They said that they have not used this technology because they did not know it. It is important to make effort to continue demonstrating this simple and profitable technology to small farmers engaged in production of potato.

Table J1 Economic Analysis of Results on Model Project of Rustic Storage Potatoes

A) Caserio Los Díaz

1) Investment Cost for Each Type of Silo — Units: Quetzales

Tipe of Silo	Capacity of Silo (qq)	Potato Variety	Labor	Materials				Estimated Material Cost Per Each Use*	Potato Cost	Total Cost (Q)
				Straw	Wood	Vynil	Chimney			
JICA I	10	Dia 71	15	20	0	0	0	35.0	550	585.0
JICA II	10	Dia 71	30	20	360	0	0	86.0	550	636.0
ICTA	10	Dia 71	30	20	360	30	17.3	90.7	550	640.7
JICA I	20	Dia 7	30	40	0	0	0	70.0	1100	1,170.0
JICA II	20	Dia 71	60	40	510	0	0	151.0	1100	1,251.0
ICTA	20	Dia 71	60	40	510	30	34.6	157.5	1100	1,257.5

* Asuming that Wood, Vynil and Chimney can be used 10 times, therefore cost of these components was divided by 10

2) Economic Result from Potato Storage in Caserio Los Díaz

Tipe of Silo	Capacity of Silo (qq)	Potato Variety	Total Cost	Amount of Potato Suitable for Sell (qq.)	Selling Price (Q/qq.)	Gross Sell (Q)	Net Income (Q)
JICA I	10	Dia 71	585.0	9.3	100	930.00	345.00
JICA II	10	Dia 71	636.0	8.6	100	860.00	224.00
ICTA	10	Dia 71	640.7	9.0	100	900.00	259.27
JICA I	20	Dia 71	1,170.0	18.4	100	1,840.0	670.00
JICA II	20	Dia 71	1,251.0	10.8	100	1,080.0	-171.00
ICTA	20	Dia 71	1,257.5	19.0	100	1,900.0	642.54

B) Caserio Los Cabreras

1) Investment Cost for Each Type of Silo

Tipe of Silo	Capacity of Silo (qq)	Potato Variety	Labor	Materials				Estimated Material Cost Per Each Use*	Potato Cost	Total Cost (Q)
				Straw	Wood	Vynil	Chimney			
JICA I	10	Dia 71	15	20	0	0	0	35.0	550	585.0
JICA II	10	Dia 71	30	20	360	0	0	86.0	550	636.0
ICTA	10	Dia 71	30	20	360	30	17.3	90.7	550	640.7
JICA I	20	Loman	30	40	0	0	0	70.0	2,000	2,070.0
JICA II	20	Loman	60	40	510	0	0	151.0	2,000	2,151.0
ICTA	20	Loman	60	40	510	30	34.6	157.5	2,000	2,157.5

* Asuming that Wood, Vynil and Chimney can be used 10 times, therefore cost of these components was divided by 10

2) Economic Result from Potato Storage in Caserio Los Cabreras

Tipe of Silo	Capacity of Silo (qq)	Potato Variety	Total Cost	Amount of Potato Suitable for Sell (qq.)	Selling Price (Q/qq.)	Gross Sell (Q)	Net Income (Q)
JICA I	10	Dia 71	585.0	9.01	100	901.00	316.00
JICA II	10	Dia 71	636.0	8.08	100	808.00	172.00
ICTA	10	Dia 71	640.7	9.15	100	915.00	274.27
JICA I	20	Loman	2,070.0	16.61	100	1,661.0	-409.00
JICA II	20	Loman	2,151.0	18.91	100	1,891.0	-260.00
ICTA	20	Loman	2,157.5	18.33	100	1,833.0	-324.46

Note: The actual buying price of potato variety Dia 71 at local market was Q 55 per quintal, while variety Loman was Q 100 per quintal,
The selling price after storage was same for the two varieties of potato, at Q 100 per quintal

Table J2 Change in Sugar Contents (Grade Brix) of Potatoes after/during the Storage Period

Type of Silo	Storage Capacity by Silo (quintal)	Sugar Content of Potato Measured at 15 days Interval (% Brix)						Density (Specific Weight) of Potato Measured at 15 days Interval (grams/cm^3)					
		15 days	30 days	45 days	60 days	70 days	Average	15 days	30 days	45 days	60 days	70 days	Average
ICTA Type	10	4.7	4.7	3.8	4.4	4.2	4.4	1.079	1.079	1.078	1.060	1.070	1.073
Japanese Type I	10	4.5	4.1	4.0	4.0	3.6	4.0	1.073	1.069	1.073	1.072	1.072	1.072
Japanese Type II	10	6.7	4.9	6.1	5.3	4.3	5.5	1.080	1.080	1.073	1.069	1.068	1.071
ICTA Type	20	5.9	6.7	5.8	7.1	5.0	6.1	1.073	1.074	1.076	1.069	1.063	1.071
Japanese Type I	20	4.5	4.1	4.0	3.9	3.9	4.1	1.071	1.071	1.074	1.069	1.068	1.071
Japanese Type II	20	3.9	4.2	3.8	4.4	3.8	4.0	1.068	1.066	1.063	1.064	1.056	1.060

Note: There was not significante changes in sugar content through the 70 days storage of potato. The difference in sugar content among type of storage may be due to difference in the inicial conditions of potato.

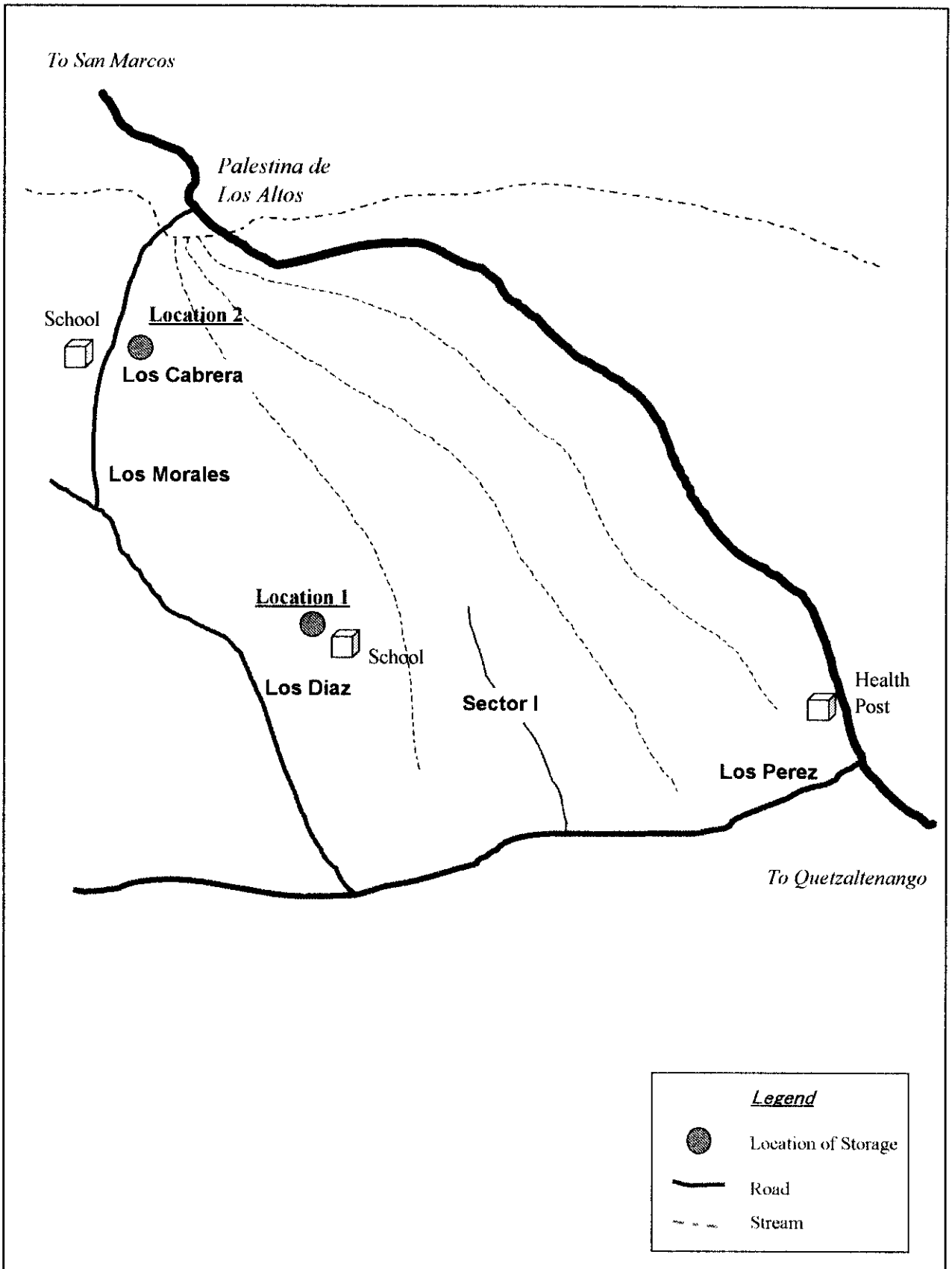
Table J3 Weekly Variation of Potato Prices at Qetzaltenango City Market

(unit:Quetzal/quintal)

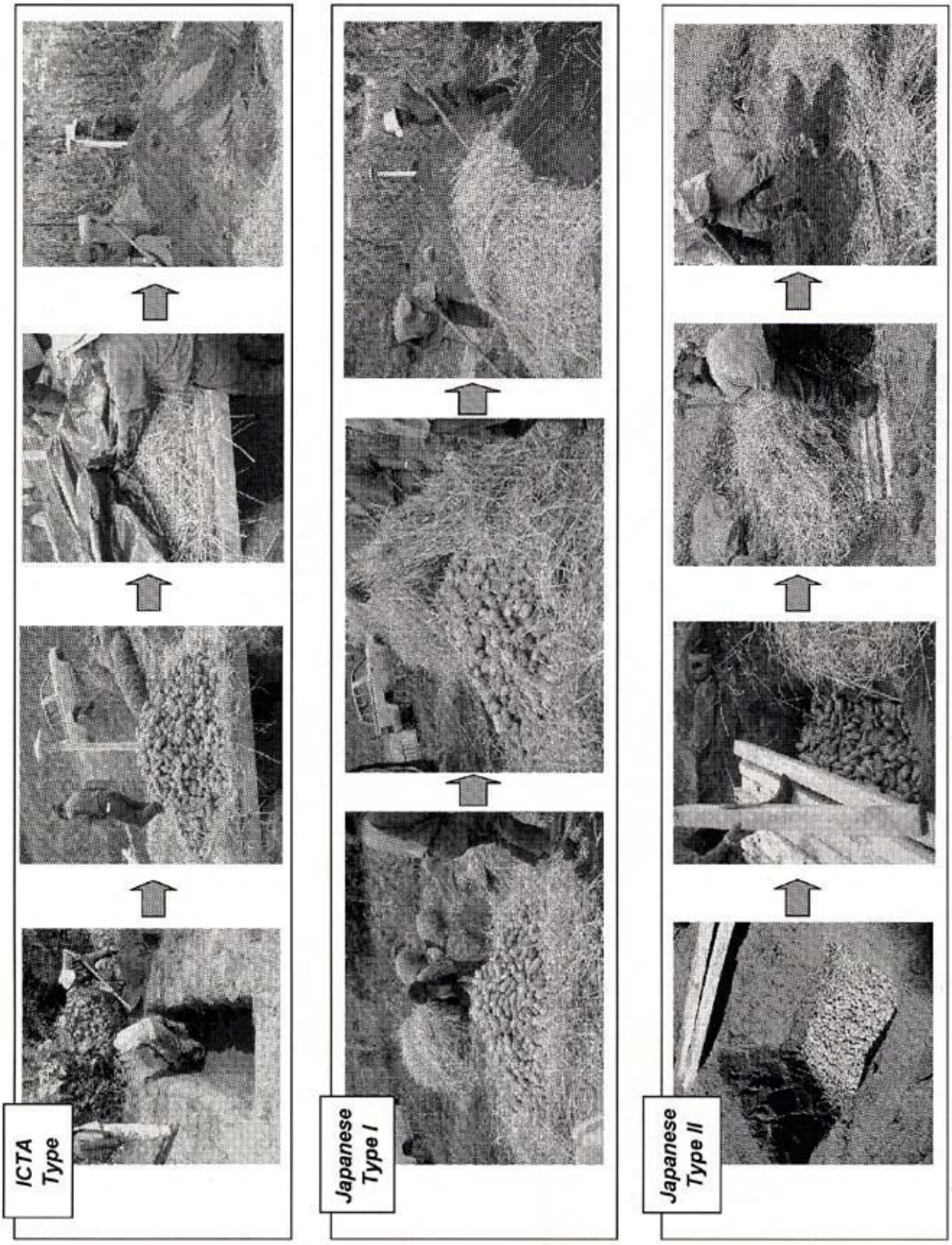
Date	Kind of Potato				
	Loman Lavada Grande Blanca	Loman Lavada Mediana Blanca	Redonda Lavada Pequena	Redonda Lavada Grande	Redonda Lavada Mediana
2002/02/06	170	150	100	140	175
2002/02/13	170		100	140	
2002/02/20	170		100	140	
2002/02/27	170		100	140	
2002/03/06	190		100	140	
2002/03/13	190		100	140	
2002/03/20	180		100	140	
2002/03/25	180		100	140	
2002/04/01	180		100	140	
2002/04/08	190		100	100	
2002/05/06	190		100	140	
2002/05/13	210		135	145	
2002/05/20	210		135	145	
2002/05/27	200		125	140	
2002/06/03	200		125	140	
2002/06/10	200		135	175	
2002/06/17	210		135	175	
2002/06/24	215		140	180	
2002/07/01	200		130	170	
2002/08/05	150		125	145	
2002/08/12	150		125	145	
2002/08/19	150		125	145	
2002/08/26	125		100	110	
2002/09/02	100		80	95	
2002/09/09	100		80	95	
2002/09/16	100		80	95	
2002/09/23	80		75	65	
2002/09/23	80		65	75	
2002/09/30	80		65	75	
2002/10/07	75		-	65	
2002/10/14	80		65	75	
2002/10/21	90		65	75	
2002/10/28	85		55	65	
2002/10/28	100		75	85	
2002/11/04	100		65	75	

Data source:MAGA Xela office file

FIGURE



THEVERIFIATION STUDY OF MASTER PLAN ON SUSTAINABLE RURAL DEVELOPMENT FOR THE REDUCTION OF POVERTY IN THE CENTRAL HIGHLAND REGION	**Figure J1**
Japan International Cooperation Agency (JICA)	**Location of Sites of Implementation of Model Project on Rustic Storage of Potatoes**



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

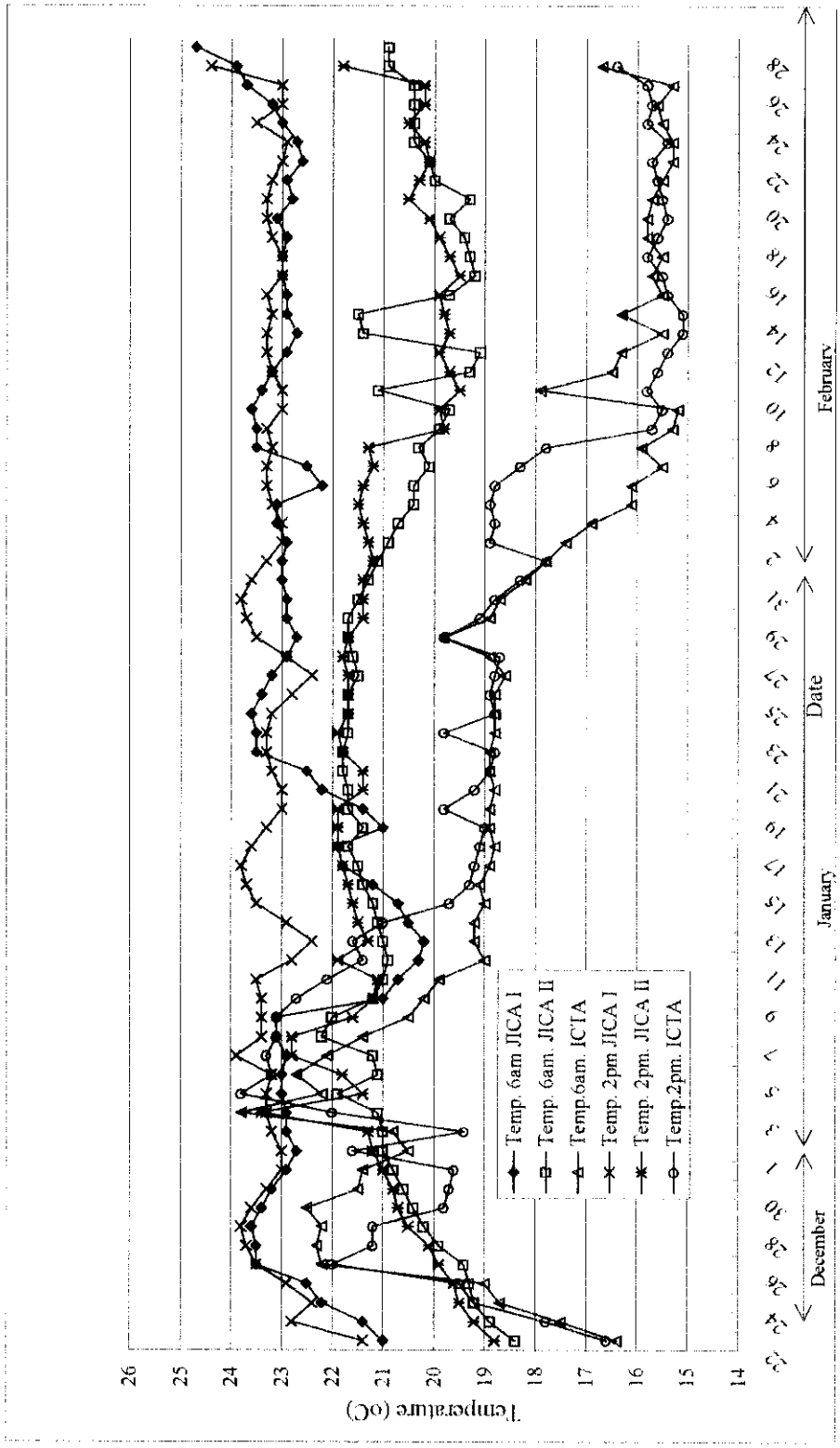
Japan International Cooperation Agency (JICA)

Figure J2
Characterics of the Three Types of Rustic Storages of Potatoes Implemented in Palestina

Periods When Potatoes Varieties Loman and Dia 71 are Sold at "La Cumbre" Selling Point, Near Palestina

Place of Potato Production / Potato Variety		January	February	March	April	May	June	July	August	September	October	November	December
San Marcos	Loman												
San Marcos	Dia 71												
Palestina de Los Altos	Loman												
Palestina de Los Altos	Dia 71												
La Cumbre	Loman												
La Cumbre	Dia 71												
Sibilia	Loman												
Sibilia	Dia 71												

Figure J3
Potato Marketing Periods and Selling Price at Farmers Market in "La Cumbre" Selling Point



THE VERIFICATION STUDY OF MASTER PLAN ON SUSTAINABLE RURAL DEVELOPMENT FOR THE REDUCTION OF POVERTY IN THE CENTRAL HIGHLAND REGION	**Figure J4** **Daily Vatiations of Temperature Inside Rustic Potato Storages Implemented in Palestina**
Japan International Cooperation Agency (JICA)	

ANNEX 1 - K
PLAN OF MODEL FARM ON POTATO PRODUCTION (PALESTINA)

ANNEX 1 - K

PLAN OF MODEL FARM ON POTATO PRODUCTION (PALESTINA)

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K. PLAN OF MODEL FARM ON POTATO PRODUCTION

1. Background

The Palestina model area is one of the important potato production places in Guatemala. However, the present yield of potato is low due to mainly use of potatoes infested by various virus and inadequate farming management. As a result, potato farmers live in very difficult conditions. In addition, much use of agricultural chemicals prevails in the model area, which may result in occurrence of negative effects for human health and environment such as contamination of groundwater. To solve these problems, the Pilot Project will provide demonstration farms that will be installed with the help of farmers. In the demonstration farms, improved technologies could be demonstrated and transferred to village farmers to contribute to the improvement in potato production.

2. Objectives

The main objectives of the project are as follows:

1) To demonstrate improved farming of potato cultivation in model farms
2) To increase unit yield of potato

3. Components and Schedule

(1) Project components

The project components consist of the following items.

1) Establishment of potato model farms with area of 2 cuerdas, one in each of the five selected communities of Palestina de Los Altos consisting of 5 caserios such as Sector-1, Los Diaz, Los Perez, Los Cabrera and Los Morales. The model farm in each community was divided into 4 sections with different crop management (ICTA technology, application of different levels of compost, IPM, and use of virus free seeds)
2) Management and monitoring of potato cultivation in the model farms
3) Transfer of farming technology to the farmers

(2) Selection of Sites

The selection of sites for project implementation began since early August; the selected project sites and date of establishing the potato model farms were made as indicated below:

Caserio	Land Owners	Date of Planting
1) Sector 1	Obispo Escobar, Juan Diaz and Rosmery Monterroso	20 August
2) Los Diaz	Jancinto Diaz and Santos Diaz	20 and 21 August
3) Los Perez	Miguel Perez	21 August
4) Los Cabrera	Hipolita Cabrera and Emilio Cabrera	22 August
5) Los Morales	Maria Monterroso and Ernesto Cabrera	22 and 23 August

Because farmers have very small land areas, in the 5 caserios it was necessary to use land of more than one farmer for the establishment of each model farm; even in the case of Mr. Miguel Perez who provided 2 cuerdas for the model farm in Los Cabreras caserio, his 2 cuerdas are in separated plots of 1.5 and 0.5 cuerdas, as shown in Figure K1.

(3) Implementation schedule

The implementation schedule is shown below;

Component	2002										
	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Preparatory work and establishment of model farms											
Management and monitoring											
Training											
Field explanation											

4. Monitoring Results

The items to be monitored for the Potato Model Farm Project are as follows:

Indicators for Evaluation and Monitoring Methods

Item	*Frequency*	Data collector	*Aggregation*	*Target*
Conditions of Potato crop	45 days after planting	Contractor and Beneficiary farmers.	Study Team	-
Quantity of potato harvested	At harvest time	Contractor and Beneficiary farmers.	Study Team	Over 130 % of the present yield
Number of participants on training and field days	After each meeting	Contractor and Beneficiary farmers.	Study Team	Participants rate is over 70 %.

4.1 Conditions of potato crop

Preparatory works for obtaining necessary potato seeds were done at the middle of July. Difficulty in obtaining the necessary virus free potato seeds, with broken dormancy and lands of the model farms, caused delay in establishing the model farms.

The model farm at each Caserio was subdivided into four plots of 0.5 cuerda each, for the implementation of different treatments for managing potato crop. The treatment implemented was i) the technology recommended by ICTA; ii) application of 3 different levels of compost; iii) Integrated Pest Management (IPM); and iv) planting potatoes seed materials free of viruses. All material inputs used in the potato model farms were provided by JICA. A summary of input used for each treatment and its respective cost is indicated below, and details are presented in Table K1.

Unit: Cost in Q

	TREATMENTS					
Item of Expenditure	T1 (0.5 cuerda)	T2, S1 (0.17 cuerda)	T2, S2 (0.17 cuerda)	T2, S3 (0.17 cuerda)	T3 (0.5 cuerda)	T4 (0.5 cuerda)
Inputs Provided by JICA						
Seed	336.0	112.0	112.0	112.0	336.0	336.0
Fertilizers	126.0	66.0	116.6	167.7	121.3	125.3
Insecticides	14.2	4.7	4.7	4.7	14.2	14.2
Fungicides	82.1	27.0	21.9	27.7	86.4	82.1
Plastic and Adhesive					160.0	
Labor (by the Farmers)	142.0	47.3	49.0	52.5	142.0	142.0
Total (without labor)	558.3	210.0	255.2	311.8	717.9	557.6

Description of Treatments:

T1: Technology recommended by ICTA
T2, S1: Application of Compost at rate of 1 kg/m^2.
T2, S2: Application of Compost at rate of 2 kg/m^2.
T2, S3: Application of Compost at rate of 3 kg/m^2.
T3: Traps for control of Insects and the biological fungicide named SUBSOIL
T4: Use of virus free potato seeds.

The management of potato farms was made by each farmer with technical guidance and monitoring of potato model farms made by an expert from FUNDIT, assigned for visiting all the farms twice a week (Tuesday and Thursday); based on his observations on the conditions of potatoes plants, the expert made recommendations to the farmers. JICA Team and MAGA counterpart made weekly visits to the model farms.

Loman was the potato variety planted in the model farms; this variety has a growing period of 90 days. The Loman variety is considered as susceptible to one of the worse diseases of potato, the Late blight, caused by the fungus *Phytophtora infestans*.

A total of 30 quintals of potato seeds were planted; 15 quintals were of first grade and 15 quintals of second grade. Potato seeds were treated with a mixture of 1 liter of Biozyme TS, plus 10 grams of Biogib mixed in a drum of 200 liters of water. The potato seeds were put inside of this solution for about 15 seconds, as

recommended by the maker of these chemical products. The purpose of this treatment is to break potato dormancy and accelerate germination.

At planting time, the potato seeds had various condition of germination, some were already germinated and well developed, some were germinated but small sprouts, and some were not germinated. According to FUINDIT expert, the cause of difference on germination of potatoes could be because the treatment for breaking dormancy may require a time longer than the 15 seconds indicated by the makers of products indicated above used for breaking dormancy.

The beginning of potato germination was observed on 10 September; observation made on 19 September indicates that almost all the potatoes had germinated, but the initial growing was not uniform. Difference on initial growth may be attributed to difference in the initial sprouting of potato seeds used, because not adequate breaking of dormancy.

The climatic conditions, especially pattern of rainfall and temperature, during development of potato was as following, details are shown in Table K2:

Month	No. of Rainy Days	Monthly Rainfall (mm)	Maximum Temperature (^{o}C)	Minimum Temperature (^{o}C)
August (20 to 31)	5	43.3	23.1	5.7
September (1 to 30)	22	169.2	23.6	5.2
October (1 to 31)	13	108.8	23.5	1.4
November (1 to 19)	7	13.8	23.0	- 0.4

Note: Data of INSIVUMEH for Labor Ovalle meteorological station at Quetzaltenango, about 23 Km from project area

The climatic conditions (high rainfall and low temperatures, mainly during the month of September) were adequate for the development of potato disease Late Blight; at the beginning of October there was less rainfall, which is favorable for development of Early Blight disease. But although the adequate climatic conditions for disease development and although that almost all nearby farms were infested from those diseases, the incidence of the two diseases was kept low during the first 45 days of development of potatoes in the model farms; this could be attributed to the management applied, consisting in the application of fungicides and insecticides twice and three times per week.

Also, the number of insects and aphids was low during the first 45 days of crop development; this can be attributed to climatic conditions unfavorable for insect growth because of frequent rains during September and to chemical control applied. The presence of potato plants affected by virus was minimal until September 28.

In incidence of diseases and insects on the potato model farms can be summarized below, and details presented in Table K3.

Name Farm Owner	% of plants affected by Late Blight	
	28 Sep.	**21 Nov.**
Miguel Perez	2 %	15 %
Obispo Escobar	5 %	30 %
Santos Díaz	2 %	10 %
Juan Díaz	5 %	30 %
Jacinto Díaz	5 %	30 %
Rosmery Monterroso	20 %	60 %
Hipolita Cabrera	5 %	25 %
María Monterroso	5 %	25 %
Ernesto Cabrera	2 %	80 %
Emilio Cabrera	8 %	30 %

The main causes of the high increase in the incidence of Late Blight from October to November can be attributed to the following:

1) During the period from September 19 to October 13 (25 days), there was rainfall in 21 days and only 4 days without rainfall; this is considered the main cause of high rate of Late Blight that appeared at the end of October.

2) In addition to the 21 days of almost continuous rainfall during the period indicated above, also occurred high relative humidity, low number of sunshine hours and low temperatures; all this factors facilitate the development of the Late Blight disease.

3) Also, there were occurrence of relatively strong winds that caused braking of potatoes in some areas; the broken potato plants were more easily penetrated by the fungus *Phytophtora infestans,* causing increase in Late Blight.

4) Almost all the nearby potato crops were very badly affected by the Late Blight disease; as most of the nearby potatoes were already mature and badly affected, there were large amount spores of *Phytophtora infestans* that were easily transported by the air to the model farms.

4.2 Quantity of potatoes harvested

Potatoes in each section for 5 caserios were harvested at the middle of December 2002. The yield of potatoes in 5 caserios is summarized below and details are shown in Table K4

Experimental section	Particular	Yield of potato (qq/cuerda)				
		Sector-1	Los Diaz	Los Perez	Los Cabrera	Los Morales
T1	Technology recommended by ICTA	6.67	3.78	4.28	11.64	5.28
T2, S1	Application of Compost at rate of 1kg/m^2	4.42	1.62	3.59	4.38	6.18
T2, S2	Application of Compost at rate of 2 kg/m^2	8.27	3.90	3.87	5.70	6.96
T2, S3	Application of Compost at rate of 3 kg/m^2	8.37	1.81	7.44	9.17	6.78
T3	IPM	4.60	4.9	6.57	4.41	6.16
T4	Planting potatoes seed materials free of virus	6.00	4.44	6.10	3.15	5.96

The unit yield of potatoes in each section in the model farms was very small and could not be over the present yield of potatoes in the normal year. It is considered that main causes are difficulty in obtaining the necessary potato certified seeds with broken dormancy and lands of the model farms from farmers. These causes delayed planting of seeds and missed an appropriate planting time. Planting commenced at the end of August. Also there occurred abnormally long rainy days and unfavorable climatic conditions.

As a result, (1) Few rains during the process of filling tubers in all the parcels became serious causes of decrease of the yield. (2) Damages by strong wind with hail occurred. (3) Potato production was seriously affected by late blight (Phytophtora infestans) owing to inadequate climatic conditions for their development. Detailed causes of the low yield of potatoes in each section in the model farms are shown in Table K5.

4.3 Number of participants in training activities and field days

There were 5 training sections and 3 field observation days. In addition, twice every week the technician met farmers in their respective farms and discussed on conditions of potato farm and provided recommendations directly to each farmer for care of potato crop. The themes discussed during training section were: i) Explanation of treatments implemented in the model farms; ii) Land preparation for potato planting; iii) Importance of use of good quality seeds, free from virus; iv) Important insects and diseases that affect potato crop, and their control; v)

Storage of potato seeds.

The number of farmer's participants in the training activities varied from 4 to 9. The number of participants in training activities was low, mainly because most training activities coincided with the travel of people from Palestina de Los Altos to the Costal area for harvesting corn and take care of sesame and sorghum crops and pasture; another cause of low participation in training activities was the lack of a farmers organization that makes difficult to convey invitations to the farmers in Palestina.

The farmers that participated in training activities and field days were very enthusiastic in trying to learn new technology in potato crop management. Some of them expressed interest in becoming producer of certified potato seeds and asked to the technician to explain the requirements for becoming certified seed producer.

5. Problems Encountered and Countermeasures

The main problems encountered for the implementation of the potato model farms were:

1) Difficulty in obtaining the necessary potato seeds frees of virus and with broken dormancy and lands of the model farms. Those delayed the beginning of establishment the model farms. Because of the delay on planting, some farmers and the expert from FUNDIT were afraid that potato plantations could be affected by frozen temperatures that often occur in Palestina de Los Altos during the month of November. Although low temperature (- 0.4 C^{o}) occurred in November, not visible damage to potato plantation were observed until November 17.

2) As was described before, the climatic conditions from the 19 of September up to 13 of October were very favorable for the development of the Late Blight that seriously affects reduction of the potato. During this period, there were 21 days of rainfall including several days with more than 20 mm rainfall, low temperatures, high relative humidity and reduced hours of sunshine.

3) After potato plants in model farms were about 2.5 months old, a high incidence of Late Blight (*Phytophtora infestans)* appeared in some of the farms; this could bring about reduction of the yield of potatoes in the model farms.

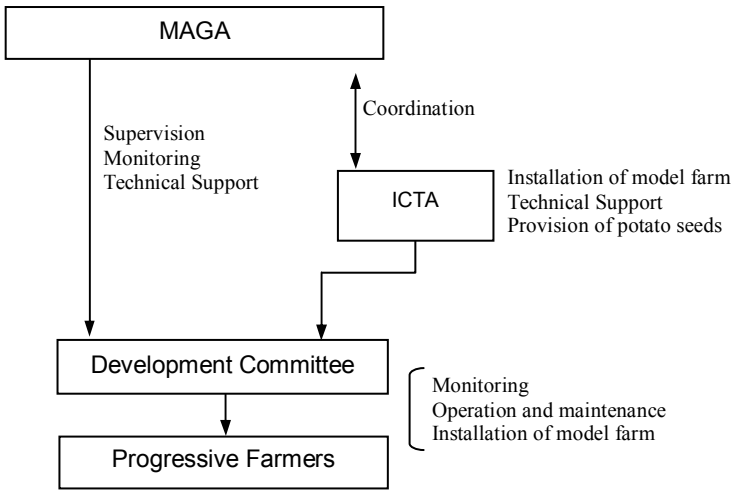
4) There was difficulty in obtaining the small area of land required for the installation of the model farms; this was because farmers have very small land areas. Because of this reason, some of the land used were not very suitable for potato production; among the eleven small plots used for model farm, some areas that do not receive enough sunshine were used for

model farm; this could affect the final production of potatoes.

5) Although recommendations are given to the farmers, sometimes they do not follow exactly, and have the tendency to do as their traditional way.

6. Organizations Concerned for Management of Further Activities

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



7. Observed Impacts

During the implementation of the project, especially as result of training activities, some impacts could be observed as follows:

1) Because the good development of potato plantation during initial stage, farmers understood the importance of using seeds of good quality; Farmers that passed in front of the model farms asked about where they could get same kind of potato seeds. Some participating farmers expressed their interest in becoming potato seed producers and requested explanation on the procedure and requirements for becoming producer of certified potato seeds. The potatoes produced in the model farms will be used by participant farmers during several years as good quality seeds.

2) There were several women among the direct participants in model farm managements; the women and some male participants expressed that this is the first time for them to receive direct training and technical advice on crop production, not only on potato production, but on any crop.

However, the increase of unit yield of potatoes was not obtained because of serious negative affects for reduction of yield during the process of filling tubers of potatoes due to shortage of rain became serious causes of decrease of the yield, damages by strong wind with hail and damages by Late Blight diseases.

As a result, the experimental results of low yield of potato in the model farms could not contribute to the poverty reduction in Palestina area s well as its surrounding areas.

Table K1 Input Used and Cost per Each Treatment of Potato Model Farm (1/2)

Item	Unit	Unit Price (Quetzal)	Quantity per Cuerda	Quantity Used (0.5 Cuerda)	Total (Quetzal/Farm)
		Treatment 1 (ICTA)			
Production Cost (Only Inputs Provided by JICA)					**558.3**
1) Inputs					**558.3**
- Seeds	qq.	224	3	1.5	**336.0**
- Fertilizers					**126.0**
15-15-15	qq.	103	0.72	0.36	37.0
Urea	qq.	95	0.12	0.06	6.0
Gallinaza Deshidratada	qq.	33	5	2.5	83.0
Foliar	lit.				0.0
- Insecticides					**14.2**
Vydate	lit.				0.0
Sistemin	lit.	96	0.1	0.05	4.8
Monarca	lit.	188	0.1	0.05	9.4
- Fungicides					**82.1**
Curzate	kg	192	0.5	0.25	48.0
Antracol	kg	64	0.4	0.2	12.8
Trimiltox Forte	kg	70	0.046	0.023	1.6
Miragefe 75 WP	gr.	1.095	36	18	19.7
SUBSOL	lit.				0.0
- Insects Traps					**0.0**
2) Total Labor (Provided by Farmers)	Man-day	35	8.1	4.05	**142.0**

Item	Unit	Unit Price (Quetzal)	Quantity per Cuerda	Quantity Used (0.5 Cuerda)	Total (Quetzal/Farm)
		Treatment 4 (Virus Free Potato Seed Materials)			
Production Cost (Only Inputs Provided by JICA)					**557.6**
1) Inputs					**557.6**
- Seeds	qq.	224	3	1.5	**336.0**
- Fertilizers					**125.3**
15-15-15	qq.	103	0.72	0.36	37.1
Urea	lib.	95	0.12	0.06	5.7
Compost	qq.	33	5	2.5	82.5
Folliar	lit.				0
- Insecticides					**14.2**
Vydate	lit.				0
Sistemin	lit.	96	0.1	0.05	4.8
Monarca	lit.	188	0.1	0.05	9.4
- Fungicides					**82.1**
Curzate	kg	192	0.5	0.25	48.0
Antracol	kg	64	0.4	0.2	12.8
Trimiltox Forte	kg	70	0.046	0.023	1.6
Miragefe 75 WP	gr.	1.095	36	18	19.7
SUBSOL	lit.				0
- Insects Traps					**0**
2) Total Labor (Provided by Farmers)	Man-day	35	8.1	4.05	**142**

Item	Unit	Unit Price (Quetzal)	Quantity per Cuerda	Quantity Used (0.5 Cuerda)	Total (Quetzal/Farm)
		Treatment 3, (Insects Traps and Fungicide SUBSOL)			
Production Cost (Only Inputs Provided by JICA)					**717.9**
1) Inputs					**717.9**
- Seeds	qq.	224	3	1.5	**336.0**
- Fertilizers					**121.3**
15-15-15	qq.	103	0.58	0.29	29.9
Urea	qq.	95	0.188	0.094	8.9
Compost	qq.	33	5	2.5	82.5
Folliar	lit.				0.0
- Insecticides					**14.2**
Vydate	lit.				0.0
Sistemin	lit.	96	0.1	0.05	4.8
Monarca	lit.	188	0.1	0.05	9.4
- Fungicides					**86.4**
Curzate	kg	192	0.5	0.25	48.0
Antracol	kg	64	0.4	0.2	12.8
Trimiltox Forte	kg	70	0.046	0.023	1.6
Miragefe 75 WP	gr.				0.0
SUBSOL	lit.	80	0.6	0.3	24.0
- Insects Traps	Traps	10	32	16	**160.0**
2) Total Labor (Provided by Farmers)	Man-day	35	8.1	4.05	**142.0**

Table K1 Input Used and Cost per Each Treatment of Potato Model Farm (2/2)

Item	Unit	Unit Price (Quetzal)	Quantity per Cuerda	Quantity Used (0.17 Cuerda)	Total (Quetzal/Farm)
		Treatment 2, S1. (1 kg Compost per $m^{2)}$			
Production Cost (Only Inputs Provided by JICA)					**210.0**
1) Inputs					**210.0**
- Seeds	qq.	224	3	0.5	**112.0**
- Fertilizers					**66**
15-15-15	qq.	103	0.582	0.097	10.0
Urea	qq.	95	0.132	0.022	2.1
Compost	qq.	33	9.78	1.63	53.8
Folliar	lit.			0	0
- Insecticides				0	**4.7**
Vydate	lit.			0	0
Sistemin	lit.	96	0.1	0.0167	1.6
Monarca	lit.	188	0.1	0.0167	3.1
- Fungicides					**27**
Curzate	kg	192	0.5	0.0833	16.0
Antracol	kg	64	0.4	0.0667	4.3
Trimiltox Forte	kg	70	0.046	0.0077	0.5
Miragefe 75 WP	gr.	1.095	36	6.0000	6.6
SUBSOL	lit.				0
- Insects Traps					**0**
2) Total Labor (Provided by Farmers)	Man-day	35	8.1	1.35	**47.3**

Item	Unit	Unit Price (Quetzal)	Quantity per Cuerda	Quantity Used (0.17 Cuerda)	Total (Quetzal/Farm)
		Treatament 2, S2. (2 kg Compost per $m^{2)}$			
Production Cost (Only Inputs Provided by JICA)					**255.2**
1) Inputs					**255.2**
- Seeds	qq.	224	3	0.5	**112.0**
- Fertilizers					**116.6**
15-15-15	qq.	103	0.432	0.072	7.4
Urea	qq.	95	0.102	0.017	1.6
Compost	qq.	33	19.56	3.26	107.6
Folliar	lit.				0.0
- Insecticides					**4.7**
Vydate	lit.				0.0
Sistemin	lit.	96	0.1	0.0167	1.6
Monarca	lit.	188	0.1	0.0167	3.1
- Fungicides					**21.9**
Curzate	kg	192	0.5	0.0833	16.0
Antracol	kg	64	0.4	0.0667	4.3
Trimiltox Forte	kg	70	0.046	0.0077	0.5
Miragefe 75 WP	gr.	1.095	6	1.0000	1.1
SUBSOL	lit.				0.0
- Insects Traps					**0.0**
2) Total Labor (Provided by Farmers)	Man-day	35	8.5	1.4	**49.0**

Item	Unit	Unit Price (Quetzal)	Quantity per Cuerda	Quantity Used (0.17 Cuerda)	Total (Quetzal/Farm)
		Treatament 2, S3. (3 kg Compost per $m^{2)}$			
Production Cost (Only Inputs Provided by JICA)					**311.8**
1) Inputs					**311.8**
- Seeds	qq.	224	3	0.5	**112.0**
- Fertilizers					**167.7**
15-15-15	qq.	103	0.288	0.048	4.9
Urea	qq.	95	0.072	0.012	1.1
Compost	qq.	33	29.4	4.9	161.7
Folliar	lit.				0.0
- Insecticides					**4.7**
Vydate	lit.				0.0
Sistemin	lit.	96	0.1	0.0167	1.6
Monarca	lit.	188	0.1	0.0167	3.1
- Fungicides					**27.4**
Curzate	kg	192	0.5	0.0833	16.0
Antracol	kg	64	0.4	0.0667	4.3
Trimiltox Forte	kg	70	0.046	0.0077	0.5
Miragefe 75 WP	gr.	1.095	36	6.0000	6.6
SUBSOL	lit.				0.0
- Insects Traps					**0.0**
2) Total Labor (Provided by Farmers)	Man-day	35	9	1.5	**52.5**

Table K2 Data on Daily Climatic Conditions Measured in Quetzaltenango Meteorological Station

	Rainfall (mm)				Maximum Temperature (°C)				Minimum Temperature (°C)				Sunshines (hours)			
Day	Aug.	Sept.	Oct.	Nov.	Aug.	Sept.	Oct.	Nov.	Aug.	Sept.	Oct.	Nov.	Aug.	Sept.	Oct.	Nov.
1		0.0	24.6	9.1		19.6	21.2	21.4		13.5	12.3	11.4	10.7	0.4	3.4	4.7
2		11.1	0.8	0.2		20.8	22.6	21.4		12.5	11.6	8.8	6.6	6.5	5.0	7.4
3		1.8	5.9	0.0		22.4	21.5	21.6		12.1	11.5	5.4	6.0	5.6	4.3	7.8
4		3.7	21.9	0.0		22.0	22.0	23.0		10.8	10.2	3.8	9.1	2.0	7.3	8.1
5		3.4	0.0	0.3		22.8	20.6	21.8		7.7	9.6	10.8	9.5	6.2	4.1	8.4
6		0.0	0.0	0.0		23.2	20.0	21.0		11.0	11.2	8.4	9.2	2.8	4.1	5.3
7		0.0	0.0	0.4		23.4	20.6	20.0		7.6	10.4	11.2	9.6	4.6	3.9	7.5
8		3.2	31.0	0.0		23.0	21.0	19.4		11.6	10.2	10.2	8.6	4.8	2.8	5.0
9		4.6	5.4	0.0		23.2	22.4	20.3		9.4	8.0	9.1	9.9	3.5	5.7	2.1
10		10.3	2.3	1.2		22.2	23.2	22.3		9.8	7.0	5.4	6.0	5.3	6.2	5.0
11		2.8	0.0	2.1		21.8	21.5	22.0		9.6	6.6	8.2	3.9	4.8	7.2	7.5
12		0.0	0.4	0.0		22.7	20.2	21.8		11.3	11.5	2.1	5.6	4.6	7.6	7.5
13		0.0	0.2	0.0		23.1	20.8	19.1		10.6	10.5	10.6	8.8	5.2	8.7	9.4
14		15.9	0.0	0.0		21.6	21.4	19.9		10.2	11.6	12.9	10.8	3.6	3.8	3.7
15		1.0	0.0	0.0		22.3	21.8	21.8		10.4	7.9	6.6	9.9	5.5	3.8	3.9
16		0.0	0.0	0.5		22.4	23.5	23.0		11.0	8.5	8.6	7.0	9.9	5.8	6.6
17		0.0	0.0	0.0		22.1	22.7	15.2		5.9	4.7	10.8	8.3	7.9	8.4	7.3
18		0.0	0.0	0.0		22.6	21.6	21.6		5.7	6.4	-0.4	2.3	5.7	7.5	6.8
19		9.9	0.0	0.0		16.4	22.0	20.0		9.8	1.4	3.2	6.6	2.9	5.3	8.3
20	0.0	5.0	0.0	0.0	22.4	18.3	20.6	20.8	6.0	7.5	4.4	7.2	7.7	3.6	5.6	5.8
21	0.0	8.2	0.0	0.0	23.0	17.5	22.4	18.4	5.7	12.6	3.6	9.0	10.8	0.1	4.9	1.6
22	1.1	2.0	0.0	0.0	20.9	18.2	23.4	18.5	12.1	11.2	10.8	8.0	1.6	0.7	8.3	9.4
23	4.4	5.8	0.0	0.0	20.6	17.2	21.4	22.2	12.0	11.4	5.6	-0.4	6.6	0.1	7.1	8.6
24	4.4	5.9	0.0	0.0	22.6	15.8	21.6	22.2	11.6	12.0	3.2	1.9	8.4	0.0	6.2	8.4
25	0.0	1.7	7.8	0.0	20.6	19.4	23.2	24.2	10.0	11.6	7.6	4.2	8.1	0.0	4.8	8.0
26	0.0	1.6	0.0	0.0	19.6	20.8	22.0	23.6	11.6	11.6	5.8	3.0	2.3	0.9	3.6	9.4
27	0.0	22.3	0.3	0.0	21.0	17.4	21.3	17.8	9.2	11.2	11.3	10.2	2.0	0.0	0.8	1.4
28	16.7	11.3	6.1	0.0	20.0	20.2	20.2		11.0	11.0	11.7		2.3	2.2	2.7	
29	7.7	11.4	0.0		21.8	20.8	21.4		12.4	11.8	10.8		5.8	1.5	5.9	
30	0.0	26.3	0.0		23.1	19.6	22.1		8.4	11.6	9.9		8.9	0.5	3.9	
31	0.0		2.1		21.0		21.4		13.2		11.2		7.2		4.5	

Table K3 Incedence of Late Blight and General Conditions of Potato Model Farm

Name or Farm Owner	Based on Observation made on 28/9/02		Based on Observation made on 21/11/02	
	% of Plants affected by Late Blight	General Conditions of Potato Plants	% of Plants affected by Late Blight	General Conditions of Potato Plants
Miguel Perez	2 %	Regular Devolopment	15 %	Good Conditions
Obispo Escobar	5 %	Good Development	30 %	Regular conditions
Santos Díaz	2 %	Good Development	10 %	Good Conditions
Juan Díaz	5 %	Is the best farm	30 %	Stems broken by wind, good conditions
Jacinto Díaz	5 %	Very Good Development	30 %	Stems broken by wind, good conditions
Rosmery Monterroso	20 %	Poor development (no care by farmer owner)	60 %	Poor development (no care by farmer owner)
Hipolita Cabrera	5 %	Good Development	25 %	Regular conditions
María Monterroso	5 %	Good Development	25 %	Regular conditions
Ernesto Cabrera	**2 %**	**Very good farm; Plants with elongated stems.**	**80 %**	Poor conditions
Emilio Cabrera	8 %	Good Development	30 %	Good Conditions

Table K4 Unit Yield of Potatoes in Each Section in the Model Farms

Los Perez		T1	T2			T3		T4
			s1	s2	s3	s1	s2	
Class-1		1.57	1.04	1.90	1.96	0.88	1.10	0.00
Class-2		1.57	1.04	2.02	2.00	0.96	1.40	2.60
Class-3		3.53	2.34	4.35	4.41	2.05	2.80	3.40
	Sub-total	**6.67**	**4.42**	**8.27**	**8.37**	**3.89**	**5.30**	**6.00**
Very small potato		3.93	2.60	4.86	4.87	2.28	3.11	2.64
Damaged potato		0.40	0.26	0.49	0.50	0.23	0.31	0.76
Total	Total	**11.00**	**7.28**	**13.62**	**13.74**	**6.40**	**8.72**	**9.40**
% of potato that is too small		35.73	35.71	35.68	35.44	35.63	35.67	28.09
% of potato damaged by insect/diseaseas		3.64	3.57	3.60	3.64	3.59	3.56	8.09

Los Morales		T1	T2			T3		T4
			s1	s2	s3	s1	s2	
Class-1		0.60	0.00	0.00	0.00	0.00	0.00	2.00
Class-2		2.08	0.00	0.00	0.00	0.00	4.24	0.00
Class-3		0.90	1.62	3.90	1.81	3.72	1.84	2.44
	Sub-total	**3.58**	**1.62**	**3.90**	**1.81**	**3.72**	**6.08**	**4.44**
Very small potato		2.17	3.12	2.10	0.98	3.24	3.24	2.50
Damaged potato		0.57	0.30	0.18	0.09	0.28	0.28	0.30
	Total	**6.32**	**5.04**	**6.18**	**2.88**	**7.24**	**9.60**	**7.24**
% of potato that is too small		34.34	61.90	33.98	34.03	44.75	33.75	34.53
% of potato damaged by insect/diseaseas		9.02	5.95	2.91	3.13	3.87	2.92	4.14

Los Diaz		T1	T2			T3		T4
			s1	s2	s3	s1	s2	
Class-1		0.34	0.00	0.00	0.00	1.04	0.50	0.36
Class-2		1.98	1.17	1.27	3.78	2.08	4.07	3.32
Class-3		1.96	2.42	2.60	3.66	2.40	3.00	2.40
	Sub-total	**4.28**	**3.59**	**3.87**	**7.44**	**5.52**	**7.57**	**6.08**
Very small potato		1.30	2.62	2.83	3.18	3.60	1.76	1.40
Damaged potato		0.32	0.69	0.74	2.04	0.60	0.44	0.38
	Total	**5.90**	**6.90**	**7.44**	**12.66**	**9.72**	**9.77**	**7.86**
% of potato that is too small		22.03	37.97	38.04	25.12	37.04	18.01	17.81
% of potato damaged by insect/diseaseas		5.42	10.00	9.95	16.11	6.17	4.50	4.83

Sector-1		T1	T2			T3		T4
			s1	s2	s3	s1	s2	
Class-1		0.62	1.14	1.50	2.01	1.24	0.00	0.00
Class-2		9.47	1.80	2.94	4.25	2.66	0.00	2.19
Class-3		1.55	1.44	1.26	2.91	5.52	0.00	0.96
	Sub-total	**11.64**	**4.38**	**5.70**	**9.17**	**9.42**	**0.00**	**3.15**
Very small potato		2.48	2.10	2.58	2.01	3.56	0.00	2.46
Damaged potato		1.40	7.68	8.10	11.19	3.70	0.00	7.11
	Total	**15.52**	**14.16**	**16.38**	**22.37**	**16.68**	**0.00**	**12.72**
% of potato that is too small		15.98	14.83	15.75	8.99	21.34	-	19.34
% of potato damaged by insect/diseaseas		9.02	54.24	49.45	50.02	22.18	-	55.90

Los Cabrera		T1	T2			T3		T4
			s1	s2	s3	s1	s2	
Class-1		1.60	2.16	0.78	1.92	1.48	1.20	1.92
Class-2		1.88	4.02	1.50	2.88	2.88	2.24	2.04
Class-3		1.80	0.00	4.68	1.98	2.40	2.12	2.00
	Sub-total	**5.28**	**6.18**	**6.96**	**6.78**	**6.76**	**5.56**	**5.96**
Very small potato		0.74	0.96	1.68	1.68	3.04	1.56	1.22
Damaged potato		2.28	1.80	0.96	1.08	0.80	1.40	3.86
	Total	**8.30**	**8.94**	**9.60**	**9.54**	**10.60**	**8.52**	**11.04**
% of potato that is too small		8.92	10.74	17.50	17.61	28.68	18.31	11.05
% of potato damaged by insect/diseaseas		27.47	20.13	10.00	11.32	7.55	16.43	34.96

Table K5 Reasons of Low Yield of Potatoes in Each Section in the Model Farms (1/3)

No	Reason	Seleccion	LOS PEREZ (Miguel Perez)							LOS MORALES (Maria Monterroso(T1) y Ernesto Cabrera)						
			T1	T2			T3		T4	T1	T2			T3		T4
				s1	s2	s3	s1	s2			s1	s2	s3	s1	s2	
1	**Soil for potato cultivation**	(1)Good soil (2)Relatively good soil (3)Medium (4)Bad (5)Very bad	**2.00**	**2.00**	**2.00**	**2.00**	**3.00**	**2.00**	**3.00**	**3.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**3.00**
2	**Location for sunshine**	(1)Good soil (2)Relatively good soil (3)Medium (4)Bad (5)Very bad	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**3.00**	**4.00**	**4.00**	**4.00**	**4.00**	**3.00**	**3.00**	**3.00**
3	**Cooperation by land owner**	(1)Good soil (2)Relatively good soil (3)Medium (4)Bad (5)Very bad	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
4	**Potato seed**	(1)Good (2)Medium (3)Bad	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**
5	**Damage by disease 1 (Tizon)**	(1)Not damaged (2)damaged (3)50% damaged (4)Very damaged	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**4.00**	**4.00**	**4.00**	**3.00**	**3.00**	**3.00**
6	**Damage by disease**	(1)Not damaged (2)damaged (3)50% damaged (4)Very damaged	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**2.00**	**1.00**	**1.00**	**1.00**	**2.00**	**2.00**	**2.00**
7	**Insect/pest**	(1)No damaged(below 5%) (2)Damaged (6-25%) (3)Mediumdamaged (26-49%) (4)Severely damaged (above 50%)	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**2.00**	**2.00**	**2.00**	**1.00**	**3.00**	**1.00**	**1.00**	**1.00**
8	**Rainfall/humid**	(1)Much rain (causa daño) (2)Sufficient rain (bieno humedo papa) (3)Small rain (causa poco daño) (4)No rain (causa daño grande)	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**
9	**Other reason: Wind with hail**	(1)very hard wind (severe damage) (2)hard wind (strong damage) (3)soft wind (light damage) (4) no wind (no damage)	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	**4.00**	**3.00**	**1.00**	**1.00**	**1.00**	**2.00**	**2.00**	**3.00**

Comments:
Basically the potato seed had high quality, but sprout of total potatoes is negatively affected because dormancy of potatoes was broken by not careful medical treatment.
Few rain during the proccess of filling of tubers in all the parcels is considered to become serious causes of decrease of the yield.

Table K5 Reasons of Low Yield of Potatoes in Each Section in the Model Farms (2/3)

No	Reason	Seleccion	LOS DIAZ (Santos (T1-T3, s2 y T4) y (Jacinto Díaz							SECTOR I (Obispo Escobar T1, Juan Díaz T2,s1,s2,s3 y T4.						
			T1	T2			T3		T4	T1	T2			T3		T4
				s1	s2	s3	s1	s2			s1	s2	s3	s1	s2	
1	**Soil for potato cultivation**	(1)Good soil (2)Relatively good soil (3)Medium (4)Bad (5)Very bad	**3.00**	**4.00**	**4.00**	**4.00**	**4.00**	**3.00**	**3.00**	**3.00**	**1.00**	**1.00**	**1.00**	**3.00**	**4.00**	**1.00**
2	**Location for sunshine**	(1)Good soil (2)Relatively good soil (3)Medium (4)Bad (5)Very bad	**4.00**	**2.00**	**2.00**	**2.00**	**3.00**	**4.00**	**4.00**	**2.00**	**2.00**	**2.00**	**3.00**	**3.00**	**3.00**	**3.00**
3	**Cooperation by land owner**	(1)Good soil (2)Relatively good soil (3)Medium (4)Bad (5)Very bad	**1.00**	**3.00**	**3.00**	**3.00**	**3.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**5.00**	**2.00**
4	**Potato seed**	(1)Good (2)Medium (3)Bad	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**
5	**Damage by disease 1 (Tizon)**	(1)Not damaged (2)damaged (3)50% damaged (4)Very damaged	**2.00**	**3.00**	**3.00**	**3.00**	**3.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**4.00**	**2.00**
6	**Damage by disease**	(1)Not damaged (2)damaged (3)50% damaged (4)Very damaged	**2.00**	**1.00**	**1.00**	**1.00**	**2.00**	**2.00**	**2.00**	**2.00**	**1.00**	**1.00**	**1.00**	**1.00**	**2.00**	**1.00**
7	**Insect/pest**	(1)No damaged(below 5%) (2)Damaged (6-25%) (3)Mediumdamaged (26-49%) (4)Severely damaged (above 50%)	**1.00**	**2.00**	**2.00**	**2.00**	**2.00**	**1.00**	**1.00**	**2.00**	**4.00**	**3.00**	**4.00**	**2.00**	**4.00**	**4.00**
8	**Rainfall/humid**	(1)Much rain (causa daño) (2)Sufficient rain (bieno humedo papa) (3)Small rain (causa poco daño) (4)No rain (causa daño grande)	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**
9	**Other reason: Wind with hail**		**3.00**	**1.00**	**1.00**	**3.00**	**3.00**	**4.00**	**4.00**	**3.00**	**2.00**	**2.00**	**2.00**	**3.00**	**4.00**	**2.00**

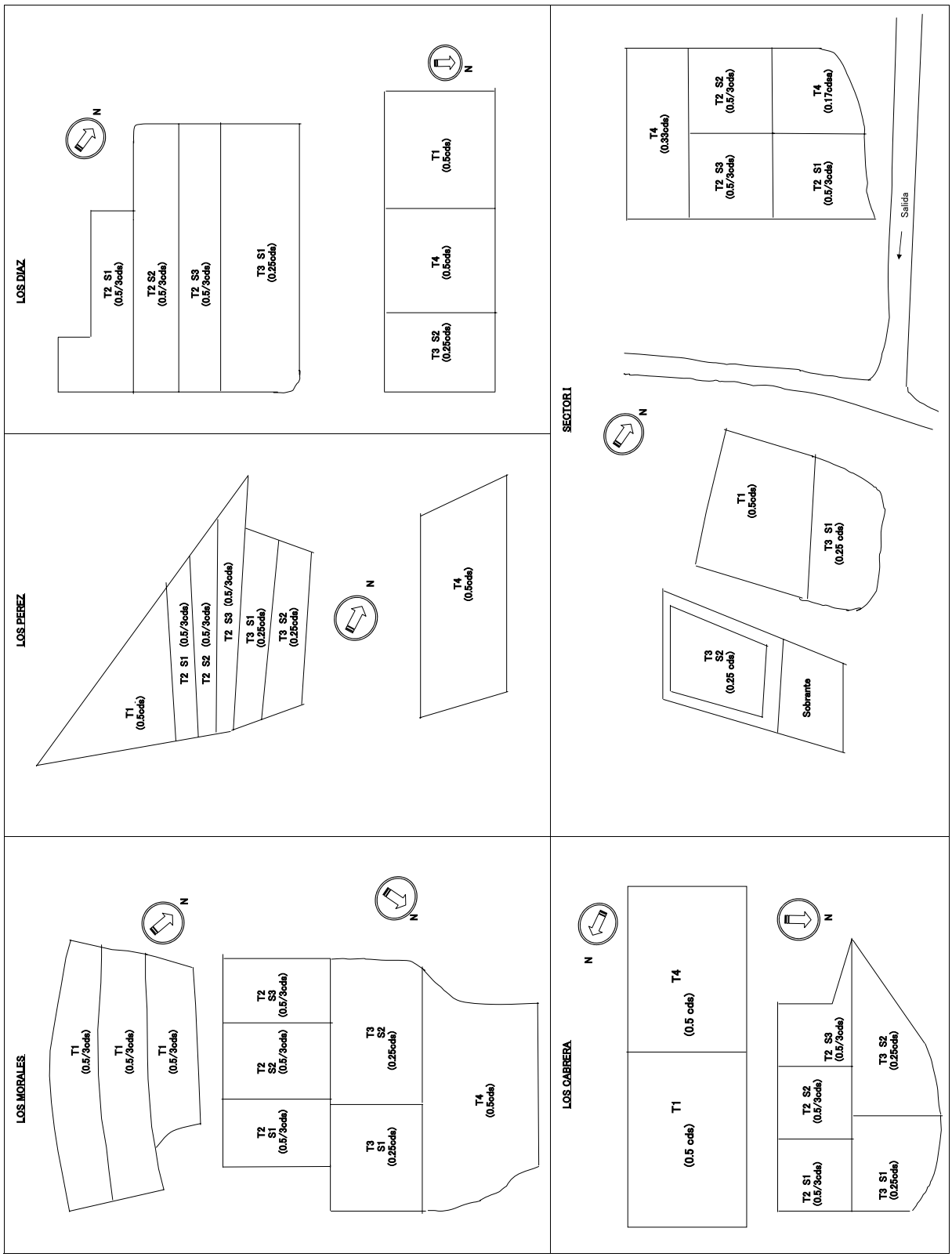
Comments:
Basically the potato seed had high quality, but sprout of total potatoes is negatively affected because dormancy of potatoes was broken by not careful medical treatment.
Few rain during the proccess of filling of tubers in all the parcels is considered to become serious causes of decrease of the yield.

Table K5 Reasons of Low Yield of Potatoes in Each Section in the Model Farms (3/3)

No	Reason	Seleccion	LOS CABRERA (Emilio Cabrera T1 y T4, Hipolita T2 y T3.)						
			T1	T2			T3		T4
				s1	s2	s3	s1	s2	
1	**Soil for potato cultivation**	(1)Good soil (2)Relatively good soil (3)Medium (4)Bad (5)Very bad	**2.00**	**3.00**	**3.00**	**3.00**	**2.00**	**2.00**	**2.00**
2	**Location for sunshine**	(1)Good soil (2)Relatively good soil (3)Medium (4)Bad (5)Very bad	**2.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**4.00**
3	**Cooperation by land owner**	(1)Good soil (2)Relatively good soil (3)Medium (4)Bad (5)Very bad	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
4	**Potato seed**	(1)Good (2)Medium (3)Bad	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**
5	**Damage by disease 1 (Tizon)**	(1)Not damaged (2)damaged (3)50% damaged (4)Very damaged	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**
6	**Damage by disease**	(1)Not damaged (2)damaged (3)50% damaged (4)Very damaged	**2.00**	**1.00**	**1.00**	**1.00**	**2.00**	**2.00**	**2.00**
7	**Insect/pest**	(1)No damaged(below 5%) (2)Damaged (6-25%) (3)Mediumdamaged (26-49%) (4)Severely damaged (above 50%)	**3.00**	**2.00**	**2.00**	**2.00**	**2.00**	**2.00**	**3.00**
8	**Rainfall/humid**	(1)Much rain (causa daño) (2)Sufficient rain (bieno humedo papa) (3)Small rain (causa poco daño) (4)No rain (causa daño grande)	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**
9	**Other reason: Wind with hail**	(1)very hard wind (severe damage) (2)hard wind (strong damage) (3)soft wind (light damage) (4) no wind (no damage)	**4.00**	**3.00**	**3.00**	**3.00**	**4.00**	**4.00**	**3.00**

Comments:
Basically the potato seed had high quality, but sprout of total potatoes is negatively affected because dormancy of potatoes was broken by not careful medical treatment.
Few rain during the proccess of filling of tubers in all the parcels is considered to become serious causes of decrease of the yield.

FIGURE



THE VERIFICATION STUDY OF MASTER PLAN ON SUSTAINABLE RURAL DEVELOPMENT FOR THE REDUCTION OF POVERTY IN THE CENTRAL HIGHLAND REGION	**Figure K 1** **Experimental Plan for Demonstration Farms**
Japan International Cooperation Agency (JICA)	

ANNEX 1 – L
MINI IRRIGATION PLAN
(PALESTINA)

ANNEX 1 - L

MINI IRRIGAITON PLAN
(PALESTINA)

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Attachments

L. MINI-IRRIGATION PLAN (PALESTINA)

1. Background

In Palestina area, farmers cultivate traditional crops such as maize and potato under the rainfed condition. Because of small land holding, climatic and topographic limitations, agricultural production cannot sustain their families. To stabilize and increase farmers' income, it is necessary to introduce small scale irrigation by utilizing the spring water which is presently not utilized effectively. The objective of the projects was to increase and stabilize farmers' income through 1)increase of the crop productivity with irrigation system and vinyl houses, 2)crop diversification, and 3)organization of users' association.

However, the project was canceled on March 2002 because of the request from MAGA. The request was made due to the fact that a group of people strongly opposed to the project and it might cause disturbances to the project and the study team.

The claims made by this opposing group are as follows.

1) The planned water source (Los Molinos spring) is exclusively for potable water supply purpose.
2) There are still some communities that do not receive potable water supply and the water source should be kept until they will have the potable water supply.
3) The said water source produces only 15 lit/sec, which is not enough to provide water for irrigation purpose.
4) They are not willing to bear any obligations for installing water supply system such as hand labor or installation cost since they think it is the obligation of the Municipality.

In response to these claims, MAGA and the JICA Study Team explained as follows.

1) The Molinos water source produces 23 lit/sec, which is sufficient for providing both for potable water supply and irrigation water.
2) The mini-irrigation project will use only 8% of the water from this source and, hence, there will be no affect on potable water supply.
3) For the utilization of water from the Molinos spring, MAGA and JICA study team already obtained the permission from the Mayor of Palestina de Los Altos municipality (municipal council) and also obtained official permission from the water committee of the beneficiaries of Molinos

water source.

4) MAGA will assist the group in order to find funding sources for installation of potable water supply system.

Although several meetings had been held among the organization and persons concerned, the opposing group never showed any intention to reach an agreement. Considering this fact, Vice-minister of MAGA decided to request cancellation of the project with concerning about the possibility of security problem to the Study Team.

2. Detail Background of the Issue

(1) Potable water system of the Palestina de Los Altos:

A potable water supply system is installed in Palestina de Los Altos by using water from Los Molinos spring. This system provides water approximately 1,400 households who reside in and around the project area. To participate in the water supply system, payment of installation fee (about Q800 to Q1,000 as of March 2002) is necessary. Anyone who pays this fee can be a beneficiary of the water supply system.

(2) Los Molinos water spring:

It is located near the center of the municipality and its ownership belongs to the municipality. According to the survey made by INFOM, the water spring produces 15 lit/sec. On the other hand, the study team also checked the water amount twice in cooperation with the Mayor in 2001 and it turned out to be 23lit/sec. About 33% of the water discharge are used for supplying potable water.

(3) The opposing group

When this system was installed in Palestina de Los Altos, there was a group of people who were reluctant to join the project since they did not want to pay any cost or to offer hand labor for installation. A political leader, who has a long-lasting conflict with present mayor, led these people and started an opposition movement against the mayor of municipality by saying that he would install free water supply system for them. Since then, the group has been opposing to the municipal authority.

Some of the people, however, started to leave this opposing group and join to the water supply system by paying necessary cost because the political leader has never realized the free water supply system as he promised.

Presently, the group consists of approximately 20 to 30 people. According to them, they are from the communities of Cruz Verde, Cruz del Mexicano and Buena Vista that are located outside of the project area. There is neither legal representative nor authorized representative in the group such as Alcalde Auxiliar of these communities except the said political leader.

(4) Discussion made between MAGA-JICA Study Team and the opposing group

The outline of the discussion between MAGA-JICA Study Team and the opposing group are as follows.

Nov. 16, 2002

A group of about 20 people visited the provincial office of MAGA Quetzaltenango. According to them, they are from the communities of Cruz Verde, Cruz del Mexicano and Buena Vista, which are all located outside of the project area and requested following two points.

1) To install potable water supply system for them before the implementation of the mini-irrigation project.
2) To use the fund of JICA for installation of their potable water supply instead of using for the mini-irrigation project.

In reply with this, MAGA and JICA study team explained following points.

1) Background and objectives of the Study and the mini-irrigation project
2) Amount of water available from Los Molinos water spring is 23 lit/sec.
3) The water use from Los Molinos spring is estimated as 8% for the planned mini-irrigation system and 33% for the present water system. The rest of 59% is still available for the future beneficiaries of potable water supply.
4) JICA do not have any budget for potable water supply system for this group's request.
5) MAGA is willing to give assistance in order to find funding source for them to have potable water supply system installed.

Dec.18, 2001

One of the persons from the opposing group made a phone call to a counterpart staff of MAGA. He protested MAGA for giving no answer regarding funding source and threatened the counterpart unless the mini-irrigation is stopped.

Dec. 19, 2001

The JICA study team discussed with two vice-ministers about the measures to deal with this problem. Then vice-ministers decided to make survey on the background of these communities and the opposing group by using a NGO that has enough experience in the area.

Jan. 29, 2002

Based on the survey result that the NGO made in the last few weeks of January, the vice-minister judged and explained that there was no problem for implementing the project.

Jan. 30, 2002

The use of water from Los Molinos for irrigation was officially admitted by the municipal council. (During the planning stage of the project, MAGA and the JICA Study Team confirmed that the ownership of the spring is under the Municipality and obtained permission from the mayor of the municipality.)

Feb. 15, 2002

A meeting was held with the opposing group. The meeting was organized and chaired by the vice-minister of MAGA and several authorities such as a representative of Palestina de Los Altos Municipality, the governor of Quetzaltenango, Ministry of Public, MAGA central office and provincial office also attended. Purposes of the meeting were 1) to find a solution for the problem of potable water supply and 2) to explain that water is sufficient to cover both for irrigation and potable water supply, and implementation of the project would not affect on the potable water supply. However, the opposing group showed no interest to reach an agreement at all during the meeting and, therefore, no agreement was made in this meeting.

Feb. 25, 2002

A meeting was held at Caserío Cruz Verde with the opposing group according to their request. The meeting was held without any authorities such as vice-minister so that people feel free to talk. Only MAGA counter personnel and a person from NGO (sub-contractor of the JICA study team) attended to talk with the opposing group. The objectives of the meeting were 1) to have free discussion with the opposing group to find a solution and 2) to see how powerful the leader of the group is in influencing people. It is estimated that about 100 to 140 persons were present at the meeting and about 30 to 60 persons were actually participating in the meeting. In the

meeting, the representatives of MAGA-JICA side were threatened and forced to sign on a Minutes of Meeting (contents of the minutes was not clearly explained).

Feb. 27, 2002

The JICA study team and the NGO explained vice-minister about the situation of the meeting on Feb 25. The vice-minister considered that this problem is political issue rather than technical issue according to his analysis on the attitude of the opposing group. Then he promised to persuade the leader of the group through a politician from Quetzaltenango with the condition that the irrigation project would use another water source. And He told to the Study Team that he would make a decision on implementation after seeing the result of it.

Mar. 4, 2002

It was reported that the leader of the opposing group did not belong to any political party at this moment and it was impossible to persuade them through a politician. Based on this fact, the vice-minister of MAGA thought that it might cause any problems or disturbances if the project was implemented and security of the Study Team could not be secured by 100%. With this consideration, the vice-ministry judged that it would be safer to cancel the mini-irrigation project and verbally requested the JICA Study Team to cancel the project.

Mar. 6, 2002

The JICA Study Team received the official letter that requested cancellation of the mini-irrigation project from the vice-minister of MAGA (see Attachment).

Mar. 9, 2002

The Vice-minister of MAGA and JICA Study Team hold an explanation meeting with the Mayor of Palestina de Los Altos and expected beneficiaries of mini-irrigation project about the cancellation of the project. Although the strong willingness for implementation of the project was observed, the expected beneficiaries basically accepted its cancellation.

3. Analysis of the Problem

3.1 Reasons for opposing movement

Following two points are considered as the major reasons for opposing the project.

(1) Political background

There has been a long-lasting conflict between a political leader and the present mayor. The political leader has been trying to give negative impact on the present mayor, and has been disturbing regardless of type of projects. From this background, it is presumed that the political leader agitated the group of people and opposed the mini-irrigation project.

(2) Water source

Water source is originally used for drinking purpose and covers both project area and non-project area. For this reason, it is easy for water users to worry about the future water availability and to make complains about the projects. Although the irrigation project will not affect potable water supply at all, this background on water source could be a part of the reason for opposing.

As it is mentioned above, detail explanation from technical points of view was made for several times. Besides, use of alternative water source was proposed for irrigation. However, the group did not accept any explanation or proposal with no reason. From this fact, the main reason for opposing is simply considered as political one.

3.2 Reasons for break down of the negotiation

(1) Purpose of the opposing group

The purpose of the political leader is simply to give a negative impact on the present mayor. Therefore, the group had no intention to reach an agreement at all and accept neither explanation nor proposal. This attitude of the opposing group was the main reason for breaking down the negotiation.

(2) Limited time and security reason

Negotiation with the opposing group needs sufficient time for continuous explanation and persuasion by proposing various types of alternative solution. On the other hand, the study period is quite limited and the Team was necessary to avoid any kind of possibility of security problems. For this reasons, continuation of the negotiation was quite difficult and resulted in break down of the negotiation.

3.3 Reasons for unpredictability of the problem

(1) Existence of the opposing group outside of the project area

Basically the study was made inside the project area and less attention was paid to the surrounding area. Therefore existence of potential opposing group was not

identified in advance.

(2) Doubt for project implementation

People in the rural area have a tendency that they do not believe any project until it is realized. The opposing group was not an exception and seemed to have a doubt in realization of the irrigation project. Therefore it is considered that the group started opposing when the project implementation become more realistic. For this tendency, it is considered to be hard to predict the existence of opposing people before the project implementation.

(3) Reluctance for providing negative information

The people in the rural area are reluctant to provide negative information when a project is going to be implemented in their community, since the negative information might affect implementation of the project. This reluctance could be a cause for difficulty in investigating the existence of potential opposing group

4. Potential Counter Measures for Future Projects

Considering the above analysis, following potential counter measures would be necessary to avoid problems in implementing similar projects in future.

(1) Potential measures for investigating existence of potential opposing group

1) The study on social aspect shall be conducted both inside the project area and its surrounding area. This survey would be more important especially for the case that water source covers larger area (than project area) or water source is multipurpose one.

2) Detail investigation shall be made for non-participants of the past projects. By interviewing the non-participants about the reasons, background, etc., people's relation inside the community and/or in concerning areas would be figured out more clearly.

3) In case that strong leader exists in the community, there is a possibility of existence of an opposing leader. Therefore, the background of the leader shall be investigated more carefully.

(2) Potential measures when the existence of opposing group is confirmed

1) Detail explanation shall be made regarding project impact to the people inside the project area and surrounding communities in order to have clear understanding. It is preferable to have meetings with a small number of people. Meeting with large number of people is often led and controlled by a few persons and hence, misunderstanding might arise. In case communication among community people is poor, it is necessary to take sufficient time so that the staff can visit even each house in the communities.

2) In early stage of the project (just before the implementation), detail explanation shall be continuously made to the opposing group and a promise that the group will not disturb the project shall be made. The promise shall be made in a written document (although it is quite difficult).

3) In case that the opposing group is from inside the project area, several projects shall be implemented so that as many as people in the community will be benefited by any of the projects.

4) It is also necessary to make a warning, in written document, that legal action will be taken if any violent disturbances occur. This type of warning could be used as preventive measure in relatively extreme case.

ATTACHMENT

MINISTERIO DE AGRICULTURA, GANADERIA Y ALIMENTACION

Guatemala, 6 de marzo de 2002
VMG-OF-164-02

SEÑOR
KENJIRO ONAKA
JEFE DEL EQUIPO DE ESTUDIO DE JICA
PRESENTE

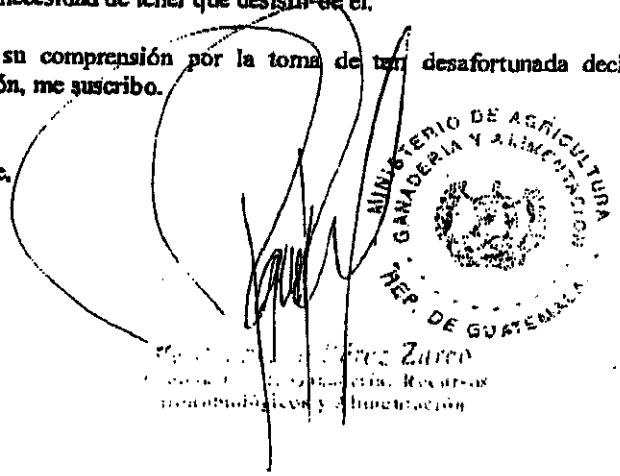
Estimado señor:

Por medio de la presente, le estamos solicitando que se considere la suspensión de la ejecución del Proyecto de Mini-Riego en la Comunidad de Palestina de los Altos, Quetzaltenango.

La solicitud la hacemos debido a que hemos detectado que existe un conflicto entre la población del lugar por la utilización de las fuentes de agua que provee al sistema de riego. A pesar de los múltiples esfuerzos por parte de la coordinación departamental del MAGA y este Despacho hemos concluido que existe un alto riesgo para la seguridad personal de la Delegación Japonesa que ejecuta el Proyecto. Por lo tanto, consideramos que a pesar de estar conscientes de la importancia y el impacto positivo que el Proyecto provocaría en la Comunidad, nos vemos en la lamentable necesidad de tener que desistir de él.

Esperando su comprensión por la toma de tan desafortunada decisión y reiterando nuestra consideración, me suscribo.

Atentamente,



c.c. Sr. Masami Shukonobe
Representante de JICA/JOCV en Guatemala
Lic. Jorge Rolando Escoto Marroquín
Ministro de Agricultura, Ganadería y Alimentación

ANNEX 1 – M
PLAN FOR MIGRANT PEOPLE TO THE COASTAL AREA (PALESTINA)

ANNEX 1 - M

PLAN FOR MIGRANT PEOPLE TO THE COASTAL AREA (PALESTINA)

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M. PLAN FOR MIGRANT PEOPLE TO THE COASTAL AREA

1. 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 bwetween April and December very year.

Those who migrate to fincas in Mazatenango and Retalhuleu must live in huts with no safe water sources, toilets or any health services available near by. It is reported that transmigrants suffer from diarrhea, intestinal infections and other water related illnesses together with pesticides related-illness and presumably tropical diseases.

The living condition of the migrants should be improved. 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.

2. Objectives

The main objectives of the project are as follows:

1) To reduce water born illness by introducing the use of water filters.
2) To reduce the pesticide-use related illness by introducing the appropriate use of pesticides through training
3) To reduce malaria and dengue by training on how to prevent illness
4) To strengthen 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) To strengthen knowledge of primary school teachers on the subjects mentioned above and improvement of teaching materials by providing appropriate materials

3. Components and Schedule

3.1 Project components

The project components consist of the following items.

1) Baseline survey for 50 samples

2) Training programs for health center personnel/school teachers, community health promoters and migrant people

3) Procurement of materials (200 water filters for potable water, 200 simple toilets, 200 sets of mask/gloves/boots/rain coat for agricultural chemicals and 200 sets of seeds of repellent plants) and the provision to the migrant people

4) Monitoring survey for 50 samples in terms of use condition of water filters, simple toilets, mask/gloves/boots/rain coat, growing condition of repellent plants and effects against malaria and dengue, number of morbidity, perception of the migrant people, and problems and requirements that the migrant people get lessons learned

3.2 Outline of components

Components of the project are outlined as follows:

(1) General Assemblies

The objectives of the Assemblies were to give information to the communities about the pilot project, the objectives, how to joint, etc. At least 3 big meetings were done on 16th January to 18th January 2002. Some meetings were needed to arrange to inform the people about training and equipment supply.

(2) Establishment of the migrant's group

For the establishment of the migrants group, one group for each caserio was made. In case of Sector-I and Los Diaz, both caserios were taking into one group because of the small amount of migrant people in those two caserios. The total amount of migrant registered is shown below: At the beginning of the pilot project, there was a few people registered, but most of the people registered at the following activities like the training of the migrant people.

No.	Caserio	Migrants registered
1	Los Morales	64
2	Los Diaz ad Sector-I	61
3	Los Cabrera	49
4	Los Perez	43
Total		217

(3) Base-line survey

The questionnaire was made and revised by the JICA Study team, the contents of the questionnaire are components of migrant family, living conditions, health conditions, type of work, crops they make, income management, etc. A sample of

50 families were made equally from 5 caserios, each family head was interviewed and fill the questionnaire with the answers.

(4) Training of teachers, health center staff, health promoters and migrants

The training guide was elaborated, containing the following topics:1) agricultural chemicals handling, 2) management and obtaining safe water, 3) tropical illnesses, 4) safe manage of the sanitary service, including the theoretical part of each topic, a series of graphs to illustrate the content. Duration of the training for each group was 20 hours, the location of the training was the Honor room in the municipality building. The contents of the training are shown below.

No.	Contents
1	Pilot project presentation
2	Obtaining and management of safe water
3	Presentation of water filter
4	Tropical diseases
5	Agriculture chemicals handling
6	Safe handling of toilet
7	Presentation of portable toilet

All the contents of training were compiled into one training guide which was revised by the JICA Study Team, which was distributed to the trainees.

In case of teachers training assisted 4 teachers from casero Los Diaz school and 4 teachers from casero Loas Cabrera, in total 8 teachers which is the 100% of the teachers from micro basin. Also there was special attendance of 4 teachers from casero Las Rosas requested by the local representative of education minister, because of the large number of migrant people in this caserio. In the health center staff training 9 people attended including, nurses from the El Carment, Buena Vista and El Eden health post, including Dr. Moir head of the health center.

The amount of the people who attended to the migrant training is summarized below.

No	Caserio	Male	Female	Total
1	Los Morales	44	4	48
2	Los Diaz/Sector-I	33	14	47
3	Los Cabrera	8	6	14
4	Los Perez	19	3	22
	Total	104	27	131

The methodology used to invite the trainees is shown below: 1) Radio announcements, 2) Contracts by promoters, 3) Personal invitations, 4) Invitation by speakers in each caserio and 5) Invitation to education supervisor, nurse chief in health center and mayor.

(5) Provision of equipment and material

To give incentive the migrant people, the portable toilets, the water filters and other equipment and materials were provided at the end of the training.

No	Caserio	Water filter	Simple toilet	Preventive equipment against agricultural chemicals	Seeds of repellent plants
1	Los Morales	55	55	56	56
2	Los Diaz/Sector-I	54	56	53	56
3	Los Cabrera	46	46	47	46
4	Los Perez	38	37	38	42
5	School (Los Diaz)	1	1	1	-
6	School (Los Cabrera)	1	1	1	-
7	School (Las Rosas)	1	1	1	-
8	Health post (El Eden)	1	1	1	-
9	Health post (El Carmen-I)	1	1	1	-
10	Health post (Buena Vista)	1	1	1	-
11	Health center	1	-	-	-
	Total	200	200	200	200

(6) Selection of migrant people for monitoring survey in Phase-II

Ideally, monitoring should be made to the sample migrants who were selected during the Base-line survey in Phase-I. However, 18 respondents out of 50 samples of Base-line survey either did not go to the coastal area or can not be identified. Therefore, these 18 samples were replaced with the newly selected samples for the monitoring in Phase-II. The detail of the interview results of 50 migrants is shown in Table M1 and Table M2. Location of farms where 50 migrants went to and worked in is shown in following table.

Name of Caserio	Name of Farm	Province	Nomber of farmer
Los Morales	Ixtan	Champeríco	6
	La Unión,	Champeríco	3
	Los Angeles	Champeríco	5
	San Rafael	Retalhuleu	5
	El Porvenir	Retalhuleu	2
Los Díaz/Sector-I	Guatalón, Retalhuleu	Retalhuleu	9
	San Marcos Nisa, Mazatenango	Suchitepequez	3
Los Cabrera	La Agrícola	Champeríco	2
	La Unión	Champeríco	6
	San Rafael	Retalhuleu	2
Los Pérez	Guatalón	Retalhuleu	7
Total			50

3.3 Schedule

The implementation schedule is shown below:

Component	2001			2002										
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
Baseline survey				■	■									
Training programs					■	■								
Procurement of materials and provision to the migrant people						■	■							
Monitoring											■		■	

Detail schedule of monitoring is shown in below:

No.	Date	Month	Place	
1	27	May	Palestina	Los Morales, Los Cabrera
2	28	May	Palestina	Los Díaz, Los Pérez
3	25	June	South Coastal Area	Finca Guatalón, Finca la Sureña, Finca Ixtan
4	26	June	South Coastal Area	Finca Santa María, Finca San Antonio, Finca la violeta, Finca la esperancita de El Naranjo
5	27	June	Palestina	Los Cabrera, Los Morales, Los Pérez
6	28	June	Palestina	Los Díaz
7	3	July	Palestina	Los Díaz, Los Cabrera, Los Morales
8	3	August	Palestina	Los Pérez, Los Morales, Los Cabrera
9	4	August	Palestina	Los Cabrera, Los Morales
10	8	August	Palestina	Los Morales, Centro de Salud
11	12	August	South Coastal Area	Finca Guatalón
12	13	August	South Coastal Area	Finca Ixtan, Finca los Ángeles
13	27	August	South Coastal Area	Finca la Agrícola, Finca la unión
14	29	August	South Coastal Area	Finca San Rafael, El Porvenir
15	30	September	Palestina	Los Pérez, Los Morales, Los Cabrera, Los Díaz
16	7	October	South Coastal Area	Finca Guatalón, Finca la Agrícola, Finca Ixtan,
17	8	October	South Coastal Area	Finca San Rafael, Finca San Marcos Nisa
18	18	October	South Coastal Area	Finca San Marcos Nisa
19	19	October	South Coastal Area	Finca los Ángeles
20	21	October	Palestina	Finca Guatalón, Finca San Rafael, Finca los Ángeles, Finca Ixtan, Finca la Agrícola
21	25	October	South Coastal Area	Retalhuleu Finca San Rafael, Finca Guatalón, Finca El Porvenir, Finca La Agricola, Finca los Angeles, Finca Ixtan
22	30	October	South Coastal Area	Finca la Agrícola
23	30	October	Palestina	Los Cabrera, Los Morales, Los Pérez
24	31	October	Palestina	Los Díaz
25	4	November	Palestina	Los Cabrera

Source: Visit Program

4. Monitoring Results

4.1 Use condition of water filter equipment

In the 50 samples, only 6 sampled migrants people (12% of the table sample) carried water filter equipment to the coastal area and 44 migrants are using it in their home in Palestina. The reasons why about 88% of sampled migrant did not carry water filter equipment are shown below (It is plural answer).

Name of Caserios	Yes, I carried it	I didn't carry it	Reasons						Total
			Small place in the truck	Due to the high volume of package	Additional payment for transportation	It was too big or heavy	They stay a few days in the coastal area	Fear of filter might broke in the travel	
Los Morales	2	13	7	2	2	0	0	2	13
Los Díaz/Sector-I	1	13	3	4	3	1	0	3	14
Los Cabrera	2	9	1	2	2	1	1	2	9
Los Pérez	1	9	1	0	4	3	0	2	10
Total	6	44	12	8	11	5	1	9	46
%	12%	88%	26%	17%	24%	11%	2%	20%	100%

Water filter equipment has a structure with double containers to filter out water. An inside container has materials of sand and gravel for water filter, and space between two containers is filled by charcoals. 6 respondents who carried water filter equipment dismantled a water filter equipment and brought one container for use as water tank in the coastal area and brought it back to Palestina after work in the coastal area. The other is used as water tank in home of Palestina. Among 44, the respondents who didn't carry water filter equipment, 39 (89%) are also using dismantled container as water tank, and only 5 (11%) (1 of Los Cabrera, 4 of Los Pérez) are using water filter equipment with double containers in Palestina.

4.2 Use condition of portable toilet

In the 50 respondents only one installed a portable toilet in the lands located in Champerico (Finca Los Angeles). The number of respondents who did not carry a portable toilet to the coastal area and reasons of no their use are shown in the following table.

Name of Caserío	Yes, I carried it	No commented	I didn't carry it	Reasons			Total
				Small place in the truck	Additional payment for transportation	Prohibition of farm owner	
Los Morales	1	0	14	6	4	4	14
Los Díaz/Sector-I	0	0	14	6	0	8	14
Los Cabrera	0	2	9	5	2	2	9
Los Pérez	0	0	10	5	1	4	10
Total	1	2	47	22	7	18	47
%	2%	4%	94%	47%	15%	38%	100%

Among 47 respondents who didn't bring a portable toilet, 12 installed it in

Palestina and 36 are still pending to install it as of 4 November as shown below.

Name of Caserío	Number of sample	Carried in the Coastal Area	Installed in Palestina	Keeping in Palestina	No answer
Los Morales	15	1	1	12	1
Los Díaz/Sector-I	14	0	6	8	0
Los Cabrera	11	0	2	9	0
Los Pérez	10	0	3	7	0
Total	50	1	12	36	1
%	100%	2%	24%	72%	2%

Afterwards installation of a portable toilet has been made gradually in the homes of the farmers in Palestina. The results of an interview survey indicated that most of portable toilet would be installed in Palestina at November and December when most migrants will come back from the coastal area.

4.3 Use condition of raincoats, masks, boots and gloves to prevent from intoxication of agricultural chemicals

Among 50 respondents, 49 answered that they used the protection equipment to apply chemicals during the period of seeding and cultivation of corn. Only 1 answered that he didn't use the equipment because he didn't receive those (from caserío Los Morales).

4.4 Growing condition of repellent plants and effects against malaria and dengue

Forty-five respondents planted seeds of repellent plants (distributed Basil plants and seed of Marigold) in Palestina. 24 respondents succeeded to grow plants and the other not. 5 respondents planted seeds in the coastal area, however seeds could not grow as shown below;

Name of caserío	Number of Sample	Coastal Area		Palestina	
		Number of respondents who plant seeds	Rate of rooting	Number of respondents who plant seeds	Rate of rooting
Los Morales	21	2	0	19	14
Los Díaz/Sector-I	12	1	0	11	4
Los Cabrera	10	2	0	8	3
Los Pérez	7	0	0	7	3
Total	50	5	0	45	24
%	100%	10%	0%	90%	48%

It is considered that one of the important causes of death of plants results from damage attacked by ants in Palestina and fumigation in the coastal area.

According to the results of an interview to migrants who didn't carry repellent plants to the coastal area, the reasons of no use of seeds in the coastal area consist

of (1) some respondents didn't believe that seeds can grow in the coastal area because of failures of growing plants in Palestina and (2) seeds of Marigold was used for medicinal weeds in the community.

4.5 Number of morbidity

The results of the interview survey indicate the number of persons with morbidity of 2001 and 2002 in the coastal area as shown below;

Number of Morbidity, 2001

(Unit: Number of infected person)

Symptom	Los Morales	Los Cabrera	Los Díaz Sector I	Los Pérez	*Total*	%
Diarrhea	2	1	3	5	11	22.9%
Nausea	1	2	2	0	5	10.4%
Head ache	0	0	0	0	0	0.0%
Fever	7	1	1	0	9	18.8%
Stomach ache	0	1	2	2	5	10.4%
Malaria	0	1	0	0	1	2.1%
Flu	0	1	1	1	3	6.3%
Hurt	0	0	1	1	2	4.2%
Nervous	0	0	0	1	1	2.1%
Vista	0	0	0	1	1	2.1%
No information	7	3	0	0	10	20.8%
Total	17	10	10	11	48	100%

Source: Results of the interview survey that JICA study team conducted in 2001

Number of Morbidity, 2002

(Unit: Number of infected person)

Symptom	Los Morales	Los Cabrera	Los Díaz Sector I	Los Pérez	*Total*	%
Diarrhea	6	0	0	3	9	15.5%
Nausea	0	0	0	0	0	0.0%
Head ache	0	1	1	1	3	5.2%
Fever	0	3	1	4	8	13.8%
Stomach ache	3	3	4	2	12	20.7%
Malaria	1	0	0	0	1	1.7%
Flu	8	6	5	4	23	39.7%
Hurt	0	0	0	0	0	0.0%
Nervous	0	0	0	0	0	0.0%
Vista	0	0	0	0	0	0.0%
Unirary infection	1	0	0	1	2	3.4%
Total	19	13	11	15	58	100.0%

Source: Results of the interview survey that JICA study team conducted in 2002

There are 58 sickness (about 21%) according to the result of interview for 50 respondents consisting of 272 persons (139 men and 133 women) in 2002. The number of persons with morbidity didn't reduce because there appears no effect of water filter equipment, portable toilet and repellent plants.

Main sickness for adults and children are shown below.

For adults	For children
Head ache	Flu
Flu	Diarrhea
Fever	Stomach ache
Unirary infection	

The results of interview why didn't buy medicine at MPUs are shown below (It is plural answer).

Name of Caserío	I bought medicine	Reasons						Total
		We didn't think to become sick	Pharmacy closed when we found it	It's so far from our community	We don't have information of medicine	Little custom of buy medicine before trip	No custom to carry medicine like necessaries of trip	
Los Morales	4	8	3	0	0	0	0	15
Los Díaz/Secor-I	5	7	2	0	0	0	0	14
Los Cabrera	3	4	2	0	2	1	1	13
Los Pérez	2	0	2	5	0	1	0	10
Total	14	19	9	5	2	2	1	52
%	27%	37%	17%	10%	4%	4%	2%	100%

14 respondents (27%) bought medicine at MPUs in the community and 9 respondents (17%) want to buy it but didn't buy because MPU were closed.

4.6 Perception of the migrant people for the Pilot

Most respondents felt a good perception that use of equipment such as masks/gloves/raincoats was very effective for protection against agriculture chemicals. On the other hand it seems that materials such as water filter equipment, toilets and seeds of repellent plant were being incapable of them.

On the other hand, there are few comments about materials such as water filter equipment, toilets and seeds of repellent plant. Rather than improvement of hygiene habit and condition of health, it is importance for them to improve necessaries like water tank.

5. Problems Encountered and Countermeasures

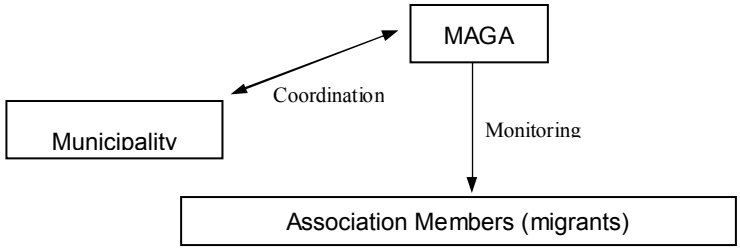
1) Though most transmigrants live in huts with no safe water sources, toilets nor any health services available near by, most respondents didn't carry water filter equipment in the coastal area. These are many causes that they did not bring it to the coastal area. They, however, dismantled two containers of the water filter equipment and used that as water tank in Palestina. It is important for them to use containers as water tank though respondents understood that water filter equipment itself should provide safe water if they use it as original form. It should be considered that more portable and adequate method such as use of sodium hypochlorinate should have applied.

2) In case of portable toilet, some owners of farms in the coastal area didn't accept installation of toilet because livestock should fall down for hole of toilet. Another reason is that most respondents move working farm every year and then they hate to move installed toilet.

3) Most of the respondents grow repellent seeds in Palestina and some plants succeeded and others died. Some migrants also cultivated seeds in the coast, however these failed. It seems that it is necessary to select varieties of repellent plants that can be suitable to climate of the coastal area.

6. Organizations Concerned for Management of Further Activities

The relations of the organizations/groups concerned for monitoring of the project are shown in the figure below.



7. Observed Impacts

1) Use of equipment such as masks/gloves/raincoats was very effective for protection against agricultural chemicals. The migrants used effectively protection equipment. It is expected that infection by agricultural chemicals to human will be drastically reduced.

2) Water filter equipment was dismantled into two containers as water tanks because respondents give the highest priority to use of water filter equipment as water tank not improving hygiene habit and condition of health. All water filter equipment was used in Palestina. Also all the portable toilet equipment will be used in Palestina. This equipment will play an important role in convenience of living of the migrants in Palestina.

3) In the coastal area, however, there was no reduction of morbidity except contamination of agricultural chemicals and also sanitary improvement was not found.

Table M1 Result of Interview

No.	Farm of the coastal area	Date of stay in farm	Cultivation				Insect repellent plants				Use of protection equipement	Retune equipment from the coastal area
			Maize	Sesame	Pasture	Sorgo	Seed in the coastal area	Growing	Seed in Palestina	Growing		
	Los Morales											
1	Los Angeles, Champeríco	May, August, November	●	●					●		●	●
2	Ixtan, Champeríco.	May, August, November	●	●					●	●	●	●
3	Ixtan, Champeríco.	May, August, November	●	●					●	●	●	●
4	San Rafael, Retalhuleu	Mayo, agosto, octubre.	●		●				●	●	●	●
5	Los Angeles, Champeríco.	May, August, November	●	●					●		●	●
6	La Unión, Champeríco	May, August, November	●	●					●	●	●	●
7	Los Angeles, Champerico.	May, August, November	●	●					●	●	●	●
8	Los Angeles, Champeríco.	May, August, November	●	●					●		●	●
9	Ixtan, Champeríco	May, August, November	●	●					●	●	●	●
10	Ixtan, Champerico.	May, August, November	●	●					●	●	●	●
11	Los Angeles, Champeríco.	May, August, November	●	●					●		●	●
12	La Unión, Champeríco.	May, August, November	●	●					●	●	●	●
13	El Porvenir, Retalhuleu.	May, August, November	●			●			●	●	●	●
14	La Unión, Champeríco.	May, August, November	●	●					●	●	●	●
15	San Rafael, Retalhuleu.	May, August, October	●		●				●	●	●	●
16	San Rafael, Retalhuleu	May, August, October	●		●		●				●	●
17	Ixtan, Champerico.	May, August, November	●	●					●	●	●	●
18	Ixtan, champerico	May, August, November	●	●					●			
19	El Porvenir, Retalhuleu.	May, August, November	●			●	●				●	●
20	San Rafael, Retalhuleu.	May, August, October	●		●				●	●	●	●
21	San Rafael, Retalhuleu.	May, August, October	●		●				●	●	●	●
Sub-total			21	14	5	2	2	0	19	14	20	20
	Los Díaz											
1	Guatalón, Retalhuleu.	May, August, November	●	●			●				●	●
2	San Marcos Nisa, Mazatenango	May, August, November	●	●					●	●	●	●
3	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
4	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
5	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
6	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
7	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
8	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
9	San Marcos Nisa, Mazatenango	May, August, November	●	●					●	●	●	●
10	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
11	San Marcos Nisa, Mazatenango	May, August, November	●	●					●	●	●	●
12	Guatalón, Retalhuleu.	May, August, November	●	●					●	●	●	●
Sub-total			12	12	0	0	1	0	11	4	12	12
	Los Cabrera											
1	San Rafael, Retalhuleu.	May, August, October	●		●				●	●	●	●
2	La Unión, Champerico.	May, August, November	●	●					●		●	●
3	San Rafael, Retalhuleu.	May, August, October	●		●				●	●	●	●
4	La Unión, Champeríco.	May, August, November	●	●					●	●	●	●
5	La Unión, Champeríco.	May, August, November	●	●					●		●	●
6	La Agrícola, Champeríco.	May, August, October	●			●	●				●	●
7	La Unión, Champeríco.	May, August, November	●	●					●		●	●
8	La Agrícola, Champeríco.	May, August, October	●			●	●				●	●
9	La Unión, Champeríco.	May, August, November	●	●					●		●	●
10	La Unión, Champeríco.	May, August, November	●	●					●		●	●
Sub-total			10	6	2	2	2	0	8	3	10	10
	Los Pérez											
1	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
2	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
3	Guatalón, Retalhuleu.	May, August, November	●	●					●	●	●	●
4	Guatalón, Retalhuleu.	May, August, November	●	●					●	●	●	●
5	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
6	Guatalón, Retalhuleu.	May, August, November	●	●					●		●	●
7	Guatalón, Retalhuleu.	May, August, November	●	●					●	●	●	●
Sub-total			7	7	0	0	0	0	7	3	7	7
Total			50	39	7	4	5	0	45	24	49	49

Table M2 Result of Interview

No.	Water Filter								Portable Toilet						Medicine							
		Reason of not carried it						Reason of separated to		Reason of not carried it						Reason of no buy in pharmacy of PROAM						
	Yes, I carry it.	Small place in the truck	Due to the high volume of package	Additional payment for transportation	It was too big or heavy	They stay a few days in the coastal area	Fear of filter might broke in the travel		Yes, I carried it	Small place in the truck	Additional payment for transportation	Prohibition of farm owner	Installed in Palestina	Keeping in Palestina	Yes, I buy medicine	We didn't think to become sick	Pharmacy closed when we found it	It's so far from our community	We don't have information of medicine	Little custom of buy medicene before trip	No custom to carry medicine like necessaries of trip
Los Morales																						
1		●						Water didn't get out of faucet	●						●							
2							●	Water didn't get out of faucet		●				●		●						
3		●						Big tank store more water		●				●		●						
4			●					Water didn't get out of faucet				●					●					
5			●					Water didn't get out of faucet				●		●		●						
6		●						Very heavy		●				●		●						
7	●							Using only small one		●			●				●					
8		●						Water didn't get out of faucet		●				●		●						
9				●				We want to use big one			●			●		●						
10							●	For space of track		●				●		●						
11		●						Very heavy				●		●	●							
12				●				Very heavy			●			●			●					
13		●						We want to use big one			●			●	●							
14		●						Water didn't get out of faucet				●		●		●						
15	●							Big tank store more water			●			●	●							
	2	7	2	2	0	0	2		1	6	4	4	1	12	4	8	3	0	0	0	0	
Los Diaz																						
1		●						Water didn't get out of faucet		●			●				●					
2				●				We think better use big one				●		●		●						
3			●					We think better use big one		●			●				●					
4				●				Big one broken				●	●		●							
5				●				Water didn't get out of faucet				●		●		●						
6			●					Water didn't get out of faucet				●		●	●							
7	●							We carried only big tank		●			●		●							
8							●	Better carry only small one				●	●			●						
9					●			We leave it behind in Palestina		●				●		●						
10			●				●	Big one is better for store water				●		●	●							
11		●						Water didn't get out of faucet		●				●		●						
12							●	Water didn't get out of faucet				●		●		●						
13			●					Big one is better				●		●		●						
14		●						We think better use big one		●			●		●							
	1	3	4	3	1	0	3			6	0	8	6	8	5	7	2	0	0	0	0	
Los Cabrera																						
1			●					Water didn't get out of faucet			●			●								●
2							●	We use only big one				●		●	●		●					
3	●							Big one store more water		●				●					●			
4				●				We think better use big one		●				●			●					
5		●						We use completeness it					●			●						
6							●	For space of track and using small one			●			●		●				●		
7			●					Very heavy		●				●		●						
8	●							Big one store more water		●				●	●							
9					●			Using only big one		●			●						●			
10				●				Big one is better for store water				●		●		●						
11						●		No receive charcoal, gravel and sand						●	●							
	2	1	2	2	1	1	2			5	2	2	2	9	3	4	2	0	2	1	1	
Los Pérez																						
1					●			We use completeness it		●				●				●				
2				●			●	Very heavy. Using only big one		●				●				●				
3		●						We use completeness it in Palestina				●	●					●				
4					●			For space. Using small one.				●		●			●					
5				●				We use completeness it		●			●				●					
6							●	We use completeness it		●				●	●							
7	●							Very heavy. Using only big one		●				●						●		
8				●				Very heavy			●		●					●				
9					●			Water didn't get out of faucet				●		●				●				
10				●				For evade to break				●		●	●							
	1	1	0	4	3	0	2			5	1	4	3	7	2	0	2	5	0	1	0	
Total	6	12	8	11	5	1	9		1	22	7	18	12	36	14	19	9	5	2	2	1	

ANNEX 1 – N
MUNICIPALITY COMMUNITY HEALTH SERVICE PLAN (PALESTINA)

ANNEX 1 - N

MUNICIPALITY COMMUNITY HEALTH ACTIVITY PLAN (PALESTINA)

TABLE OF CONTENTS

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N. MUNICIPALITY COMMUNITY HEALTH ACTIVITY PLAN

1. Background

In Palestina model area, health related problems are found.

1) Lack of health education including prevention of common diseases and family planning
2) Dependency on health volunteers without financial incentives, resulting in high droop-out rate and discontinuity of community health activities
3) Lack of essential drugs in quantity and variety while the drugs sold by private pharmacies are very expensive
4) Not easy access to drugs purchase and health services.

2. Objectives

The main objectives of the project are as follows:

1) Better access to cheaper drugs and more varieties of drugs at the municipal pharmacy by introducing PROAM drugs
2) Better access to cheaper drugs as well as first aid treatment at the village level by selling PROAM drugs at the Minimal Pharmacy Unit (MPU) located inside the villages
3) Offering sustainable and regular health education program and system by community health promoters in co-operation with the Health Center.

3. Components and Schedule

3.1 Components

The project components consist of the following items.

1) Training program-I for 10 health promoters and heath committee members by health center
2) Training program-II for 4 health promoter and 2 officers of the municipality pharmacy regarding Auxiliary pharmacist
3) Procurement of drugs and necessary equipment
4) Construction of 2 MPU buildings
5) Monitoring survey.

3.2 Outline of components

Components of the project are shown below:

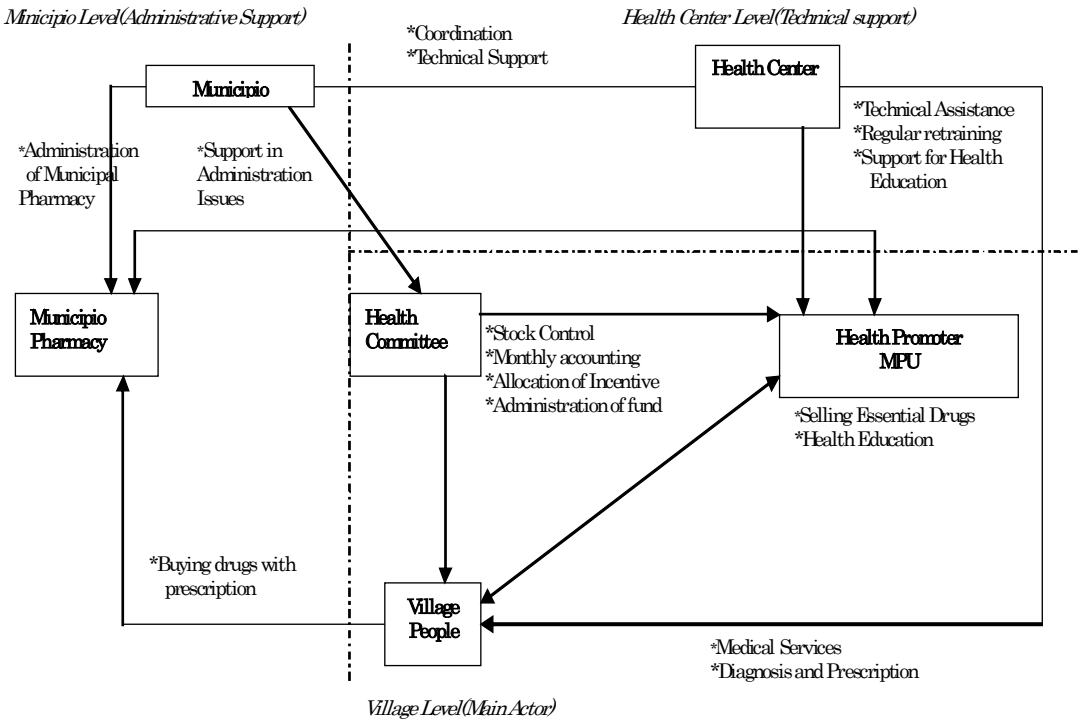
(1) General plan

This project covers 5 caserios in Palestina de Los Altos. Regarding accessibility to public health facilities and accessibility from near-by villages, Los Diaz and Los Cabrera were finally selected as MPU installation site through the discussion with the Municipality, Health Center and Municipal Pharmacy. MPU in Los Diaz is to cover Sector 1, Los Perez and Los Diaz while MPU in Los Cabrera is to cover Los Cabrera and Los Morales. However, during the implementation several caserios outside of the micro basin were benefited by the services of the MPU's.

The basic idea of the project is to introduce PROAM cheap drugs in the Municipal Pharmacy, and then the drugs can be distributed to two Minimal Pharmacy Units (MPU). PROAM rules allow to sale the drugs with an increase of 35% of profit from the cost price. The profit is used for incentive of promoter and health committee to support the educational program. With this drug distribution structure, a sustainable revolving drug fund system can be established. Part of the profit from the sales of drugs will go to these promoters as incentives, and other part is use by health committee to finance educational programs for the community.

For each MPU, health committee and community health promoters were selected and trained. The promoter are in charge of selling of essential drugs and giving first aid treatment at MPU as well as for regular health education and the health committee in charge of administration of the revolving fund and coordination of the activities.

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 N1 and the correlation between the actors is shown below.



(2) Training program-I

The training was carried out successfully, 10 promoters were trained in the Palestina de los Alto's Municipality building. The training was carried out for 5 days from February 25 to March 1, from 8 a.m. to 4 p.m. All the contents were given to the promoters properly using different teaching methods. The main purpose was to train Health Promoters to take care of educational programs and preventive surveillance for the village people and work as a health promoter for the Health Minister programs.

This training was given by expert authorized by Health Center, Dr.Roberto Santamarina.

The list of the contents of the training and schedule is shown below.

Contents	Day
1) Community sketch	February 25
2) Population census	February 25
3) Vaccination	February 26
4) Diarrhea control	February 26, 27
5) Acute Respiratory Infections	February 27
6) Growing Promotion	February 28
7) Emergencies	February 28, March 1
8) Environment attention	March 1

The list of the promoters and caserio who attend the training is shown below.

Promoters	Caserio
1) Modesta Carreto	Sector 1
2) Marta Gonzales	Los Diaz
3) Marta Morales	Los Morales
4) Delfina Ramirez	Los Morales
5) Anastasio Gonzales	Los Cabrera
6) Dorotea Gonzales	Los Perez
7) Cristina Castillo	MPU Los Diaz
8) Virgilio Diaz	MPU Los Diaz
9) Patricia Castillo	MPU Los Cabrera
10) Alfonso Gonzales	MPU Los Cabrera

(3) Training program-II

The period of the training was from December 3 to December 18 and a recess for a Christmas holiday and from January 4 to January 1, to complete 20 days of training from 8 a.m. to 4 p.m. The six trainees completed all the attendance.

Main purpose is to train the health promoters and auxiliary pharmacist who will be in charge of the MPU and Municipal Pharmacy regarding basic pharmaceutical matters, basic knowledge on sale of basic cheap drugs in the village and municipal level at the minimum risk. Another objective of the training was to obtain the diploma of the San Carlos University of Auxiliary Pharmacist to obtain the authorization of sale of PROAM drugs. To obtain the diploma the trainees had to pass 3 tests given by the trainer. Two of the test were given during the training and final one at the end of the training, all of them was passed successfully by the six trainees. All of them obtained the diploma of Auxiliary pharmacist given by the San Carlos University.

Four (4) health promoters from villages and two (2) auxiliary pharmacists from Municipality staff attended this course. The names of the trainees are shown in table below.

Name	Community
Municipality	
Mabel Iliana Morales	Palestina de los Altos
Feliciana Margarita Calderon	Palestina de los Altos
Village Promoter	
Virgilio Diaz Vásquez	Los Díaz
Cristina Lucila Castillo	Los Díaz
Alfonso González Vásquez	Los Cabrera
Feliciano Margarita Calderón	Los Cabrera

The schedule of the training is shown below:

Contents	Day
1) Basic Principals	December 3 - 4
2) Action and Effect of the Medicine	December 5 - 7
3) Administration routes and stability of the medicine	December 10 - 11
4) Metrology	December 12
5) Classification of the medicine by therapeutic group I	December 13 - 14
6) Classification of the medicine by therapeutic group II	December 17 - 18
7) Use and risk of medicine	January 2 - 3
8) Medicine Plants	January 4, 7 - 8
9) Legislation of the pharmacy establishment	January 8 - 9
10) Administration	January 9 - 10

(4) Construction of MPU houses

Locations of MPUs were decided by the Study Team with discussion of community people and mayor of Palestina de Los Altos. One MPU house was constructed in the school of Los Diaz and the another was in the school of Los Cabrera. The contract was made between the Study Team on December 15, 2001. The contractor started his work from December 19, 2001 and 2 MPU houses were completed on February 15.

(5) Procurement of medicines and materials

The procurement of medicines from PROAM was made after completion and authorization of PROAM. The materials and drugs were supplied to the MPU before opening. The procurement was made by Municipality of Palestina de los Altos. Agreement for the main actors was made and signed for the responsibilities and role of each one.

(6) Selecting and training health committee

One of the objectives of training II was to train Health committee members. Before the training there was a selection of the committee members. First meeting was held to explain the necessity of a Health Committee and the role, and responsibility of each member summarized below.

Committee Member	Role and Responsibility
President	Leader of the group, arrange meetings and coordination with other institutions.
Vice-President	Same as President
Secretary	In charge of taking notes and write minutes and record of meetings
Accountant	Make the stock control, sales control and to calculate benefits
Money Keeper	In charge to take care of the cash and money.

Second meeting was held to select all the candidates that can and want to be committee member, and a list of candidates was given to community. Last meeting was held to decide 5 members of the community, the selection were made by a majority voting in the community meeting. At the end of the meeting all community members agree about the selected members of the community.

The list of the members of the Health Committee selected is shown below.

Los Diaz Health Committee

Committee Member	Role and Responsibility
President	Obispo Escobar
Vice-President	Santos Diaz
Secretary	Nohelia Morales
Accountant	Rosemary Monterroso
Money Keeper	Carmelina Gomez

Los Cabrera Health Committee

Committee Member	Role and Responsibility
President	Pedro Cabrera
Vice-President	Emilio Cabrera Vasquez
Secretary	Maria Monterrroso
Accountant	Juan Morales
Money Keeper	Anastasio Gonzales

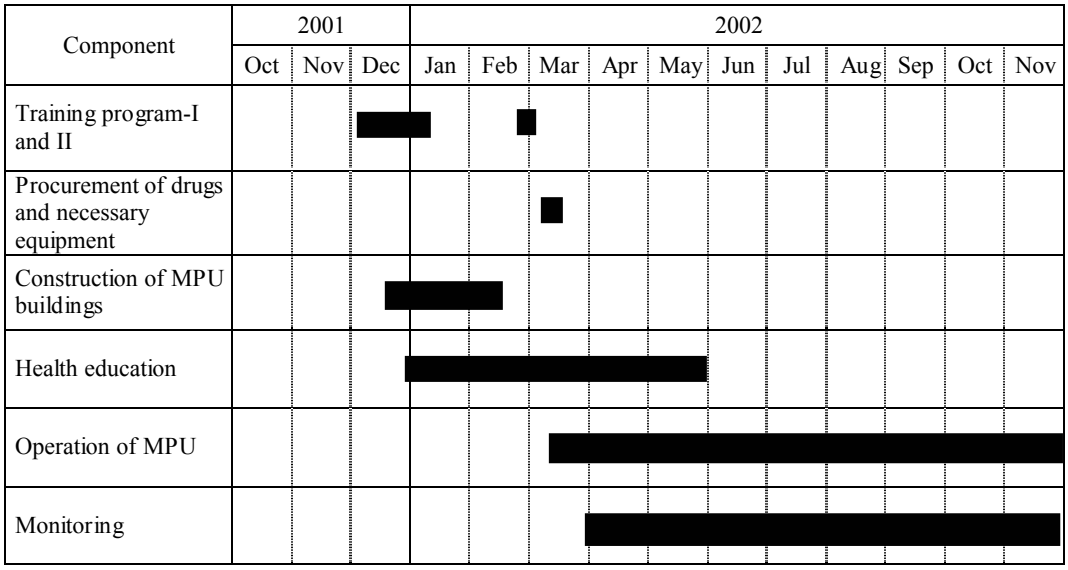
The training of the Health Committee was given on January 11 in the Municipality building to the 10 members of the 2 Health Committee. The list of the contents of the training is shown below.

Contents
✓ What is a Health Committee
✓ Members
✓ Objectives
✓ Drug stock control
✓ Sales Record
✓ Benefit calculation
✓ Benefit Investment
✓ Health Promoter Supervision
✓ Services that Health Promoter provide
✓ Coordination with Institutions

The inauguration and opening of Municipal Pharmacy and MPU's was made on March 12 2002, in which was presented to the community, the new Municipal Pharmacy, two MPU's and promoters in charge of MPU and the Communitarian Education Service.

3.3 Schedule

The implementation schedule is shown below:



4 Monitoring Results

The activities in the Municipal Pharmacy Unit (MPU) started on March 11, 2002, are mentioned in table below.

Activity	Execute	Frequent Execution
1) Low price Drug selling	Health Promoter	Daily
2) Stock control, money use from drug sale	Health committee, Municipality staff	Monthly
3) Education program for community	Health Promoter, Health Center Staff	Monthly
4) Epidemiological surveillance in coordination of Health Center Staff	Health Promoter, Health Center Staff	Monthly

4.1 Sale of Drugs:

Both committees agree that one of the health promoters had to be in charge of MPU during one month period for each promoter separately. The Health Committee has been taking the role to take care of the MPU in a seriously manner especially in case of the daily sale control and monthly stock record control.

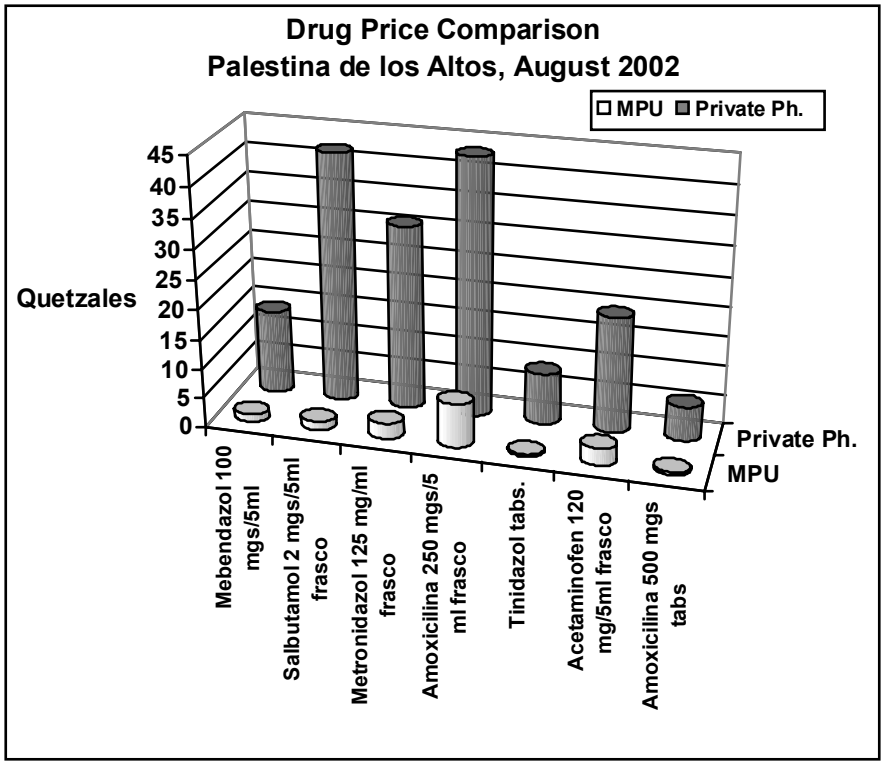
The ten most sold drugs in Los Cabrera MPU are the following:

No.	Drug	Properties
1	Mebendazol 100 mgs/5ml	Anti parasite, pediatric
2	Acetaminofen 500 mg tab.	Analgesic, anti fever.
3	Acetaminofen 80 mg tabs	Analgesic, anti fever, pediatric
4	Tinidazol tabs.	Anti parasite
5	Vitaminas multiples capsula	Multivitamin
6	Albendazol 200 mgs tab.	Anti parasite
7	Amoxicilina 250 mgs/5 ml frasco	Antibiotic pediatric, wide spectrum
8	Metronidazol 125 mg/ml frasco	Anti parasite, anti ameba
9	Guayacolato de glicerilo	Expectorator, pediatric
10	Ranitidina tab.	Anti ulcera

The ten most sold drugs in Los Diaz MPU are the following:

No.	Drug	Properties
1	Acetaminofen 500 mg tab.	Analgesic, anti fever
2	Mebendazol 100 mgs/5ml	Anti parasite, pediatric
3	Salbutamol 2 mgs/5ml frasco	Bronco dilator
4	Metronidazol 125 mg/ml frasco	Anti parasite, anti ameba, etc.
5	Albendazol 200 mgs tab.	Anti parasite
6	Vitaminas múltiples cápsula	Multivitamin
6	Amoxicilina 250 mgs/5 ml frasco	Antibiotic pediatric wide spectrum
7	Tinidazol tab.	Anti parasite
8	Acetaminofén 120 mg./5ml frasco	Analgesic, anti fever, pediatric
9	Amoxicilina 500 mgs. Tab.	Antibiotic wide spectrum
10	Ranitidina tab.	Anti ulcera

The price of MPU drugs is considerably cheaper than private pharmacies in Palestina de los Altos as shown in the figure below.



	(1) MPU	(2) Private Phamacy	Comparison (1)/(2)
Mebendazol 100 mgs/5ml	1.32	14.24	9%
Salbutamol 2 mgs/5ml frasco	1.51	42.15	4%
Metronidazol 125 mg/ml frasco	2.62	31.15	8%
Amoxicilina 250 mgs/5 ml frasco	7.45	43.45	17%
Tinidazol tabs.	0.38	8.65	4%
Acetaminofen 120 mg/5ml frasco	2.98	19.62	15%
Amoxicilina 500 mgs tabs	0.49	5.83	8%

The main population attended was from Caserio Los Diaz and Los Cabrera, but near caserios also went to the MPU's, as shown in the table below.

MPU	Attended Caserios
Los Diaz	**Los Diaz***
	Los Perez*
	Sector 1*
	El Carmen
	Buena Vista
	Cruz Verde
	Los Miranda
	Los Marroquin
Los Cabrera	**Los Cabrera***
	Los Morales*
	Palmira
	El Carmen

* Caserios in project area.

4.2 Stock control, money use from drug sale

Monthly stock controls have been made four times, performed by committee members, two promoters and JICA Study Team in each MPU.

The loss/profit statement of Caserio Los Diaz MPU from March 11 to November 5 is shown in following table.

Los Diaz MPU
Balance from March 11 to November 5 (Q)

	Income	Outgo	Balance
Sales	4,904.08		4,904.08
Purchase		1,438.50	3,465.58
Promoter incentive		634.16	2,831.43
Committee fund		634.16	2,197.27

Los Diaz Health committee fund
Balance from March 11 to November 5 (Q)

	Income	Outgo	Balance
MPU input	634.16		634.16
Aprofam training		100	534.16
Medical attention supplies		143.56	390.60
Transportation fee for members		26	364.60
Building repair		55	309.60

The committee renewed the drug stock on June 6. The purchase was made through Municipal Pharmacy and the amount was Q1438.50. The Health Committee fund was used for education purposes, support of the medical attention in the MPU, building repair and transportation fee for health committee members. The treasurer keeps remaining balance.

The loss/profit statement of Caserio Los Cabrera MPU from March 11 to November 5 is shown in following table.

Los Cabrera MPU
Balance from March 11 to November 5 (Q)

	Income	Outgo	Balance
sales	4,730.91		4,730.91
Purchase		1,369.90	3,361.01
Promoter incentive		612.03	2,748.98
Committee fund		612.03	2,136.95

Los Cabrera Health committee fund
Balance from March 11 to November 5 (Q)

	Income	Outgo	Balance
MPU input	612.03		612.03
Aprofam training		100	512.03
Medical attention supplies		143.56	378.28
Transportation fee for members		26	363.28

The committee renewed the drug stock on June 6. The purchase was made through Municipal Pharmacy, the amount was Q1,369.90. The Health Committee fund was used for education purposes, support the medical attention in the MPU and transportation fee for health committee members. The treasurer keeps remaining balance.

4.3 Educational program for the community:

Due to less attendance to the health educational program, mainly the health education has been given to the school students of each caserio by Health Promoter in charge. In addition, a health education has been performed personally to the persons who come to purchase drugs. An educational plan has been coordinated with a main church in the community. Summary of the program undertaken is shown in the following table.

Content	Attendant	Month	Attendants	
			Cabrera	Diaz
✓ Diarrhea	All Villagers	March	10	10
✓ Vaccination	Family Parents	April	8	10
✓ Diarrhea	School students	May	25	35
✓ Acute Respiratory Infections	School Teachers	June	6	6
✓ Sexual Transmitted Diseases, HIV, AIDS	Family Parents	July	22	20
✓ Environmental Attention	School students	August	30	39
✓ Growing Attention	Family Parents	Sept	19	15
✓ Family Planning	School Teachers	Oct	5	5

4.4 Epidemiological surveillance in coordination of health center staff

The Health Promoter who attends the MPU is in charge surveillance activities in coordination with Health Center. Summary of these activities is shown below.

Activities
Patient Reference to Health Center
Community Sketch Drawing
Population Census Performance
Contamination Source Detection
Contagious Infection Diseases Detection
Vaccination Campaign
MPU Medical Attention support

4.5 Monitoring Results

The monitoring indicators were taken successfully; data are shown in Table N1, N2 for Los Diaz MPU and Table N2 for Los Cabrera MPU.

5. Problems Encountered and Countermeasures

5.1 Low profitability of MPU and low incentive for MPU promoter

Problems: Monthly profits gained by MPUs for the periods of 8 months, from March to November 2002, are summarized below.

Monthly Profits of MPU **(Unit: Q)**

	Los Cabrera MPU		Los Diaz MPU	
	Profit	Incentive for Health Promoter	Profit	Incentive for Health Promoter
March	143.8	71.9	160.8	80.4
April	143.8	71.9	160.8	80.4
May	143.8	71.9	160.8	80.4
June	205.4	102.7	265.3	132.7
July	153.6	76.8	105.8	52.9
August	81.6	40.8	91.4	45.7
Sep	81.6	40.8	91.4	45.7
Oct	130.9	65.5	117.9	59.0
Nov	139.7	69.8	114.3	57.1
Total	1,224.1	612.0	1,268.3	634.2
Monthly Average	136	68	141	70

As shown in the table above, the promoter's incentives for 1 month activities for 4 hours a day are around Q70, especially from August to September. The incentives were depressed up to around Q40-45. According to the interview to the promoter, all the promoters recognized their significant roles in their community and expressed their intentions to continue their activities. However in view of sustainability of this project, it is considered necessary that incentive of at least Q100 per month should be given to a health promoter.

Countermeasure: In order to increase the sales and profit, the following countermeasures were taken;

(1) Introduction of medical attention in each MPU

A person who wants diagnostics by doctor gets used to go down to the health center located in the central of the municipality. With a assistance of the Municipality Health Center, the MPUs provide a place for medical attendance of the Health Center in order to facilitate easy access to doctor. A doctor from the Health Center goes round each 2 MPU twice a month. It is expected that people who visit a doctor at MPU will purchase the medicines based on the doctor's discriptions at the same time in MPU, which push up the sales of the MPUs.

(2) Advertisement

Out of the model area, there are several communities, such as El Carmen, Palmira, Tojwabil, and so on, which have high possibility to become market for the medicine sales of MPU. However it was revealed that many persons in the areas did not know about the cheap medicine of MPU. Thus an advertisement of MPU services were made by several means.

1) The road sign was located near the main communal road. 2) 2 communal radio stations broadcast information of MPU at 3 times a day for 1 months. 3) Authorities meetings were hold in the community for informing the cheap medicines and services of MPU. 4) Information about medicines and services was given to the health promoters in the outsides of the model are.

5.2 Incorrect balance in the account

Problems: At the beginning of operation of MPU, in March and April, the balances of the accounts of each MPU had some loss, which are shown in the following table.

Discrepancies of the account* **(Unit: Q)**

	Los Cabrera	Los Diaz
Sales	1,663	1,860
Material cost	1,232	1,378
Benefit	431	482
Actual cash in hands	342	403
Loss	89	79

* Account record: From March 11 to May 02, 2002

Countermeasure: The Study Team had meetings with each health committees in May and discussed how to solve those discrepancies of the balances. After discussion with the health committees and health promoters, they decided that the promoters should shoulder those discrepancies, and the promoters paid the loss of the balance for 2 months. The committee also decided to investigate the account of MPU frequently and strictly as the auditors. After establishment of those audit systems, there is no any discrepancy at all.

5.3 A few attendance from community to the health education Program

Problems: Due to lack of interest about the health programs, the number of the attendant to the health educational program from the community were not a lot as shown in the Table N3. Especially, in April, no any attendant presented to the program.

Countermeasure: From May 2002, the health programs were held for the students and teachers in the schools in each caserio. And at the MPUs the persons who had come for buying drugs were received health education personally.

5.4 Capabilities of promoters and committee members

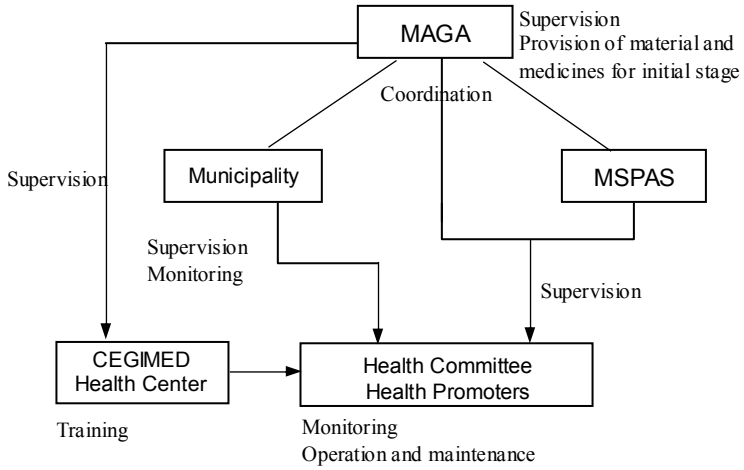
Problems: Regarding Training I and II, technical terms were difficult for the attendants to understand. Also promoter long absence of studying made difficult

to read and write fast.

Countermeasures: Rephrasing of word and detail explanation was necessary for the comprehension of attendants. All evaluation was made orally.

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 Easy access to the medicines

People of community has reduced the expense budget by getting cheaper drugs and saving transportation fee and travel time to Palestina to purchase drugs. Also they explained that the availability of drugs in the MUPs is convenient at nighttime and weekend for them.

The main benefit of the MPU is received by the villagers who live in the model area. But other villagers who live out of the study area will also have benefit because the low price drugs and the location of the MPU is near their house than Palestina de los Altos Pharmacies.

The most sold drugs are for treatment of the most incident diseases in the population of Palestina de los Altos according to Health Center information as shown in the following table.

The most sold drugs in bottle (March-November 2002)

No.	Name	Sales	Disease
1	Salbutamol 2 mg/5ml	148	Treatment For Severe Cough And Acute Respiratory Infection
2	Acetaminofen 120 mgs/5ml	140	Pain Relief, Decrease Fever (Children <2 Year Old)
3	Amoxicilina 250 mgs/5 Ml Fco	138	Anti-Biotic (Children)
4	Metrodinazol 125 mg/5ml	118	Anti-Ameba for Children
5	Mebendazol 100 mgs/5ml	116	Anti-Parasites for Children

The most sold drugs in tablets (March-November 2002)

No.	Name	Sales	Disease
1	Acetaminofen 500 mg Tab.	1527	Pain Relief, Decrease Fever (Adult and Big Children)
2	Ranitidina 15 0mgs	600	Anti-Gastritis
3	Vitaminas Multiples Capsula	580	Vitamin for Pregnancy and Adult
4	Tinidazol	441	Anti-Parasites for Adult
5	Acido Folico	430	Vitamin

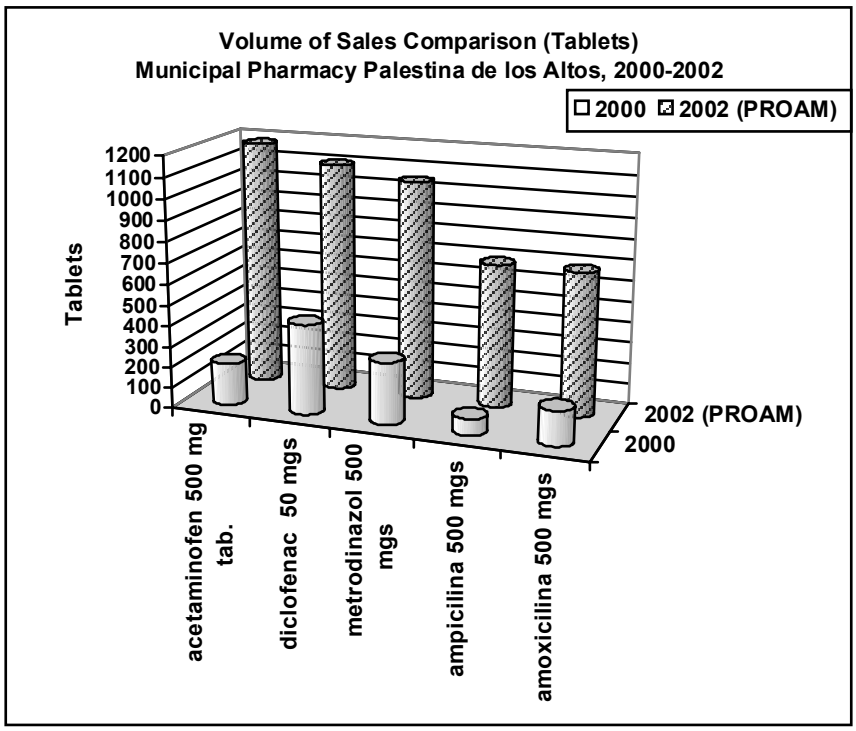
In the season of migration to the coastal areas, migrant bought drugs to use in coastal areas, like: analgesic, anti fever, anti parasite, multivitamin, etc.

7.2 Fund for health activities in the community

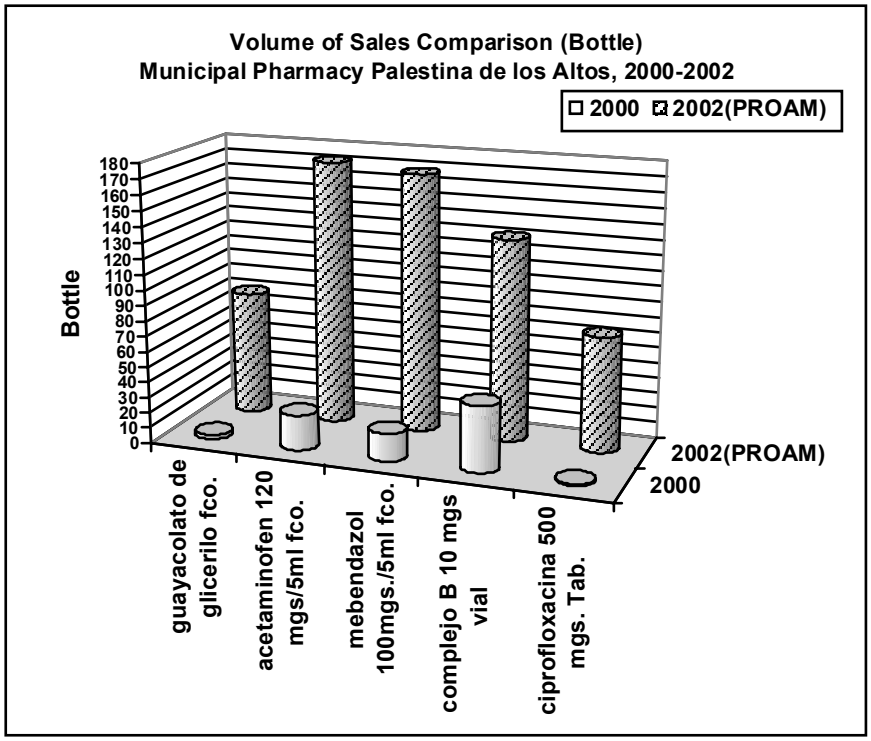
From revenue of the MPU, each health committee has a fund for their own activities. Health committee fund has been utilized successfully for health activities, maintenance of MPU installations, support the medical attention in the MPU, building repair and transportation fee for health committee members. On 12-14 of November, the health committee arranged a capacitation with the cooperation of APROFAM and paid the lecture fee to APROFAM from the health committee fund. In the future, it is expected that such activities arranged by the health committee will increase as increase of the revenues of the MPUs.

7.3 Sales of PROAM drugs at the Municipal Pharmacy

To introduce PROAM drugs to MPU, the Municipal Pharmacy also had to introduce PROAM drugs, meaning that villagers from others areas of the model area in Palestina de los Altos also received benefit of cheaper drugs. The sales volume amount, therefore, increased in Municipal Pharmacy after introduction of PROAM. The increase amounts of the representative medicines are shown in the next figures.



	Y 2000	Y 2002 (PROAM)	Comparison (Times)
acetaminofen 500 mg tab.	204	1,181	5.8
diclofenac 50 mgs tab	434	1,103	2.5
metrodinazol 500 mgs tab	298	1,049	3.5
ampicilina 500 mgs tab	78	690	8.8
amoxicilina 500 mgs tab	167	690	4.1



	Y 2000	Y 2002 (PROAM)	Comparison (Times)
Guayacolato de glicerilo fco.	3	81	27.0
Acetaminofen 120 mgs/5ml fco.	23	173	7.5
Mebendazol 100mgs./5ml fco.	18	169	9.4
Complejo B 10 mgs vial	43	132	3.1
Ciprofloxacina 500 mgs. Tab.	1	75	75.0

Table N1 Role and Responsibility of Each Actor for Municipal Community Health Activities

Municipal Pharmacy	（１） Regularly(every three month) purchasing PROAM drugs and selling them to MPU with 105% of original purchasing price. （２） Selling PROAM drugs at municipal pharmacy with 135% of original price.
Municipality	（１） Organizing health committees and selecting competent health promoters （２） Preparing all the necessary document to apply to PROAM （３） Monthly supervision of accounting and stock control done by health committee
Health Committee	（１） Monthly administration of drug sales benefit, stock control, accounting for MPU and recording as well as allocation of incentive to health promoter. （２） Safely keep the certain part of benefit for future health activities in the communities. The committee has the right to decide the purpose of use. （３） Support for health education session given by health promoters （４） Co-ordination among health promoter, municipality and municipal pharmacy
Health Promoter	（１） Selling essential drug as well as giving first aid treatment to the village people （２） calculate daily benefit, kinds of drugs sold, first aid attended, stock and record them （３） Implementing monthly health education session in co-operation with health committee （４） Purchasing drugs from Municipal pharmacy with the rate of 105% and selling at 130% of the original prices. （５） Referring the patients to the health center if the symptom does not disappears or in case of very severe symptoms （６） Keep contact with Health Centre for technical assistance
Health Centre	（１） Technical support to Health promoter, health committee and municipal pharmacy （２） retraining for health promoters concerning drug selling and health education topics when needed （３） Support for implementation of monthly health education （４） Providing the prescription to the patient
Users	（１） Appropriate use of the drugs according to the guidance given by health promoter （２） Active participation to monthly health education （３） Avoid giving drugs bought to others Avoid self-treatment and go to the appropriate health facilities when the symptoms do not disappear or very severe symptoms
JICA Study Team	（１） Financing and Purchasing initial equipment and inputs together with municipality including building of MHU （２） Monitoring and Evaluation

Table N2 Monitoring Result for MPU Los Diaz, April to November, 2002.

Indicator	Data Collector	Frequency	Check method	Target	Result						
					April	May	June	July	August	Sep	Oct
Accounting record	Municipality and Health committee	Monthly	Count number of drugs and sales record	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy
Participation of health center in education session	Health committee	Every 3 months	Check record of participants	80% Health center attendance			Health Center staff attended			Health Center staff attended	
Health education participants	Municipality and Health committee	Monthly	Count of first aid material, record of treatments and interview to the community	80% of community family member attend.	10 people Less than target of participants	35 students Less than target of participants	6 teachers Less than target of participants	20 people Less than target of participants	39 students Less than target of participants	15 people Less than target of participants	5 teachers Less than target of participants
Use of committee budget	Project Staff	Monthly	Check purposes of budget use	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy

Table N3 Monitoring Result for MPU Los Cabrera, April to November, 2002.

Indicator	Data Collector	Frequency	Check method	Target	Result						
					April	May	June	July	August	Sep	Oct
Accounting record	Municipality and Health committee	Monthly	Count number of drugs and sales record	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy
Participation of health center in education session	Health committee	Every 3 months	Check record of participants	80% Health center attendance			Health Center staff attended			Health Center staff attended	
Health education participants	Municipality and Health committee	Monthly	Count of first aid material, record of treatments and interview to the community	80% of community family member attend.	8 people Less than target of participants	25 students Less than target of participants	6 teachers Less than target of participants	22 people Less than target of participants	30 students Less than target of participants	19 people Less than target of participants	5 teachers Less than target of participants
Use of committee budget	Project Staff	Monthly	Check purposes of budget use	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy	No discrepancy

ANNEX 1 – O
WATER QUANTITY IMPROVEMENT PLAN FOR EXISTING WATER SUPPLY (PALESTINA)

ANNEX 1 – O

WATER QUALITY IMPROVEMENT PLAN FOR THE EXISTING DRINKING WATER (PALESTINA)

TABLE OF CONTENTS

Attachment

O. WATER QUALITY IMPROVEMENT PLAN FOR THE EXISTING DRINKING WATER (PALESTINA)

1. Background

In Palestina de Los Altos 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 : 3 set
  (including 3 protection houses and 1 tank)
- 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

Item	*Frequency*	*Data collector*
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 purified water. As a 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 municipality staff in charge of the water system has been made in order to give skills and knowledge for using and maintaining the sterilizer. It seems this capacitation has been finished successfully and all the attendants learned all the skills and knowledge.

Time has not passed so long after commencement of the treatment, thus actual operation and maintenance works could not be observed at site yet. But an anticipation can be derived from an status in another municipal potable water system, named urban potable water system, to which the Municipality of Palestina de Los Altos installed a sterilizer in February 2002 by their own fund. With same operators and operation system the municipality manages 2 communal potable water systems, such as this urban potable water system and the rural potable water system to which the Project had installed the sterilizers. In the urban potable water system, the sterilizing system has been duly operated since February 2002 with monthly refill of Hypochloride sodium, other operations and maintenance. This fact shows the capability of the operation staff and proper financial assistance of the Municipality, which will be observed in the rural potable water system in future.

4.3 Number of water born disease patients

After commencement of the water treatment time has not passed so long, thus actual effect of the Project could not be observed at site yet. However the tendency of the number of the patients can be estimated with an effect of the urban potable water system which has had sterilizer since February 2002. The following table shows a change of number of patients of water born diseases, estimated based on data of the municipality health center.

Number of Patients of Water Born Diseases

	unit	Water Treatment (Period)	
		Before (Feb-Sep '01)	After (Feb-Sep '02)
Total Patients*1 of Health Center by all diseases	patients	194	190
WBD*2 Patients*1 of Health Center	patients	56	35
Estimated*3 Annual WBD Patients in the Central Area	patients	252.0	157.5
Indicator of WBD patients*4 in the Central Area	**patients/ 1000 habitant**	**126.0**	**78.8 (37% less)**

*1: Patients: only from the Central Area of the Municipality, where the treated water is supplied.
*2: WBD: Water born diseases
*3: Estimated total WBD patients: There are 2 more clinics in the Central Area. Thus the total is estimated with multiplying by 3. And time span adjustment by multiplying by 1.5. 1.5 = 12months/8month(Feb-Sep)
*4: The Central Area has 2,000 habitant.

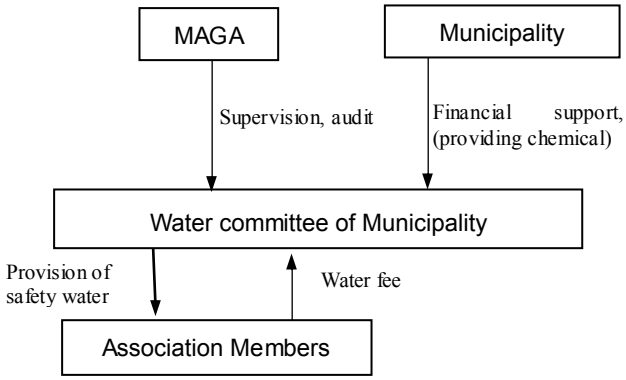
As shown above, the number of the patients was depressed around 37 % and the indicator decreased from 126.0 to 78.8 patients/1,000habitants which is less than an average Guatemalan national indicator for the water born disease patients in 2001, 89.6 patients/1,000habitants. It is expected that almost same effect would be observed with the Project.

4.4 Simple water quality test

Water quality before the water treatment was checked and an existence 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, an examinations are under process. The results and conclusions will be provided in the Draft Final Report.

5. 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.



6. Observed Impacts

6.1 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 low, i.e. Article 87 of "the Codigo de Salud (Decreto 90-97) in December 1999", that the Municipalities have responsibility on it. However it is fact that, in general, the municipalities did 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 Palestina de Los Altos 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.

ATTACHMENTS

INSTITUTO DE FOMENTO MUNICIPAL -INFOM-
LABORATORIO DE AGUA
Tel/Fax: 472-3499

INFORME DE ANÁLISIS FISICOQUÍMICO DE AGUA

MUESTRA No. 1073-02

INFORMACIÓN DE LA MUESTRA

Interesado: ***EQUIPO DE ESTUDIO JICA, QUETZALTENANGO***	Temperatura in situ (°C): ---
Punto de muestreo: ***Grifo domiciliar (Rural)***	pH in situ: ---
Fuente: ***Sistema de abastecimiento de la localidad***	Conductividad (µS/cm): ---
Municipio: ***Palestina de Los Altos***	Cloro residual (mg/L):
Departamento: ***Quetzaltenango***	Sólidos disueltos (mg/L): ---
Fecha de captación: ---	Salinidad (%): ---
Hora de captación: ***12:00***	Fecha de recepción laboratorio: ***10-10-02***
Técnica de preservación: ***Ambiente***	Hora recepción laboratorio: ***08:00***
Responsable de captación: ***Luis Rosado (Persona ajena al Laboratorio INFOM)***	

RESULTADOS

ITEM	PARÁMETROS FISICOS	UNIDADES	*LMA	*LMP	RESULTADO
1	Color aparente	Unidades Pt-Co	5.0	35.0	***<1***
2	Color verdadero	Unidades Pt-Co	Nsc	Nsc	***<1***
3	Conductividad	µS/cm	100	750	***140***
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	***70***
8	Sólidos en suspensión	mg/L	Nsc	Nsc	***<1***
9	Temperatura de análisis	° C	15.0 - 25.0	34	***25***
10	Turbiedad	UNT	5.0	15.0	***<0.5***
ITEM	**PARÁMETROS QUÍMICOS**	**UNIDADES**	**LMA**	**LMP**	**RESULTADO**
11	Acidez	mg/L $CaCO_3$	Nsc	Nsc	***0.75***
12	Alcalinidad debida al bicarbonato	mg/L $CaCO_3$	Nsc	Nsc	***60***
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	***60***
16	Dióxido de carbono	mg/L CO_2	Nsc	Nsc	***0.66***
17	Dureza total	mg/L $CaCO_3$	100.000	500.000	***60***
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	***0.02***
21	Nitratos	mg/L NO_3^-	Nsc	10	***7.0***

** 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.

Mirna Gómez
Ingeniera Química, Col. 914
Supervisora de Laboratorio

INSTITUTO DE FOMENTO MUNICIPAL LABORATORIO DE AGUA SUPERVISOR FISICO QUIMICO Quetzaltenango

INSTITUTO DE FOMENTO MUNICIPAL -INFOM-
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INFORME DE ANÁLISIS BACTERIOLÓGICO

MUESTRA No. 1172-02

INFORMACIÓN DE LA MUESTRA

Interesado: ***EQUIPO DE ESTUDIO JICA, QUETZALTENANGO***	Temperatura in situ (°C): ---
Punto de muestreo: ***Grifo domiciliar***	pH in situ: ---
Fuente: ***Bomba de distribución***	Conductividad (µS/cm): ---
Municipio: ***Palestina de Los Altos***	Cloro residual (mg/L): ---
Departamento: ***Quetzaltenango***	Sólidos disueltos (mg/L): ---
Fecha de captación: ***05-11-02***	Salinidad (%): ---
Hora de captación: ---	Fecha de recepción laboratorio: ***05-11-02***
Técnica de preservación: ***Refrigeración***	Hora recepción laboratorio: ***16:00***
Responsable de captación: ***Sr. Murakamy (Persona ajena al Laboratorio INFOM)***	

RESULTADOS

ITEM	PARÁMETRO BACTERIOLÓGICO	RESULTADO	UNIDADES
1	Grupo Coliforme Fecal	***2***	UFC/100 mL
2	Grupo Coliforme Total	***140***	UFC/100 mL
3	Recuento Aeróbico Total	***20***	UFC/mL

OBSERVACIONES

- ☑ Para el análisis de Coliformes Totales y Fecales se utilizó el Método de Membranas de Filtración. Para el grupo Coliforme Total se empleó medio de cultivo ENDO y para el grupo Coliforme Fecal medio de cultivo M-FC.
- ☑ De acuerdo a la norma COGUANOR para agua potable NGO 29001 (Decreto No. 986-1999, Publicado en el Diario Oficial de fecha 04 de febrero de 2000), el límite máximo permisible para el grupo ***Coliforme total es 1 UFC/100 mL*** cuando se utiliza el método mencionado en el inciso anterior.
- ☑ El Recuento aeróbico total se realizó a través del método de Vertido en Placa, utilizando Agar Estándar como medio de cultivo.

INSTITUTO DE FOMENTO MUNICIPAL LABORATORIO DE AGUA SUPERVISOR DE BACTERIOLOGIA Guatemala

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Director de Laboratorio

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INFORME DE ANÁLISIS FISICOQUÍMICO Y BACTERIOLÓGICO DE AGUA

MUESTRA No. 1250-02

INFORMACIÓN DE LA MUESTRA

Interesado: ***EQUIPO DE ESTUDIO JICA - QUETZALTENANGO-***	Temperatura in situ (°C): ---
Punto de muestreo: ***Salida del equipo de cloración***	pH in situ: ---
Fuente: ***Sistema de abastecimiento de la localidad***	Conductividad (µS/cm): ---
Municipio: ***Palestina de los Altos***	Cloro residual (mg/L): ***0.9***
Departamento: ***Quetzaltenango***	Sólidos disueltos (mg/L): ---
Fecha de captación: ***26-11-02***	Salinidad (%): ---
Hora de captación: ***11:35***	Fecha de recepción laboratorio: ***27-11-02***
Técnica de preservación: ***Refrigeración***	Hora recepción laboratorio: ***08:30***
Responsable de captación: ***Ing. Héctor Godinez (Persona ajena al Laboratorio INFOM)***	

RESULTADOS

ITEM	PARÁMETROS FISICOS	UNIDADES	*LMA	*LMP	RESULTADO
1	Color aparente	Unidades Pt-Co	5.0	35.0	***5***
2	Color verdadero	Unidades Pt-Co	Nsc	Nsc	***1***
3	Conductividad	µS/cm	100	750	***147***
4	Olor en frío	Organoléptico	No rechazable	No rechazable	***Cloro***
5	Olor a 60 °C	Organoléptico	No rechazable	No rechazable	***Cloro***
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	***73***
8	Sólidos en suspensión	mg/L	Nsc	Nsc	***2***
9	Temperatura de análisis	° C	15.0 - 25.0	34	***22***
10	Turbiedad	UNT	5.0	15.0	***0.6***
ITEM	**PARÁMETROS QUÍMICOS**	**UNIDADES**	**LMA**	**LMP**	**RESULTADO**
11	Acidez	mg/L $CaCO_3$	Nsc	Nsc	***0.5***
12	Alcalinidad debida al bicarbonato	mg/L $CaCO_3$	Nsc	Nsc	***66***
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	***66***
16	Dióxido de carbono	mg/L CO_2	Nsc	Nsc	***0.44***
17	Dureza total	mg/L $CaCO_3$	100.000	500.000	***50***
18	Manganeso total	mg/L Mn	0.050	0.500	***<0.1***
19	Sulfatos	mg/L SO_4	100.000	250.000	***<7***
20	Hierro total	mg/L Fe	0.100	1.000	***0.13***
21	Nitratos	mg/L NO_3	Nsc	10	***13.2***
ITEM	**PARÁMETROS BACTERIOLÓGICOS**	**UNIDADES**	**LMA**	**LMP**	**RESULTADO**
22	*Escherichia coli*	NMP/100 mL	Nsc	Nsc	***<2***
23	Coliformes totales	NMP/100 mL	Nsc	< 2	***<2***
24	Conteo aeróbico total	UFC/mL	Nsc	Nsc	***74***

** 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 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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