1. INTRODUCTION

1.1 Authority

This is Final Report prepared by the JICA Study Team in accordance with the Contract for the Study on the Master Plan Study on Sustainable Rural Development for the Reduction of Poverty in the Central Highland Region of the Republic of Guatemala (the Study) agreed upon between the Government of Guatemala, the Ministry of agriculture, Livestock and Food (MAGA) and the Japan International Cooperation Agency (JICA) in July 29 1999.

1.2 Objectives of the Study and Study Area

The objectives of the Study are (1) to prepare a Master Plan on a sustainable rural development project for the rural areas in the Central Highland Region of Guatemala and (2) to transfer technology, mainly procedures and methods of the plan formulation, to the Guatemalan counterpart personnel through on-the-job training in the course of the Study. The plan is being formulated to reduce poverty in the Study area by integrating a) increase of farmer's income, b) improvement of life quality and c) conservation and effective use of natural resources.

The Study area covers about 6,000 km^2 located in the Central Highland Region. It consists of the four provinces of Chimaltenango, Solola, Totonicapán and Quezaltenango.

1.3 Performance of the JICA Study Team

The Study was carried out in two phases. The Phase-1 study was carried out for about 9 months from January 1999 to October 2000. In this period, the following study was conducted.

(1) Assessment for the present conditions and development constraints in the Study area

(2) Selection of "Model Micro-Basin" in each province

(3) Formulation of the preliminary rural development plans in each selected model micro-basin prepared based on the farmer's participatory approach methods and

(4) Selection and examination of pilot projects from the each model area

During the Phase-I period, the JICA Study Team submitted the following reports to the Government of Guatemala. All the results of the Phase-1 were compiled in

the Interim Report.

(1) Inception Report: February 8, 1999

(2) Progress Report -1: May 2, 2000

(3) Interim Report: October 6, 2000

The Phase-2 study was carried out for five months from January 2001 to July 2001. In this period, the following study was conducted.

(1) Explanation of the contents of the Interim Report

(2) Preparation of the rural developments in the model micro-basins

(3) Detail implementation plan of the pilot projects

A JICA expert was attacked by armed robberies February 11, 2001. The attack occurred on the road connecting San Francisco El Alto with Santa Maria Chiquimula city Totonicapán province. The JICA headquarters in Tokyo ordered that all members of the Study Team stop the field survey and stay in the capital until it is confirmed that four model micro-basins have no problems with security. The Study Team returned to Japan March 23, 2001 and again started the study in Guatemala from May 8, 2001. During this period, the JICA Study Team submitted the following reports to the Government of Guatemala. All the results of the Phase-1 and the Phase-2 were compiled in the Draft Final Report.

(1) Progress Report-2: March 20, 2001

(2) Draft Final Report July 2, 2001

In principle, the Study was carried out by the joint efforts of the JICA study team and the counterpart personnel assigned from the Government of Guatemala. The Study Team transferred technical knowledge to the counterpart personnel. Throughout the study course, a series of regular meetings were held once a two weeks and exchanged views on surveys and projects.

The counterpart personnel and the JICA experts who took part in the Study are shown in Table 1.

2 PROJECT BACKGROUND

2.1 General Economic Conditions in the Country

The population of Guatemala is estimated at 10.8 million in 1998. Population growth rate is 2.7 % per annum. About 65 % of the population lives in rural areas. About 20% of the total population or 2.4 million people live in Guatemala City, the capital.

Economically, the agricultural sector is the most important in the country. It contributes to 23.3 % of GDP and accounts for 59% of the country's labor force. About 60 % of the country's total export comes from agricultural produce such as coffee, banana, sugar, meat and cardamom. The economic condition of Guatemala has been seriously affected by international market prices for primary products.

A financial crisis occurred in 1990 and the balance of payments deteriorated. Since 1991, the Government has propelled an economic policy for stabilizing an economic conditions to prevent increasing inflation and so forth. Though the situation has improved after 1993, it deteriorated again in 1997.

The Government has endeavored to promote a free trade policy and to expand the scale of trade. In 1996, the value of GDP decreased owing to a decline in international market prices of primary products. Afterward, the economy of Guatemala has been revitalized due to stabilization of the price of primary products, increase of public investments through income produced by privatization, and public investment in peace treaty-areas. Under such situation, the annual growth of GDP has increased and achieved 5.1% in 1998. On the other hand, the Government has serious financial problems due to the shortage of tax income and has attempted to reform the tax system.

The macro economic indicators in recent years are shown in the following table.

Particulars	1994	1995	1996	1997	1998
GDP(million US$)	12,990	14,600	15,700	17,800	18,000
Average growth of GDO per annum (%)	4.0	4.9	3.1	4.4	5.1
GNP/capita (US$)	1,190	1,340	1,470	1,462	1,485
Consumption Price Index	12.5	8.4	11.1	9.3	7.0
Unemployment (%)	3.3	3.7	4.9	4.5	4.5
Financial Balance of the Government (M-Quetzal)	-939	-218	-270	-1,596	1,941
Revenue (M-Quetzal)	5,787	7,267	8,658	9,828	12,893
Expenditure (M-Quetzal)	6,725	7,485	8,928	11,424	10,952
Balance of Payment (M-US$)	-625	-572	-451	-632	-1,115
Current Account Balance (M-US$)	-997	-877	-643	-1,466	-2,092
Trade Balance (M-US$)	-997	-877	-643	-1,466	-2,092
Exports of goods (FOB) (M-US$)	1,550	2,156	2,236	2,386	2,546
Imports of goods (FOB) (M-US$)	2,547	3,033	2,880	3,852	4,638
Income from no-trades	-77	-188	-329	-147	-217
Current transfer balance (M-US$)	449	493	522	N/A	N/A
Balance of capital (M-US$)	655	556	738	N/A	N/A
Errors and omission (M-US$)	-24	-136	-72	N/A	N/A
Reserves excluding gold (M-US$)	863	702	870	1,047	1,354
External debt (M-US$)	3,420	3,665	3,785	4,124	4,565
Public/public sector (M-US$)	2,729	2,835	2,766	N/A	N/A
Bilateral (M-US$)	1,116	1,183	1,132	N/A	N/A
International institutions (M-US$)	987	1,003	1,036	N/A	N/A
External debt (M-US$)	3,420	3,665	3,785	4,124	4,565

2.2 National Development Policy

After 35 years of civil war, the Guatemala Government and rebel forces signed Peace Accords in December 1996. The Government has focussed on poverty alleviation and human resource development for small-scale farmers in the rural areas in the peace process and maintaining an appropriate macroeconomic framework.

The Government prepared action programs between 1996 and 2000 for the social development and construction of peace in the country. Since then, the Government has promoted the following matters for poverty alleviation and human resource development;

(1) To reinforce basic infrastructure in the rural areas by improvement and rehabilitation of the rural and main roads, secondary and regional road and privatization for the Government's infrastructures such as ports, power, telecommunications, highways, and the postal services.

(2) To liberalize the economy and improve the public sector

(3) To reduce the poverty and inequality by basic education reform, investment in social infrastructure and reconstruction/local developments that contribute to the sustainable self-development of the local population,

mostly indigenous people living in extreme poverty.

The new administration was established in January 2000 and it seemed that the new administration would follow the basic development policy made by the previous government.

At present, SEGEPLAN is formulating the new development plans for the future and gives high priorities to the development of the follows;

People Security, Justice, Demilitarization, and Human Rights

- Increase de Professionalism of Civil Nation Police
- Judicial Investigation
- Prison System
- Reform the Judicial System
- Human Rights

Decentralization, Rural Development and Environment

- Strategic Way of Decentralization
- Structures and Practices of Government Power
- Modernization of the Government Institutions
- Sustainable Agriculture
- Policy for Access to Land
- Management of Natural Resources
- Rational Use of Natural Resources
- Environmental Contamination

Education

- Educational Reform
- Gender
- Inter-Culture
- Quality of Education
- Re-adjustment of Curricula
- Development of Human Resources
- Modernization of Educational Sector

People Participation and Political Reform

- Strengthening of Mechanisms of Participation
- People Representation and Decision Making
- Social Auditing
- People Organization

Integrated Human Development

- Children and Youth

- Women
- Inter-Culture

2.3 Background for the Study

The Study area consists of four provinces in the central highland region and is identified as a poor area. About 70 % of the rural people in the Study area suffer from malnutrition due to a shortage of foodstuff. Moreover, owing to poor access to water supply system and the health services, water borne diseases and respiration infections are more prevalent and mortality is higher compared to other regions. Most of the farmers in the Study area having very small land holdings. Access to the markets, irrigation facilities and extension services for agricultural technology is very poor. Further, there is a shortage of funds for the farmers. As a result, agricultural production is low as are farm incomes.

A recent increase in population has brought about the development of steep lands that are not suitable for farming, resulting in the unplanned deforestation, serious soil erosion, decrease of fostering capability of water resources in the river basins, deterioration of water quality of the river water and groundwater.

Under these circumstances, the Guatemalan government considered there should be the sustainable rural development for the reduction of poverty in the central highland region with a view to conservation and efficient use of natural resources, increasing farm incomes and improving life quality of the farmers. The Guatemalan government requested the Japanese government on July 1998 to carry out a master plan study in the central highland region. The Government of Japan dispatched a preparatory study team to Guatemala headed by Mr. Kiyoshi Sawada on November 1999 to Guatemala. The team held a series of discussions with the relevant authorities of the Government of Guatemala and both sides agreed on the Scope of Work of the Study on 29 July 1999.

This Study was carried out based on the basic concept of “Agreement on Social and Economic Aspects and the Agrarian Situation, III Agrarian Situation and Rural Development” in the Guatemala Peace Agreements.

3. PRESENT CONDITIONS IN THE STUDY AREA

3.1 General View for the Study area

3.1.1 Administration

The Study area is about 6,050 km^2 or 5.6% of the total area of the whole country. Administratively, it is under four provinces (Chimaltenango, Sololá, Totonicapán and Quetzaltenango), 67 municipalities and local traditional authorities. Municipalities have the important function of providing services to the people. Within the process of decentralization and the encouragement of participation, more emphasis is given to reinforcement of the organization of municipalities. The Central Government delivers 10% of its ordinary revenue, 1% of a value-added tax, and other subsidies to municipalities. Under municipalities, local traditional authorities of which the head is called the Auxiliary Mayors or "*Alcaldes Auxiliares*", manage the municipal administration of the small villages, hamlets, and cantons. The total population of the Study area was 1,300,000 in 1994 or 12.3% of the total population of the country. The indigenous people in the Study area are mainly Kaqchikel, K'iche, Tu'zujil and Mam and occupy about 80% of the total population. The total number of households is 240,000. The family size is about 5.5. The population density is about 217 persons per km^2 and population growth rate is 2.4 % per year.

3.1.2 Social Aspects

(1) Guatemalan Society

According to the report of the Historical Elucidation Committee, the armed confrontation caused 200,000 deaths and disappearance of about 500 thousand to a million people were displaced in and out the domestic and foreign countries. Around 150 thousand people sought protection in Mexico. In June of 1999, the process of return from Mexico concluded and 42,000 people returned. According to ACNUR, there are only three returned communities in the Study area at La Guardiana (San Pedro Yepocapa, Chimaltenango), Las Delicias (Palmar, Quetzaltenango) and Magnolia Miramar (Colomba, Quetzaltenango) and one from CPR is in Salvador and Annex (for CPR Sierra, San Miguiel Pochuata, and Chimaltenango). Technical assistance for these communities is in the hands of various government and non government institutions such as CTEAR and PDP.

Within the Study Area, Chimaltenango was the most affected by the internal

conflict. Some communities of San Martín Jilotepéque, San José Poaquil and Comalapa were totally destroyed and the population was obligated to move out of their community. In other parts of the study area they didn't suffer as much as the communities previously mentioned. Now SEPAZ and FONAPAZ has started a Victim Assistance Program of Violations to the Human Rights (AVIDEH) and are going to start some activities in Chimaltenango in the Study Area. Also land conflict is one of the important factors to be considered in project development.

The Central Highlands in the Study area was a rural economy based on the farming of corn and other complementary activities. The Mayan rural families did not only depend on agriculture and hand made craft and carried out commerce etc. However this modality has change a lot within the historical process. Many Quetzaltenango people immigrate to Mexico to get money, basically to Chiapas as farm workers. Also people in Quetzaltenango and Totonicapán in the Study area immigrate to the United States.

(2) Health

The health sector is characterized by the involvement of many institutions, both public and private, non-governmental organizations (NGOs), and a sector of traditional medicines, which plays an important role especially in rural areas with a Mayan tradition. The total coverage of health services in 1999 was 67% being contributed by 24% by the Ministry of Public Health and Social Assistance (MSPAS), 18% by SIAS, 17% IGSS and 8% by others.

The total fertility rate (TFR) is 5.0 children per woman of reproductive age (15 – 49 years old). The TFR is higher in the rural area (5.8) than in urban area (4.1), and it is higher among indigenous women (6.2) than among non-indigenous (ladino) women (4.6). Indigenous population has one of the worst health profiles for women and children in Latin America. Principle causes of morbidity and mortality in the country and the Study area are (a) acute respiratory infections and diarrhea, (b) nutritional deficiencies, and (c) other diseases such as Malaria, HIV/AIDs, and diseases among adults.

In the Study Area more than 80% of deliveries are attended by comadronas (traditional birth attendants) with exception of Quetzaltenango. Number of health facilities where deliveries can be attended is quite limited. Though the MSPAS and many NGOs have carried out training of comadronas to promote clean and safe delivery at the community level and to encourage referral of

pregnant women with risk to the heath institutions, the maternal care in those areas should be further improved.

(3) Rural Infrastructure

(i) Roads

The road infrastructure in Guatemala is divided in four classes: central American, national, provincial and rural roads. The General Management of Roads from the Ministry of Transportation, Infrastructure and Houses in coordination with the respective Committees of Urban and Rural Development are in charge of the construction and maintenance of these roads, with the exception of rural roads.

The total length of the roads in the Study Area represents 16.6% of the national system's total, of which 67% of the length is not sealed, which makes the transiting and transporting of merchandise very difficult in the rainy seasons as shown in the following table.

Road System in the Study Area

Province	Central American		National		Provincial		Rural	Total
	Asphalt	Earth	Asphalt	Earth	Asphalt	Earth	Earth	
Chimaltenango	63	0	42	34	70	179	343	731
Sololá	53	0	86	10	73	89	99	410
Totonicapán	61	0	15	42	22	92	353	585
Quetzaltenango	58	0	122	28	100	142	172	622
Total in the Study area	235	0	265	114	265	502	967	2,348
Total Guatemala	2,102	44	967	1,316	1,767	4,825	3,067	14,118

Source: MTIV Dirección General de Caminos, 1999.

(ii) Electricity, Potable Water and Sanitation

The electricity service is set up and planned by a Committee of Urban and Rural Development in each respective areas. Its construction, operation and maintenance are carried out by INDE. The statistics indicate that the coverage of electricity services was still less than 60% of the population in 1994.

The Ministry of Public Health and Social Assistance (MPSAS), in coordination with INFOM and other state organizations states the policy of access and coverage of potable water service, and each municipality is obligated to supply the respective communities with potable water. The elimination and disposal of wastewater is the responsibility of MSPAS' in coordination with each municipality. The MSPAS is in charge of the quality

regulations of services for potable water and disposal, elimination and discharge of wastewater.

The coverage of electricity, water and latrine services is shown in the following table.

Coverage of Potable Water, Latrines and Electricity

Province	Total of houses	Potable Water		Latrines		Electricity	
		houses	%	houses	%	houses	%
Chimaltenango	59,795	45,888	76.7	15,363	25.7	35,366	59.1
Sololá	40,455	34,331	84.9	5.691	14.1	21,982	54.3
Totonicapán	47,323	33,533	70.9	4,935	10.4	26,500	56.0
Quetzaltenango	92,536	63,180	68.3	28,100	30.4	57,299	61.9
Total 4 provinces	240,109	176,932	73.7	54,089	22.5	141,147	58.8
Total Guatemala	1,553,708	1,055,960	68.0	491,110	31.6	864,211	55.6

3.1.3 Institution for Development

(1) Organizations involved in the Development Process

Many organizations and many channels for rural development exist as shown in Figure 1. In the process of decentralization, Social Funds have increased considerably and the Ministries themselves have concentrated their duties on formulation of policies and arrangements among relevant authorities concerned and are instituting new alternative systems like SIAS, PRONADE, etc.

Other institutions related to rural development are municipalities and Development Councils. The municipalities are the basis of decentralization and rural development. The Development Councils are created at both province and municipality level. The participated members are municipal mayors, governors, the representatives of Social Fund, provincial administrations of the Ministries, NGOs and cooperatives, and others.

(2) Ministry of Agriculture, Livestock and Food (MAGA) and Decentralized Organizations

(i) Organizational Structure of MAGA

MAGA is made up of three groups of institutions: centralized institutions (MAGA), functional autonomy institutions (INAB, ICTA AND FONTIERRA) and Special execution units (PLAMAR, FONAGRO, PROTIERRA AND PROFRUTA), as shown in Figure 2. Under the decentralization policy, the major functions of MAGA are (a) to formulate and administrate policies and strategies for agricultural sectors of farming, livestock, forest and hydro-biology and (b) coordination, regulation, evaluation of actions in the above agricultural sectors.

In addition, there are supporting organization for MAGA for rural development.

(a) CONADEA (National Council for Agriculture and Livestock Development) was created in 1995 and has recognized as "Principal mechanism of consulting, coordination and social participation in the decision making for rural development." Representatives of various sectors like Cooperatives, NGO's, ANACAFE, AGEXPRONT, Farmers Organization gather monthly.

(b) RADEAS (Network of agents for the Sustainable Agricultural and livestock Development) RADEAS is a space for the participation of the Civil Society at a province level to define and extend strategies and actions for development, and to give priority and act to needs. Now about 10 provinces are functioning with the participation of NGO's, Cooperatives, Associations etc. However, they don't have enough resources for their functioning.

(3) Organizations for Supporting Fund

(a) The Land Fund is founded in June 1999. Its role is to promote the access of rural people to the land. To fulfil this objective, this fund carries out these functions. (i) Impulse a active and transparent land market and (ii) Facilitate the land acquirement and technical and judicial assistance. The Land Fund plays an intermediary role between offer makers and demanders of the land. To the beneficiaries, Banks like BANRURAL concede credits with mortgage of the domain.

(b) FONAGRO (National Fund for the Reactivation and Modernization of the Agriculture and livestock activities) is also a special execution unit of MAGA that was funded in 1994 as the financial instrument of MAGA to impulse the agricultural sector. Cooperatives, NGO's , farmer's association and rural women organization etc., have access to the resources of the fund. This fund that comes from the "2KR program from Japan enters in this fund.

(c) FIS (Social Investment Fund) [1]The Social Investment Fund was created in 1993 as a decentralized autonomous state entity with judicial personality and proper patrimony. This fund has stimulated the investment to overcome the condition of poverty in rural area. During the first years of implementation, they gave more priority to the education sector. Water and Sanitary sector has importance. In the years of 98 and 99 new orientations are taken of investments such as access roads and bridges for vehicles. The total amount of investment reaches Q388.651 thousand (1998). Major fields of investment are health and nutrition, water supply and sanitary,

[1] Description about these fonds is based on the " informe Global de Fondos Sociales Guatemala 1998".

education, environment, transport and agriculture & livestock. For the carrying out of these extensive activities, FIS makes agreements with governmental, no-governmental organizations such as PRONADE (Ministry of Education), FONAPAZ, INFOM, IICA, WFP, CADISOGUA (NGO's) etc.

(d) FONAPAZ (National fund for the peace) was created in 1991, with the purpose of carrying out programs and projects to solve the problems to which the population is affected by armed conflicts confronts, as well as to coordinate and supervise activities of Ministries, NGO's, churches etc., for the benefit of the affected population. The total amount of investment was Q638,108 thousand (1998). Just like FIS, FONAPAZ covers several sectors and has increased the investment for the peace process these years. FONAPAZ also has several agreements with international, national and, governmental organizations. Two thirds of the agreements was subscribed with municipalities in 1999, however the difficulty of implementation through municipalities is mentioned.

(e) FSDC (Solidarity Fund for Community Development) was created in 1992 with the object to promote and develop communities by respective municipalities. This fund was carried out through Urban and Rural Development Councils. During 1998, FSDC carried out investment of Q 488.250 thousand. Main fields for investment are transport, water and sanitary, and electrification.

(f) INFOM (Municipality Foment Institute) was created in 1957, as a state, decentralized, autonomous Institution with a juridical personality and proper patrimony, whose objective is to support the municipalities by providing direct service as well as technical and financial assistance. The total amount of investment in 1998 was Q 103,125 thousand and about 70% were assigned to the water and sanitary sector. Within the decentralization process, INFOM plays an important role for the municipal reinforcement.

(g) FODIGUA (Guatemalan Fund for Indigenous Development) was created in 1994, with the object to support and reinforce the process of sustainable and self-manageable human development for the indigenous population. The total amount of investment was Q. 29,543 thousand in 1998. About 66% of investment in 1998 was concentrated to electrification and infrastructure.

(h) FOGUAMA (Guatemalan fund for the environment) was created in 1997, attached to CONAMA. The objective of FOGUAMA is the financing of sustainable environmental development projects for solid waste and sewage treatment, forest fire identification, forest coverage monitoring and institutional reinforcement. In 1998, Q 4,345,000 was invested for National commission for environment, authority for sustainable management of basin, MAGA, National institute for forest and municipality. About 75% of investments are

provided in the form of grant.

(4) Organization for Forest and Environment

(a) INAB is a special execution unit of MAGA and was created in 1997. The objective of INAB is to promote and foster the country's forestry development through sustainable forest management, reforestation, forestry industry and handcrafting. Main activities of INAB are management plan for forests, forestry incentive program (PINFOR), forest fire control, control of cutting tree and reinforcement program on municipality and communal forests.

(b) Ministry of Environment: the CONAMA that was created according to the decree No.68-86 "Environmental protection and improvement law", raised a legation to the status of the Ministry of Environment 2000. Its function is to advise and coordinate all kinds of actions for the protection and improvement of natural resources.

(c) CONAP (National Council for Protected Areas) created in 1989 to conserve, protect, manage and administrate the protected areas. These areas include Biosphere reservation, private natural reservation, cultural monuments and national and regional parks etc., whose areas reach about 30% of the national territory. CONAP is in charge of 78% of protected areas. (99 areas within 123 protected areas. CONAP is in charge of most of the province of Sololá, as the Area of Multiple Uses "Lake of Attila".

(5) Credit Organization

(a) BANRURAL (Rural Development Bank) is a banking entity conformed as an incorporated company of mixed capital, which does all kinds of operations as a commercial bank. The objective of BANRURAL is to promote economic and social development of the rural area, and it is oriented to finance agricultural activity, craftsmanship and commerce etc,. The total investment in 1999 was Q 937,773,000. About 40% of the investment was provided to the agricultural sector, 26% for micro-medium company, financial intermediate for 19%, 14% for cooperative credit, etc,. The interest rate of the bank is 19-20% per year. BANRURAL manages resources from several trust funds like Land Fund, FONAGRO, PLAMAR, PROZACHI etc. In case of PLAMAR, the interest rate is applied to 12 % for irrigation projects.

(6) Organization for Training

(a) The Institute of Science and Agricultural Technology (ICTA) is an institution decentralized of the Ministry of Agriculture, Livestock and Food. The responsibility of ICTA is to generate and promote the use of science and agricultural technology. The Mission of ICTA is to contribute to a competitive development of the agricultural sector, including livestock, fishery and forestry sub-sectors. In generating technology ICTA is guided by the

principles of efficiency and sustainability. The general objective of ICTA is defined as: to contribute to increase productivity and profitability of the agricultural sector through the development and transfer of technology. At the top of ICTA management structure is the board of directors, presided by the minister of MAGA, and include as member, the minister of SEGEPLAN, the director of San Carlos University, and representative of private sector.

(b) The Technical Institute of Training and Productivity (INTECAP) is a Technical-Educational institution responsible for the technical formation in Guatemala. INTECAP was created by congressional decree No. 17-72 on May 1972. The objective and functions of INTECAP are:

- Development of human resources and increment of productivity.
- To contribute with the government development plan in attaining the targets for formation and training of labors.
- To promote the collaboration between private and public sectors.
- To promote the increase of productivity in all aspects and levels, and help to develop human resources.
- To collaborate with other institutions in promoting social and economic development of the country.

At the top of ICTA management structure is the board of directors, presided by the minister of Public Works and Social Welfare, and include as member of the minister of SEGEPLAN, representatives of private sector, and labor sector. The budget of INTECAP comes from a tax of 1 % to value of labor salaries paid by private companies. In addition to specializing labor for industrial sector, INTECAP provides services to other sectors such as agricultural, livestock, forestry, mining, fishery, textile, and food.

(7) NGOs

NGOs are one of the most important institutions in the field of socio-economic development at the community level. According to the UNDP's Directory in 1997, the NGOs cover various activities such as agriculture, environmental conservation, health and sanitation, and so on. Generally, one NGO covers more than one field. The number of NGOs in the country is about 1,500. NGOs can be broadly classified into to three types by their function and by their constituent members. The types are classified as Federation NGO, Development NGO, and Community-level Group.

3.1.4 Natural and Environmental Condition

(1) Land Resources

(i) Climatic conditions in the Study Area

Most of the Study area is located in the Guatemalan Central Highlands, at altitude ranging mostly from 1,000 to 3,300 meters above sea level.

Within the Study area there are different microclimates associated with differences in altitude. In areas located above 2,000 meters, frosting temperatures occur during the months from December to February. The annual average rainfall also shows correlation to altitude. Areas located at higher altitude are lower values of average rainfall compared to areas located at lower elevation.

(ii) Soil and Land Suitability Classification

The main characteristic of the Study area is its highly dissected mountain relief, forming land with very steep slopes and very narrow, and deep valleys. There are several volcanoes within the Study area. Exceptions to the mountainous character of the Study area some areas of relatively large flat valleys in Chimaltenango and Quetzaltenango provinces. The main characteristics of soils within the Study area are related to their volcanic origin, with the exception of some relatively small areas of alluvial soils. The land suitability classification map of Guatemala was prepared by the national geographic institute (IGN) in 1989 following the classification system of the US Department of Agriculture (USDA). The land capability classification for the Study area is summarized in the following table.

Land Class	Study Area		Chimaltenango		Sololá		Totonicapán		Quetzaltenango	
	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Agri. Land Classes I -IV	178,080	28.5	59,310	30.0	31,830	30.0	45,940	36.6	41,000	21.0
Non-Agri. Land Classes V- VIII	446,580	71.5	138,590	70.0	74,270*	*70.0	79,620	63.4	154,100	79.0
Total	624,660	100	197,900	100	106,100	100	125,560	100	195,100	100

Source: JICA's Study Team, based on data of MAGA, 1998.
Note: *includes the Area of Atitlan lake.

(2) Water Resources

(i) Hydrographic Basins

The Study Area is divided into 12 hydrographic basins. There are nine basins in the Pacific Region (Achiguate river, Coyolate river or Xaya river, Madre Vieja river, Nahualate river, Sis-Icán river, Atitlan lake, Samala river,

Ocositos river and Naranjo river), one basin of Caribbean Sea Region (Motagua river) and two basins of Mexican Gulf Region (Cuilco river, Salinas river or Chixoy river).

(ii) Groundwater

The groundwater in the Study Area is located in volcanic rocks of the Tertiary and Pleistocene Eras, and there is groundwater in alluvial sediments in Sololá Province with a high to medium potential. There is limited use of groundwater for irrigation and it must be considered a good future alternative water source. Types of aquifers and their location are shown below.

Types of Aquifers and Their Location

Aquifer Type	Code	Material	Municipality
Basement Rocks	I	Cretaceous metamorphic rocks, intrusive rocks	Huitán
Tertiary Volcanic Rocks	Tv	Tertiary volcanic rocks, latitic to dacitic welded tuff, ryolitic lava flows, andesitic/basltic lava flows, pyroclastic flows, volcanic mud flows and tuffs	Santa Catalina Palopó, San Antonio Palopó, Santa Catalina Ixtahuacán, San José Poaquil, Momostenango, Palestina de los Altos
Combined area of Tertiary and Pleistocene volcanic rocks	Qp	Pumice sediments, pyroclastic flow with clastic beds	El Tejar, San Andrés Xecul, Olintepeque, Cajolá, San Martín Sacatepéquez, Almalonga
	Tv		San Juan Comalapa, San Martín Jilotepeque, Patzún, Patziciá, Zaragoza, Sololá, Santa Lucia Utatlán, Nahualá, San Andrés Semetabaj, Santa Clara La Laguna, San Francisco El Alto, San Carlos Sijá, Concepción Chiquirichapa, San Francisco La Unión
Combined are Tertiary rocks and alluvial deposits	TvQal		Santa Cruz La Laguna, San Pablo La Laguna, San Marcos La Laguna
Holocene volcanic rocks	Qv		Génova, Flores Costa Cuca, Colomba

Source: The Study on Groundwater Development in the Central Plateau Area in Guatemala, JICA, 1995

(3) Environments

The main environmental problems reported in the Study Area are the deterioration of natural resources and contamination problems. The deterioration of natural resources is mainly the result of deforestation leading to a diminution of biodiversity, increases erosion and diminution of water

resource quality. The main contamination problem is the contamination of waters due to domestic sewer, solid waste and uncontrolled pesticide use.

There are no data available on forest situation. There are only unconfirmed estimate of the loss of forest in the Study Area, some estimates mentions of forest loss are 16% in ten years ("Monografía Ambiental de la Región Sur-occidente", ASIES, 1993). The main reason of deforestation may be due to cutting young trees for consumables and construction materials, firewood for the processing of lime, damage by pine weevils, etc.

In the Study Area, there are 5 life zones according to criteria of life zones in Guatemala as shown below.

Life Zone Distribution

Provinces	Life Zone Distribution (km2)*					
	Bmh-s(c)*	Bh-MB	Bmh-MB	Bmh-M	Bh-s(t)	Total
Chimaltenango	358	1,079	370	0	172	1,979
Sololá	130	374	368	64	0	936
Totonicapán	0	577	414	71	0	1,061
Quetzaltenango	890	364	682	15	0	1,951
Total	1,378	2,394	1,834	150	172	5.928
%	23	40	31	3	3	100

Source:: Monografía Ambiental Región Sur-occidente, Monografía Ambiental Región Central, Asies, 1993

*: Bmh-s(C)=warm sub-tropical very humid forests, Bh-MM=low mountain humid forests, Bmh-MB=low mountain very humid forest, Bmh-M=mountain very humid forest, Bh-s(t)= Template sub-tropical humid forest

For the protection of biodiversity the Government of Guatemala established a protected zone system. The protected areas in the Study Area are shown in Annex-1.

There was not been a systematic evaluation of the soil erosion problem. Soil erosion is found in many places in the Study area. Main reasons may be due to steep slope and little thickness of soil, deforestation, rapid expansion of the cultivation area, etc.

There are 52 sewer systems in the Study Area, but few have wastewater treatment and they discharge directly to the rivers without treatment. The most severe case of contamination is presented in Samala river (Totonicapán, Quetzaltenango, San Cristóbal Totonicapán, Cantel and Salcajá cities).

The Atitlan Lake basin, as a semi closed basin, needs special control because

of the growing population in the area and the delicate equilibrium of the environment.

There are no available data of the affects of agricultural chemicals. However, field inspection in the Study area shows that heavy dosages of agricultural chemicals are applied to vegetables and potatoes, which may directly affect human and contaminate groundwater.

3.1.5 Agriculture

(1) General Land Use

A high percentage (71.5 %) of land in the Study area is classified as non-agricultural land (classes V to VIII). Also, the Study area is characterized by its high population that depends almost entirely on the land for attaining their income, food, and firewood for cooking. The availability of suitable land is not sufficient to satisfy the needs of the large population. The limited availability of agricultural lands and high population density are excerpting high pressure on the lands not suitable for agriculture, which are in fact, being used for agriculture production without application of land conservation measures. Also, because of the limited availability of land, a large number of farmers in some municipalities, mainly in Quetzaltenango province, must migrate temporarily every year to find employment or rent land in others provinces of the coastal lowland areas.

The present land use pattern for the Study area is summarized, in a general way, in the table below. The details are shown in Annex-1.

Present Land Use	Study Area		Chimaltenango		Sololá		Totonicapán		Quetzaltenango	
	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%	Area (ha)	%
Basic Grains	93,700	15.5	17,900	9.0	19,150	18.1	16,950	16.0	**47,030**	**24.1**
Vegetables	43,460	7.2	**17,250**	**8.7**	7,500	7.0	5,600	5.2	5,690	2.9
Perennial Crop (Mainly Coffee)	142,140	23.5	54,760	27.7	**25,800**	**24.3**	1,500	1.4	60,080	30.8
Forest	289,200	47.8	106,850	54.0	40,190	37.9	**81,200**	**76.5**	60,670	31.1
Urban/Pasture/ Others	36,700	6.1	1,140	0.6	13,460*	*12.7	850	0.9	21,630	11.1
Total	605,200	00	197,900	100	106,100	100	106,100	100	195,100	100

Source: JICA Study Team, based on Present Land Use Map 1:250,000 of IGN, 1991, data from MAGA, and Field Observation. Note: * Includes the area of Atitlan lake.

(2) Crops and Agricultural Production

The main characteristic of agricultural production within the Study area is that

a large percentage of farmers are engaged in the production of basic grain and pulses, mainly maize and black bean. These two crops are the main staples for Guatemalan people. The average area planted to maize and bean by each household is very small, at subsistence level, and mostly for family self-consumption. The average size of farms dedicated to the production of maize and bean within the Study area is 0.49 ha, half the national average.

Maize and bean production in the Study area is done entirely under rainfed conditions. The growing period of maize planted in the Study area is between 7 to 8 months. All small farmers produce maize in a traditional way. The average yields of maize vary from 1.3 to 2.1 tons/ha throughout the Study area.

Wheat is also a basic grain cultivated in the Study area, but the area planted to this crop has being decreasing significantly during the last 15 years.

Vegetable production at a commercial scale has being increasing significantly within the Study area. The majority of farm households have small land areas for planting vegetables. Due to the high elevation, there are good climatic conditions for vegetable production. Vegetables are produced mainly in rainfed condition. Irrigated land in the Study area is very small. Chimaltenango is the major vegetable-producing province in Guatemala. Main vegetables are broccoli, snow pea, carrot, beet, cauliflower, lettuce, French bean, cabbage, and tomato. Production of potato is the main economic activity in some municipalities of the Study area, mainly in Quetzaltenango and Sololá.

Coffee production is a very important agriculture activity within the Study area. Export of coffee is one of the main export commodities of Guatemala. Coffee production is the major economic activity for several municipalities of Sololá province, and is also very important in some municipalities of Chimaltenango and Quetzaltenango. The majority of coffee farmers have small land areas planted to coffee (0.2 to 0.6 ha).

Other crops produced within the Study area are blackberry, strawberry, peach and apple, which are planted in relatively small areas.

(3) Summary of Constraints for Agriculture

The main problems affecting development of agriculture production in the Study area are:

(i) A large majority of farm households have a very small agricultural land

area, therefore agriculture production is at subsistence scale.

(ii) The scarcity of water resources for irrigated agriculture development and dependence on rainfall for agriculture production.

(iii) Lands of very steep slopes are commonly used for agriculture without soil conservation measures to minimize soil erosion and land degradation.

(iv) Low temperature due to high land altitude and narrow selection of crops.

(v) Low land use intensity, most farmers can plant only during rainy season.

(vi) Inadequate management of coffee plants, including pruning the coffee plants, inadequate amount of shading, inadequate fertilization which causes strong acidification of soils.

(vii) A large percentage of coffee plantations are very old and need replanting.

(viii) High cost for coffee farmers cooperative to attain certification of organic coffee production (US $ 2,000 to 3,000 per year).

(ix) Lack or insufficiency of infrastructure for post-harvest management of vegetables, especially cold storage.

(x) Lack of infrastructure for post-harvest processing of coffee, such as pulping mill, drying floor, storage warehouse, etc. Consequently farmers can not add value to their produce, and they get low prices for coffee sold at farm gate. Almost all farmers depend on middlemen for selling their coffee produce.

(xi) None or very small coverage of extension service for technical assistance, especially in the proper control of insects and diseases affecting vegetables.

(xii) Most farmers do not know the correct recommendations for pesticides management, dosages, and timing of application. Because of this, most farmers over apply both over dosages and frequency of applications. Large quantities of vegetables exported to the US have being discarded because high levels of pesticides. A few years ago this was the cause of losses of several millions of US dollars.

(xiii) Low average yields obtained by small farmers.

(xiv) Low incomes of farm households, due to small areas, low yields, and low margin in the marketing of their produce.

(xv) Very limited access to agricultural credit, and very high interest rates (21 to 30 %).

(xvi) Lack of a cooperative marketing system which would enable small farmers to pool resources to necessary inputs and sell produce. The

majority of small farmers depend on middlemen.

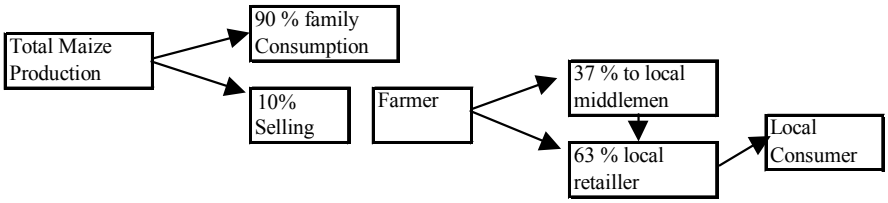
(xvii) Lack of organization of majority of farmers, or weakness in planning and management capability of existing farmers' organizations.

(xviii) Very difficult conditions for conveying the harvested coffee from the farm to the selling point near the road. Farmers have to traverse steep slopes with very heavy loads on foot.

(xix) Poor conditions of rural roads, which increases cost of transporting produce to market.

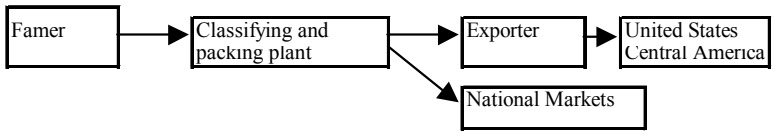
(4) Marketing

Because the small land area available (average 0.4 ha) and low yields, about 90% of maize produced by farmer households within the Study area is for family self-consumption, and it is estimated that only about 10% is dedicated to the local market of which the market flow is illustrated below.

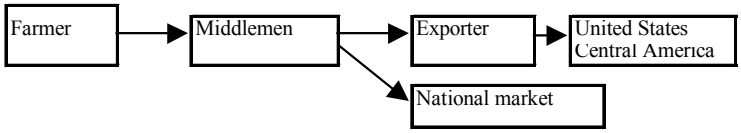


Vegetables produced in the Study area are sold through two market channels to both, in the country's internal market and for export as shown below.

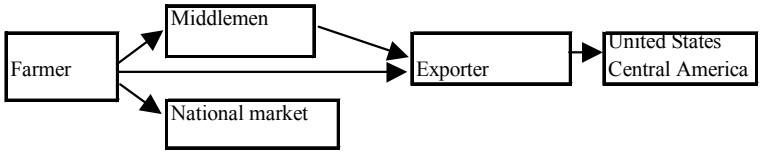
1) Farmer organized into coopertives with infrastructures



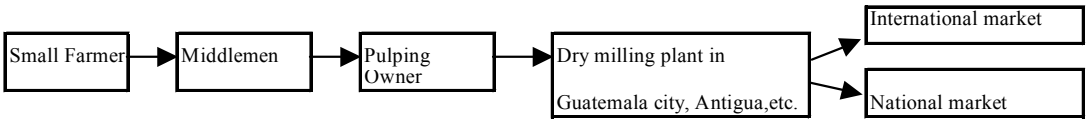
2) Individuals farmers, Not organized in cooperative
a) Contract growing system (middlemen provide credit)



b) Farmer's self-financing or bank loan



The marketing system for coffee produced by farmer's having small land area is summarized as follows:



3.1.6 Legal Aspects

(1) Water Right

The rights on the use of water are based on the provisions of the Constitution of 1985, where the public control of waters is defined. On the other side, the Civil Code in force defines private control of the waters.

(2) Environment

As regards to environmental regulation, there are two fundamental laws that are complementary and which regulate the environment: the law of Protection and Improvement of the Environment (Decree No. 68-86) and the Health Code (Decree No. 90-97).

(3) NGOs

Under the present legal framework of Guatemala, no specific law or regulation concerning NGOs has been prepared yet and, therefore, there is no clear definition for NGO. Distinction among the so-called NGO (non-profit making organization with objectives for socio-economic development), private firms, and other type of civil associations is hard to make. Basically, any group of people can form a non-governmental organization under this legal condition.

3.2 Chimaltenango Province

3.2.1 Social Conditions

Demographic and social conditions in Chimaltenango province are shown in the following table.

Items	Unit	Value
Area	Km^2	1,979
Total population in 1994	person	315,000
Population in the rural area in 1994	Person (% of population)	184,000 (58%)
Population in the urban area in 1994	Person (% of population)	131,000 (42%)
Population density in 1994	Person/km2	159
Total number of household in 1994	No.	59,800
Average family size	Persons/family	5.3
% of indigenous people	%	78
Major indigenous people		Kaqchikel
Economically active population in the rural area	%	56
Economically active population for agriculture	%	85
Literacy rate	%	63.8
Number of municipality	No.	16

The main characteristic of Chimaltenango derives from its location. The capital of the municipality of Chimaltenango lies 55 km from Guatemala City, the capital. Due to this reason, many economic activities have flourished like Maquila industry and Agro-exportation of vegetables, fruits and flowers. Besides, Chimaltenango is transforming into a commuting town for employees of the capital. Because of these changes, farm labor wages have increased. Another tendency that influences the future of agriculture is the indifference of young generation towards agriculture. So now many farm workers come from distant villages.

3.2.2 Land and Agriculture

Major soils in Chimaltenango province are: soil series Cauque, Quiché, Tecpán, Yepocapa, Camancha, Balanjuyu, Zacualpa, Poaquil, Alotenango, and series Osuna. About 59,300 ha, or 30 % of total area of Chimaltenango province is classified as land suitable for intensive agriculture production, classes I to IV.

About 82,000 ha or 42 % of the total area in this province is presently being used for agricultural production. Almost all (99.7 %) agriculture production is under rainfed condition. There is only about 240 ha of irrigated land in the entire province.

In the province there are three sub-regions with differences in elevation, topographic conditions, soils and micro-climates; these sub-regions are: (1) The northern sub-region which comprises the Motagua river basin, and includes the municipalities of San Martín Jilotepeque, San José Poaquil, Santa Apolonia and Tecpán Guatemala. Coffee is the main crop in this sub-region.

(2) The central and southern sub-region, which includes the municipalities of Chimaltenango, El Tejar, Parramos, San Andrés Itzapa, Zaragoza, Comalapa, Patzún, Patzicia and Santa Cruz Balanya. The main crops in this sub-region are vegetables for export and domestic markets and (3) The southwestern sub-region, which includes the municipalities of Pochuta, Acatenango and San Pedro Yepocapa; in this sub-region coffee is the main crop.

Chimaltenango is the major vegetable producing province in the entire Guatemala. The types of vegetables more largely produced are snow pea, French bean, lettuce, cabbage, broccoli, cauliflower, carrot, and beet. Major vegetable producing municipalities in Chimaltenango province are: Tecpán, Patazún, Patzicia, Santa Cruz Balanya, Parramos, Zaragoza, Chimaltenango, and San Andrés Itzapa. In addition to vegetables and maize, other important crops produced in Chimaltenango province are, strawberry, blackberry, and small areas of fruit trees such as peach.

A relatively high percentage of farm households raise a small numbers of pigs, sheep, and chicken; a smaller percentage of farm households have one or two cattle which are kept around the house and feed with dry leaves of maize. In Chimaltenango there are a few small cooperatives of poultry producers that have achieved good economic success; In Chimaltenango there also some very large poultry producers.

3.2.3 Water Resource

The province of Chimaltenango is divided into four hydrological basins: the basin from the Motagua river which drains to the Caribbean Sea, and the basins of the Achiguate river (Guacalate river), the Coyolate river (or Xayá river), Madre Vieja river, which drains to the Pacific Ocean. The characteristics of the basins in the province of Chimaltenango are shown below.

Characteristics of the hydrological basins in Chimaltenango Province

Basin	Area (km^2)	Flow (m^3/sec)		Point of observation	Municipalities
Motagua River	995.85	Minimum		Concua II	Chimaltenango, San Jose Poaquil, San Martín Jilotepeque, Comalapa, Santa Apolonia, Tecpán Guatemala, Patziciá, Santa Cruz Balanyá, Zaragoza, El Tejar.
		Average			
		Flow (l/s/ha)			
Achiguate River	128.5	Minimum	0.49	Alotenango	Chimaltenango, Yepocapa, San Andrés Itzapa, Párramos, El Tejar
		Average	1.25		
		Flow (l/s/ha)	0.015		
Coyolate or Xayá River	715.35	Minimum	5.15	Coyolate Bridge	Santa Apolonia, Tecpán Guatemala, Patzún, Pochuta, Patziciá, Acatenango, Yepocapa, San Andrés Itzapa.
		Average	12.88		
		Flow (l/s/ha)	0.103		
Madre Vieja River	139.3	Minimum	5.95	Palmira	Tecpán Guatemala, Patzún, Pochuta
		Average	7.92		
		Flow (l/s/ha)	0.167		
TOTAL	1979.0				

Source: Plan Maestro de Riego y Drenaje, MAGA, 1991.

Of these basins, the Coyolate River (or Xayá) and the Pixcayá River (tributary to Motagua in Chimaltenango), are being used by the Municipal Company of Water of Guatemala (EMPAGUA) as an important source of potable for the City. That is why any project which involves using water from these rivers, must be coordinated with the company, in order to respect its acquired rights. In addition, there are projects for the use of the Motagua River on behalf of EMPAGUA and INDE for the use of potable water and hydroelectricity, which makes coordination with the entities necessary in case of the promotion of irrigation projects in these rivers. In the case of the Madre Vieja River, there is no acknowledgement of projects for the use of its water.

The potential of groundwater water in the province of Chimaltenango is shown in the following table.

Development Potential of the Groundwater

No	Municipality	Geology	Type
1	San José Poaquil	Tv	B
2	San Martín Jilotepeque		A
3	San Juan Comalapa	TvQp2	B
4	Patzún	TvQp2	B
5	Patziciá	TvQp2	B
6	Zaragoza	TvQp2	B
7	El Tejar	TvQp	A

Source: Study of the Development of Subterranean Waters in the Central High Plateu of the Republic of Guatemala, JICA, 1995

Notes:

Tv: Volcanic Rocks from Terciary A: High Potential

Qp: Volcanic Rocks from Pleistocen B:Medium Potential

3.2.4 Social Services and Infrastructure

(1) Demography and Principal Causes of Mortality and Morbidity

Principle demographic indicators in 1999 are shown below:

Principal Demographic Indicators in Chimaltenango Provinces 1999

Indicators	Chimaltenango
Total population	417,000
Migrant population	15,500
% of migrant population	3.72
No. of live birth	16,200b
Birth rate (total births 1999/total population)*1,000	39
Fertility rate (total births/women of reproductive age)*1,000	183
Infant mortality rate (per 1,000 LB)	39.8
Maternal mortality rate (per 100,000 live birth)	55.7
General mortality rate (per 100,000 live birth)	5.85

Population of women in reproductive age = women aged 15 – 44

Source: MSPAS, Memoria Anual de Vigilancia Epidemiologica

Principal causes of infant death during 1999 were pneumonia, neonatal sepsis, prematurity, malnutrition and diarrhea as shown below. Principal causes of general mortality during the same period were pneumonia, malnutrition, cancer, cirrhosis and diarrhea. Although the infectious diseases such as ARI and diarrhea, and malnutrition continue to be principal causes of mortality and morbidity, the importance of adult diseases such as cancer and diseases associated with arterial hypertension are also increasing.

(2) Access to Health Care Services

Access to health care service in the province is summarized in the following table. Seventy-seven % of the population has access to health services and the remainder none.

Coverage of Health Care Services by Institution 1999 (%)

Institution	MSPAS	SIAS	UGSS	Other	None
%	55	22	-	-	23

Source: MSPAS, Memoria Anual de Vigilancia Epidemiologica

There are six NGOs working for SIAS under the agreement with MSPAS to provide primary health care services in the communities as of 1999.

(3) Maternal Care

Maternal care services are shown below. About 77% of women received prenatal care at least once during pregnancy. Percentage of pregnant women who received second dose of tetanus toxoide (to prevent neonatal tetanus during delivery and thus reducing the risk of infant mortality) was only 30%.

Delivery Care Provider in Chimaltenango Province 1999 (%)

Delivery care provider	Medical personnel	Comadrona	Empirica*	Nobody	Total
%	14.0	84.9	0.3	0.8	100.0

*Empirica includes comadronas who had never received any training, relatives/ friends.
Source: MSPAS, Memoria Anual de Vigilancia Epidemiologica

(4) Immunization

In spite of the campaigns carried out by the MSPAS, NGOs and municipalities, the immunization coverage for infants (under 1 year old) is still below 90%. The main reasons for failure in receiving immunization are said to be migration of some families during the harvest season, traditional beliefs that prevents parents to accept immunization for their children.

Immunization Coverage among Children Under 1 in Chimaltenango Province 1999

Immunization	B.C.G	Polio	D.P.T	Measles
%	87	83	82	80

Source: MSPAS

(5) Electricity, Water Supply and Sanitation

The 5th National Census of Population carried out in 1994 indicates that the service coverage rate of drinkable water, latrines and electricity is 76.7%, 25.7% and 59.1% respectively. This indicates that basic social infrastructure is at a low level, the lack of sanitary services in the province with being very obvious.

(6) Roads

The province of Chimaltenango has one lined Central American road (CA-1) that connects the capital with the provinces of Sololá, Totonicapán, Quetzaltenango and others. It has also two national roads that connect Antigua, Acatenango, Patziciá, Sololá (No. 1) and Yepocapá, Escuintla (No. 10), partially lined, and several provincial roads and highways, whose lengths are shown below.

Road System in Chimaltenango

Categories of the Roads	Length (km)	
	Asphalt / Surface	Terracería
Central American	63	
National	42	34
Provincial	70	179
Rural		343
TOTAL	175	556

Source: Dirección General de Caminos, 1999.

3.3 Sololá Province

3.3.1 Social Conditions

The demographic and social conditions of Sololá province are summarized in the following table.

Items	Unit	Value
Area	Km2	1,061
Total population in 1994	person	222,000
Population in the rural area in 1994	Person (% of population)	148,000 (67%)
Population in the urban area in 1994	Person (% of population)	74,000 (33%)
Population density in 1994	Person/km2	209
Total number of household in 1994	No.	40,000
Average family size	Persons/family	5.5
% of indigenous people	%	94
Major indigenous people		Kaqchikel, K'iche, Tz'utujil
Economically active population in the rural area	%	65
Economically active population for agriculture	%	79
Literacy rate	%	44.3
Number of municipality	No.	19

Agriculture is the most important activity in this province. Tourism is also an important industry for some communities near the lake, especially Panajachel and Santiago Attila.

3.3.2 Land and Agriculture

Soil series most largely extended in Sololá, are series Totonicapán, Quiché, Patzite, Sinache, Camancha, and series Quetzaltenango. About 31,800 ha, or 30 % of total Sololá province land is classified as classes I to IV. An estimated area of about 42,440 ha or 40 % of province area is being used for agriculture production. Agriculture production is almost entirely rainfed conditions; only about 220 ha are presently provided with irrigation in Sololá province.

Sololá province may be divided into three sub-regions according to the elevation of the land and kind of main crops.

(i) The North and Northeast sub-region, which includes the municipalities of Sololá, Concepción, San Andrés Semetabaj, San Antonio Palopo, Santa Cruz la Laguna, San José Chacaya and Santa Lucía Utatlan. These municipalities are located at elevations higher than 2,000 m.a.s.l. The main agricultural product are potato, vegetables and basic grains.

(ii) The sub-region of the western part of the province, which includes the municipalities of Nahuala, Santa María Visitación, San Pablo la Laguna, Santa Catarina Ixtahuacán, and Santa Clara la Laguna; the main agriculture production in these municipalities is basic grains, and coffee in the municipalities of Nahuala and Santa Clara la Laguna.

(iii) The sub-region located at the south of Atitlan lake, which include the municipalities of San Juan la Laguna, San Pedro la Laguna, Santiago Atitlan, and San Lucas Toliman; Coffee is the main crop in this sub-region; In this sub-region is produced the Atitlan coffee, the second most famous gourmet coffee of Guatemala.

Livestock and poultry are raised on a small scale. Some families raise a few pigs, sheep, and chicken; a small percentage of farm households have one or two cattle that they feed with dried maize leaves.

3.3.3 Water Resource

The province of Sololá is divided into three hydrographic basins: the one from the Nahualate river, the Madre Vieja river, and the Sis-Icán river and a closed basin in the lake of Attila. The characteristics of the basins are shown in the following table.

Characteristics of the hydrological basins in Sololá

Basin	Area (km^2)	Flow (m^3/sec)		Point of observation	Municipality
Basin of the Lake of Attila	430.4	Minimum			Sololá, San José Chacaya, Santa Lucía Utatlán, Nahuala, Santa Clara La Laguna, Concepción, San Andrés Semetabaj, Panajachel, Santa Catalina Palopó, San Lucas Tolimán, Santa Cruz La Laguna, San Marcos La Laguna, San Juan La Laguna, San Pedro La Laguna, Santiago Attila.
		Average			
		Flow (l/s/ha)			
Nahualate	531.6	Minimum	5.86	San Miguel Moca	Santa María Visitación, Santa Lucía Attila, Nahuala, Santa Catalina Ixtahuacán, Santa Clara La Laguna, Santa Cruz La Laguna, San Juan La Laguna, San Pedro La Laguna, Santiago Attila.
		Average	30.17		
		Flow (l/s/ha)	0.103		
Sis/ Icán	43.6	Minimum	0.55	La Maquina	Santa Catarina Ixtahuacán
		Average	3.94		
		Flow (l/s/ha)	0.036		
Madre Vieja	135.8	Minimum	5.95	Palmira	San Andrés Semetabaj
		Average	7.92		
		Flow (l/s/ha)	0.167		
	1141.4				

Source: Plan Maestro de Riego y Drenaje, MAGA, 1991

The potential of groundwater in the province of Sololá is shown below.

Characteristics of the Groundwater

No.	Municipality	Geology	Type
1	Sololá	TvQp2	B
2	Santa Lucía Utatlán	TvQp2	B
3	Nahuala	TvQp2	B
4	Santa Catarina Ixtahuacán	Tv	B
5	San Andrés Semetabaj	TvQp2	C
6	Santa Catarina Palopo	Tv	C
7	San Antonio Palopo	Tv	C

Source: Study of the Development of the Subterranean Waters in the Central High Plateau of the Republic of Guatemala, JICA, 1995

Tv: Volcanic Rocks from Tertiary A: High potential B: Medium Potential

Qp: Volcanic Rocks from Pleistocene C: Low Potential

3.3.4 Social Services and Infrastructure

(1) Demography and Principal Causes of Mortality and Morbidity

Principle demographic indicators in 1999 are shown below. Principal causes of

infant death during this period were pneumonia, prematurity, diarrhea diseases and malnutrition. Principal causes of general mortality during 1999 were pneumonia, malnutrition, alcoholic intoxication, and diarrhea diseases. Common diseases include intestinal parasite, anemia, skin diseases and amoebiasis.

Principal Demographic Indicators in Sololá Provinces 1999

Indicators	Sololá
Total population	299,000
Migrant population	6,700
% of migrant population	2.23
No. of live birth	11,100
Birth rate (total births 1999/total population)*1,000	37
Fertility rate (total births/women of reproductive age)*1,000	167
Infant mortality rate (per 1,000 LB)	48.7
Maternal mortality rate (per 100,000 live birth)	170.6
General mortality rate (per 100,000 live birth)	-

Population of women in reproductive age = women aged 15 – 44
Source: MSPAS, Memoria Anual de Vigilancia Epidemiologica

(2) Access to Health Care Services

Access to health care services in Sololá province is in the following table.

Coverage of Health Care Services by Institution 1999 (%)

Institution	MSPAS	SIAS	UGSS	Other	None
%	54	39	-	-	2

Source: MSPAS, Memoria Anual de Vigirancia Epidemiologica

There are seven NGOs working for SIAS under the agreement with MSPAS to provide primary health care services in the communities as of 1999.

(3) Maternal Care

Maternal care services in the province are shown below. About 70% of women received some kind of prenatal care at least once during pregnancy. Percentage of pregnant women who received second dose of tetanus toxoide was only 30%.

Delivery Care Provider in Sololá Province 1999

Delivery care provider	Medical personnel	Comadrona	Empirica*	Nobody	Total
%	8	86	6	-	100

*Empirica includes comadronas who had never received any training, relatives/ friends.
Source: MSPAS, Memoria Anual de Vigilancia Epidemiologica

(4) Immunization

Immunization coverage among children under one year of age is shown below.

Immunization Coverage among Children Under 1 in the Provinces 1999

Immunization	B.C.G	Polio	D.P.T	Measles
%	87	83	82	80

Source: MSPAS

(5) Electricity, Water Supply and Sanitation

The V National Census of Population, carried out in 1994, indicates that the coverage rates of drinkable water, latrines and electricity services are 84.9%, 14.1% and 54.3% respectively. This indicates that the basic social infrastructure is at a low level the lack of sanitation services in the Province with being very notorious.

(6) Roads

The province of Sololá has a lined Central American highway (CA-1) that passes through the north connecting the capital city with the provinces of Totonicapán, Quetzaltenango and others. It has also two national ones that unite Antigua, Acatenango, Patziciá, Patzún, Sololá (no.1) and the routes like Godinez, San Lucas Tolimán, Patulul (no. 11), lined and many provincial roads and highways, whose lengths are shown in following table.

Road System in Sololá

Categories of the Roads	Length (km)	
	Asphalt / Surface	Terracería
Central American	53	
National	86	10
Provincial	73	89
Rural		99
TOTAL	212	198

Source: Dirección General de Caminos, 1999.

3.4 Totonicapán Province

3.4.1 Social Conditions

Demographic and social conditions in Totonicapán province are shown below.

Items	Unit	Value
Area	Km2	1,061
Total population in 1994	person	272,000
Population in the rural area in 1994	Person (% of population)	243,000 (89%)
Population in the urban area in 1994	Person (% of population)	29,000 (11%)
Population density in 1994	Person/km2	257
Total number of household in 1994	No.	47,300
Average family size	Persons/family	5.7
% of indigenous people	%	94
Major indigenous people		K'iche
Economically active population in the rural area	%	89
Economically active population for agriculture	%	41
Literacy rate	%	49.8
Number of municipality	No.	8

It is characterized that people of this province have more participation in non-agriculture activities like small industry and commerce. The traditional local authority properly manages about 60% of the communal forests.

3.4.2 Land and Agriculture

The more common soil series in Totonicapán province is: Totonicapán series, Quiché, Patzite, Sinache, Camancha, and Quetzaltenango series. About 46,000 ha, or 37 % of total area of Totonicapán province are classified as agricultural suitability classes I to IV. It is estimated that about 41,000 ha or 34.6 % of total land province area is being used for agriculture production. All the agriculture production is done under rainfed condition; there are only about 40 ha under irrigation in Totonicapán province.

The agricultural production in Totonicapán province is mainly maize and black bean for self-consumption of farmers' household but there are also very small areas of land used for fruit production, such as avocado, apple and peach. The severe climatic condition of high mountains is the main factor that limits agriculture production in Totonicapán province; frost is common during several months of the year.

Raising of animals such as pigs, sheep, chicken and a few cattle are undertaken by a small percentage of households.

3.4.3 Water Resource

The province of Totonicapán is divided into three hydrographic basins from the Pacific: the Nahualate and Salamá rivers which drain to the Caribbean: and Motagua river which drains to the Gulf of Mexico: Salinas (Chixoy River). The

characteristics of these basins are shown below.

Characteristics of the hydrographic basins

Basin	Area (km^2)	Flow (m^3/sec)		Point of view	Municipalities
Motagua River	82	Minimum		Concua II	Totonicapán
		Average			
		Flow (l/s/ha)			
Nahualate River	82	Minimum	0.67	Santa Catalina Ixtahuacán	Totonicapán
		Average	1.72		
		Flow (l/s/ha)	0.049		
Salamá River	224.2	Minimum	0.99	Cantel	Totonicapán, San Cristobal, Totonicapán, San Francisco El Alto, San Andrés Xecul
		Average	4.67		
		Flow (l/s/ha)	0.014		
Salinas River (Chixoy)	661.8	Minimum			Totonicapán, San Francisco El Alto, Momostenango, Santa María Chiquimula, Santa Lucía la Reforma, San Bartolo
		Average			
		Flow (l/s/ha)			
Total	1,050				

The potential of groundwater in this province is shown below.

Potential of Subterranean Waters

No.	Municipality	Geology	Type
1	San Francisco El Alto	TvQp2	C
2	San Andrés Xecul	TvQp	A
3	Momostenango	Tv	B

Source: Study of the Development of Subterranean Water in the Central High Plateau of the Republic of Guatemala, JICA, 1995.
Tv: Volcanic Rocks from Terciary A: High Potential, B:Medium Potential, C: Low Potential
Qp: Volcanic Rocks from Pleistocen

3.4.4 Social Services and Infrastructure

(1) Demography and Principal Causes of Mortality and Morbidity

Principal demographic indicators in 1999 are shown below:

Principal Demographic Indicators in Totonicapán Provinces 1999

Indicators	Totonicapán
Total population	347,000
Migrant population	126,000
% of migrant population	36
No. of live birth	12,700
Birth rate (total births 1999/total population)*1,000	36
Fertility rate (total births/women of reproductive age)*1,000	173
Infant mortality rate (per 1,000 LB)	56.0
Maternal mortality rate (per 100,000 live birth)	102
General mortality rate (per 100,000 live birth)	6.56

Population of women in reproductive age = women aged 15 – 44

Source: MSPAS, Memoria Anual de Vigilancia Epidemiologica

Principal causes of infant death during the same period were pneumonia, diarrheal diseases, neonatal sepsis, asphyxia at birth and bronchitis. Principal causes of general mortality during 1999 were pneumonia, diarrheal diseases, malnutrition, and neonatal sepsis as shown below. Other common diseases are intestinal parasite, skin diseases, and amoebiasis

(2) Access to Health Care Services

Access to health care services is summarized in the following table. Totonicapán has the highest percentage of population without access to any health care services among all the provinces of the Study area.

Coverage of Health Care Services by Institution 1999 (%)

Institution	MSPAS	SIAS	UGSS	Other	None
%	48	20	-	-	32

Source: MSPAS, Memoria Anual de Vigirancia Epidemiologica

There are two NGOs working for SIAS under the agreement with MSPAS to provide primary health care services in the communities as of 1999.

Apart from above mentioned health care services, Catholic Church organization (Pastral Social de Salud) is carrying out clinic services for urban poor and community-based health programs such as health education and basic sanitation in rural areas. CARE is implementing health program with focus on nutrition in nine municipalities including Santa Maria Chiquimula

(3) Maternal Care

Maternal care services are shown in the following table. About 81% of women received some kind of prenatal care at least once during pregnancy. Percentage of pregnant women who received second dose of tetanus toxoide was only 24%.

Delivery Care Provider in Totonicapán Province 1999

Delivery care provider	Medical personnel	Comadrona	Empirica*	Nobody	Total
%	5	95	-	-	100

*Empirica includes comadronas who had never received any training, relatives/ friends.

Source: MSPAS, Memoria Anual de Vigilancia Epidemiologica

(4) Immunization

Immunization coverage among children under one year old in Totonicapán is the lowest in the Study area. Immunization coverage has not improved much because some parents do not accept their children being injected when they are not sick.

Immunization Coverage among Children Under 1 in the Provinces 1999

Immunization	B.C.G	Polio	D.P.T	Measles
%	83	80	80	72

Source: MSPAS

(5) Electricity, Water Supply and Sanitation

The 5th National Census of Population carried out in 1994, indicates that the coverage rates of the services of drinkable water, latrines and electricity 70.9%, 10.4% and 56.0% respectively. This indicates that the basic social infrastructure has a low level, being very notorious the lack of sanitation services in this province.

(6) Roads

The province of Totonicapán has a Central American surfaced road (CA-1) that connects the capital with the provinces of Sololá and Huehuetenango. It has also two national roads, which connect Los Encuentros, Totonicapán, Quetzaltenango (route no. 1) and San Bartolo, San Carlos Sija, Quetzaltenango (route No. 9N) and several provincial roads and highways, whose lengths are shown below.

Road System in Totonicapán

Categories of the Roads	Length (km)	
	Asphalt/ lined	earth
Central American	61	
National	15	42
Provincial	22	92
Rural		353
TOTAL	98	487

Source: Dirección General de Caminos, 1999

3.5 Quetzaltenango Province

3.5.1 Social Conditions

Demographic and social conditions in Quetzaltenango province are shown below.

Items	Unit	Value
Area	Km2	1,951
Total population in 1994	person	504,000
Population in the rural area in 1994	Person (% of population)	303,000 (60%)
Population in the urban area in 1994	Person (% of population)	201,000 (40%)
Population density in 1994	Person/km2	258
Total number of household in 1994	No.	92,500
Average family size	Persons/family	5.4
% of indigenous people	%	60
Major indigenous people		K'che, Mam
Economically active population in the rural area	%	56
Economically active population for agriculture	%	76
Literacy rate	%	68
Number of municipality	No.	24

Because Quetzaltenango province extends from the highlands to the coast, there is a great difference in the land use pattern among municipalities. Also people in the northern are annually migrate to the large-scale farmlands in the coastal lands. They rent lands to cultivate maize for self-sufficiency and/or work as seasonal agricultural labor. Also there is a tendency of migrating to the USA to obtain employment at present.

3.5.2 Land and Agriculture

Major soil in Quetzaltenango province are: soil series Ixtan, Chuva, Chocola, Retalhuleu, Camancha, Quetzaltenango, Totonicapán, Palin, and Patzite. About 41,000 ha, or 21 % of the total Quetzaltenango province is classified as agricultural suitability classes I to IV. The area used for agriculture production in this province is estimated at about 124,000 ha or 64 % of total land area of the province. Agriculture production is almost entirely rainfed, depending on rainfall; only some 350 ha are provided with irrigation.

Quetzaltenango province has a large variation of micro-climate and soil conditions; considering these variation in climate, the province may be divided into three sub-regions:

(i) The north sub-region, which includes the municipalities of San Carlos Sija, Cabricán, Sibilia, Huitán, Palestina de los Altos, Cajolá, San Miguel Siguila, San Mateo, Olintepeque, San Francisco la Unión, and La Esperanza; this sub-region is characterized by the high altitude of its lands, varying mostly between 2,000 and 3,000 m.a.s.l. The average annual rainfall varies between 700 to 900 mm; The average temperature is estimated at about 13.5 °C, and very low values (-9 °C) of minimum absolute temperatures are registered during the moths from December to February.

(ii) The sub-region of the central part of Quetzaltenango province, which includes the municipalities of Quetzaltenango, Concepción Chiquirichapa, San Martín Sacatepequez, Ostuncalco, Almolonga, Cantel, and Zunil; this sub-region is characterized because its lands are at altitude in the range between 1,000 and 2,000 m.a.s.l. The average annual rainfall in this sub-region is estimated at about 1,000 mm; the mean temperature is estimated about 15 °C; in this sub-region also occurs low minimum temperatures (-7 °C) during the period between December to February.

(iii) The south sub-region, which includes the municipalities of Colomba, El Palmar, Flores Costa Cuca, Genova, and Coatepeque; this sub-region is characterized because most of the land is at altitudes of less than 1,000 m.a.s.l. The average annual rainfall varies from 2,000 mm up to 4,470 mm; the mean temperature is estimated at about 18.5 °C.

The variations in soil and climatic characteristics of the three sub-regions of Quetzaltenango make a large diversity of agriculture production in this province possible. A large percentage of farmers in Quetzaltenango province produce the basic food crops of maize and black bean. Wheat is also being produced by a small percentage of farmers. Potatoes are produced in several municipalities of the central sub-region, such as Concepción Chiquirichapa, San Martín, San Juan Ostuncalco, La Esperanza, and in the in the northern sub-region Palestina de los Altos. Vegetables and fruit such as peach, are produced at a small scale is several municipalities of the province. In the municipalities of the southern sub-region, such as Colombia, Génova and Coatepeque coffee is the main produced. Sugarcane and African palm are produced in some areas of the southern sub-region of Quetzaltenango province.

Many farmers' households have some pigs, sheep, and poultry that they raise in the backyards. Some of the families also have a few cows that they feed with dry leaves of maize. Some areas, mostly in the southern sub-region, are used for pasture.

3.5.3 Water Resources

The province of Quetzaltenango is divided into the three basins that drain to the Pacific: Ocositos River, Naranjo River and Samalá River and a basin that

drain to the Gulf of Mexico (Cuilco River). The characteristics of each basin are shown below.

Characteristics of each basin

Basin	Flow (m^3/sec)		Point of view	Municipalities
Ocositos River	Minimum	0.50	Caballo Blanco	Coatepeque, Flores Costa Cuca, Génova, Colomba, El Palmar, Concepción Chiquirichapa, San Martín Sacatepequez
	Average	1.58		
	Flow (l/s/ha)	0.032		
Naranjo River	Minimum			San Miguel Siguila, Concepción Chiquirichapa, Colomba, San Martín Sacatepequez, San Juan Ostulcalco, Palestina
	Average			
	Flow (l/s/ha)			
Samalá River	Minimum	2.57	Cuilco	San Carlos Sija, Cabricán, Sibilia, Palestina de los Altos
	Average	14.12		
	Flow (l/s/ha)	0.022		
Salinas River	Minimum			San Carlos Sija
	Average			
	Flow (l/s/ha)			

The potential of groundwater in Quetzaltenango province is summarized below.

Potential of Groundwater

No.	Municipality	Geology	Type
1	Olintepeque	TvQp	A
2	San Carlos Sijá	TvQp2	B
3	Cajolá	TvQp	A
4	Concepción Chiquirichapa	TvQp2	B
5	San Martín Sacatepéquez	TvQp	A
6	Almolonga	TvQp	A
7	Huitán	Br	C
8	Colombá	Qv	A
9	San Francisco La Unión	TvQp2	B
10	Génova	Qv	B
11	Flores Costa Cuca	Qv	B
12	Palestina de Los Altos	TvQp2	B

Source: Study of the Development of Subterranean Waters in the Central High Plateau of the Republic of Guatemala, JICA, 1995
Hydro-geological study of the basin of Samalá, INSIVUMEH
Notes: Tv: Volcanic Rocks from Terciary A: High Potential
Qp: Volcanic Rocks from Pleistocen B: Medium Potential, C: Low Potential
Qv: Volcanic Rocks from Holocene

3.5.4 Social Services and Infrastructure

(1) Demography and Principal Causes of Mortality and Morbidity

Principle demographic indicators in 1999 are shown below.

Principal Demographic Indicators in Quetzaltenango Provinces 1999

Indicators	Totonicapán
Total population	662,000
Migrant population	92,000
% of migrant population	14
No. of live birth	20,400
Birth rate (total births 1999/total population)*1,000	31
Fertility rate (total births/women of reproductive age)*1,000	204
Infant mortality rate (per 1,000 LB)	43.0
Maternal mortality rate (per 100,000 live birth)	133
General mortality rate (per 100,000 live birth)	-

Population of women in reproductive age = women aged 15 – 44
Source: MSPAS, Memoria Anual de Vigilancia Epidemiologica

Principal causes of infant death during 1999 were pneumonia, diarrhea diseases, prematurity, neonatal sepsis, and malnutrition. Principal causes of general mortality during 1999 were pneumonia, diarrhea diseases, cancer, and cardiac insufficiency. Other frequent diseases include intestinal parasite, anemia and urinary infection. In addition, the number of AIDs patients in this province is the second highest in the country.

(2) Access to Health Care Services

Access to health care services is shown below.

Coverage of Health Care Services by Institution 1999

Institution	MSPAS	SIAS	UGSS	Other	None
%	24	18	17	8	33

Source: MSPAS, Memoria Anual de Vigirancia Epidemiologica

There are six NGOs working for SIAS under the agreement with MSPAS to provide primary health care services in the communities as of 1999.

(3) Maternal Care

Maternal care services in this province are summarized below. In the Study area Quetzaltenango has the highest percentage of deliveries attended by health professionals. About 92% of women received some kind of prenatal care at least once during pregnancy. Percentage of pregnant women who received second dose of tetanus toxoide was 29%.

Delivery Care Provider in Quetzaltenango Province 1999

Delivery care provider	Medical personnel	Comadrona	Empirica*	Nobody	Total
%	23	67	6	4	100

*Empirica includes comadronas who had never received any training, relatives/ friends.

Source: MSPAS, Memoria Anual de Vigilancia Epidemiologica

(4) Immunization

Immunization coverage among children under one year old in Quetzaltenango is shown below:

Immunization Coverage among Children Under 1 in the Provinces 1999

Immunization	B.C.G	Polio	D.P.T	Measles
%	92	89	89	85

Source: MSPAS

(5) Electricity, Water Supply and Sanitation

The 5th National Census of Population carried out in 1994, indicates that the coverage rates from drinkable water, latrines and electricity services are 68.9%, 30.4% and 61.9%. This means that the basic social infrastructure is found at a low level.

(6) Roads

The province of Quetzaltenango has a Central American surfaced road (CA-2) which connects Escuintla, Mazatenango, Retalhuleu, Coatepeque, and Malacatán. It also has three national roads that connect Los Encuentros, Totonicapán, Quetzaltenango (root No. 1), San Bartolo, San Carlos Sija, Quetzaltenango (route No. 9N) and Retalhuleu, Coatepeque, El Rodeo (route No. 13), in addition to several provincial roads and highways, whose length is demonstrated below.

Road System in Quetzaltenango Province

Categories of the Roads	Length (km)	
	Asphalt/Surface	Terracería
Central American	58	
National	122	28
Provincial	100	142
Rural		172
TOTAL	280	342

Source: Dirección General de Caminos, 1999

4. SELECTION OF "MODEL MICRO-BASIN"

4.1 Basic Concept of Selection and Procedure

(1) Basic Concept

The field survey indicated that poverty of the farmers in the Study area is due to the following three main causes.

(i) Low agricultural income of the farmers that result in small scale of farmlands, low yield of crops, low crop intensity, low degree of extension services for appropriate agricultural technology, poor access to markets, etc;

(ii) Devastation of natural resources due to deterioration of lands and soil erosion due to unplanned communal deforestation and environmental contamination by high dosages of agricultural chemicals, and no efficient use of water resources which are less developed and

(iii) Poor quality of life of farmers because of low health, sanitation and water supply services, low access to education, low capacity of subsistence, low quality of houses, etc.

The natural conditions such as topography, soil, elevation, hydrology, geographical and sociological conditions are the main factors generating the land utilization pattern and controlling agricultural production in the Study area.

From the above survey, it is concluded that the conditions mentioned in (i) and (ii) are attributed to the present land use pattern, and that the poor quality of life of farmers is due mainly to the low level of social infrastructure development in the area.

The Study area, with four provinces and 67 municipalities, has an area of about 6,000 km^2. Supposing that one micro-basin is 5 km^2, there are 1,200 micro-basins in the Study area. Since it is very difficult to directly select one model micro-basin from each province, selection of the model micro-basins should be done stepwise.

A model micro-basin from each province is selected based on the following three screening steps.

(i) First Screening Step: One representative municipality in each province is selected based on the representative land use pattern in the province and

the poverty criteria of FIS that considerably reflects the degree of quality of life of farmers.

(ii) Second Screening Step: One or several micro-basins covering communities in one municipality is or are selected based on the evaluation factors of the scale of the community and the basin area, confirmation of the representative land use pattern, effectiveness of demonstration and the ripple effect of the project, non existence of social problems, legal uptake of water sources, and so forth.

(iii) Third Screening Step: Final screening of the model micro-basin in each province is made by confirmation of the intention of heads of municipalities and Aldea or Caserio (the local community units) relevant to the micro-basin under the Study. In the case several micro-basins are selected in the second screening step, one micro-basin will be selected based on the specific criteria for selection that reflects the conditions of the municipality containing the micro-basins before confirmation.

(2) Procedure for Selection of Model Micro-basins

The procedure for selection of model micro-basins is illustrated in Figure 3 and consists of the following steps.

(i) First Screening:

Selection of municipalities having representative land use in each province: The representative land use patterns in the Study area are identified based on the following studies and investigations.

(a) Interpretation of land use maps (1/250,000) of the four provinces, prepared by IGN in 1991;

(b) Interpretation of land use maps of Totonicapán province (1/50,000) prepared by EU in 1998;

(c) Interpretation of the survey results of cultivated area by crop on the municipality level provided by the MAGA provincial offices; and

(d) Field confirmation survey conducted by the JICA Study Team

As a result, the representative four land use patterns in the Study area were identified and the representative land use patterns in each province are as follows:

Number	Representative land use pattern	Name of province
1	Forest	Totonicapán
2	Basic grain (maize, frijol, wheat, etc)	Quetzaltenango
3	Basic grain and vegetables	Chimaltenango
4	Perennial crops such as coffee	Soloá

Based on the above studies and investigations, the municipalities in each province that have the representative land use pattern were identified.

Selection of municipalities having class "c" poverty defined by FIS in each province: INE conducted the "10th National Population Census and 5th National Housing Census" in 1994. FIS standardized "poverty" based on the results of those censuses. Poverty degree in each municipality and each community in the country was calculated based on the following six evaluation factors and their weight of %, and defined as indicator of unsatisfied basic necessities (indicador NBI ponderado).

Evaluation factors	**Weighted %**
1. Number of people per house	5
2. Quality of house	10
3. Access to sewage disposal facilities	25
4. Access to drinking water supply facilities	30
5. Access to education	10
6. Capacity of subsistence	20

Poverty classes are determined by the value of indicator of unsatisfied basic necessities and consist of five classes from extreme to low poverty as follows:

Class of poverty	Particular	Value of indicator of unsatisfied basic necessities
a	Extreme poverty	Above 30
b	Severe poverty	20-29.99
c	Regular poverty	15-19.99
d	Relative poverty	10-14.99
e	Low poverty	Below 10

It is considered that the indicators of unsatisfied basic necessities and poverty classes prepared by FIS are sound enough to be applied to our selection of micro-basins for the following reasons:

(a) Evaluation factors for poverty are very appropriate for evaluating of the degree of quality of life of the farmers in the Study area;

(b) There are no nationwide or province-wide standards to evaluate poverty except FIS criteria. Since FIS evaluated poverty for all the

municipalities and all the communities in the country, poverty assessment for the farmer households in a huge area like the Study area, can be easily practiced on an reliable level, and

(c) Everyone can easily use the FIS poverty standard in future projects.

In this Study, municipalities classified by "Regular poverty (class c) or medium class poverty" were selected in order to avoid selecting extreme cases.

Based on both the results of evaluation from the viewpoint of representative land use pattern and medium class 'c' poverty, selection of one representative municipality was made from each province.

(ii) Second Screening:

Demarcation of micro-basins in the screened municipality: Micro-basins with an area of about 5 km^2 are delineated by the use of 1/50,000 topographic maps.

Selection of communities having class "c" poverty defined by FIS: The selected municipality consists of the local communities such as Pueblos, Aldeas, Cacerios, Parajes, Fincas, and others that range from "a" to "e" in value of indicator of poverty. Among them, communities having class "c" poverty are screened.

Preparation of criteria with 8 evaluation factors for selection and evaluation: The screened communities in the municipality mentioned above are evaluated based on the following 8 factors and their order of assessment. When all the communities cannot adequately pass the value of the evaluation factors, the range of "c" poverty (15-19.99) should be extended to 13.5 to 22 (plus/minus 10% of the value of "c") for selection. The same above procedure should be applied to evaluate the communities having these ranges.

No. of evaluation factors	Evaluation factors	Order of assessment	Criteria for community and/or micro-basin
No.1	Number of households in community	1	Should be between 50 and 250 in number
No.2	Area of river basin (micro-basin) (km^2)	2	Should be between 3 and 15 km2.
No.3	Land use	3	Should be as same as the representative land use pattern for province
No.4	Access (road)	4	Should be within 10 km from the main road.
No.5	Legal uptake of water source	5	Can be used legally
No.6	Overlapped by other projects	6	Not overlapped by other projects that other agencies have conducted and/or are carrying out
No.7	Social problems	7	No serious social problems for implementation of the project
No.8	Overlapping other municipalities	8	Micro-basin does not cover the area of other municipalities

(iii) Third Screening:

Preparation of specific criteria for selection and evaluation: If there are several communities screened in the second screening step, the specific criteria for the communities are determined taking into account hydrological conditions and effectiveness of demonstration and the ripple effect of the project. The communities are assessed by the specific criteria and one micro-basin is selected.

Confirmation of intention of heads of municipality and/or Aldea/Caserio : The intention of heads of the relevant local authorities of the municipality and/or Aldea/Caserio under the Study is confirmed and one model micro-basin in each province is finally selected.

4.2 Selection Procedures

4.2.1 Chimaltenango Province

(1) First Screening

There are 16 municipalities in Chimaltenango province. As shown in Table 2, six municipalities belong to class “c” poverty: San Martin Jitotepeque, Comalapa, Patzun, Pochuta, Acatenango and Zaragoza. There are 3 municipalities: San Martin Jitotepeque, Pachuta and Acatenango where coffee is grown mainly by coffee. Chimaltenango province plays an important role in the provision of drinking water to Guatemala City. Especially water from the Pixcaya river basin is the most important source. It is considered that adjustment and coordination of

drinking water supply to Guatemala city and agricultural water use in this province are very difficult and the municipalities which cover the Pixcaya river basin should be excluded in the selection of the model micro-basin. As a result, Patzun municipality was selected as shown in Table 2.

(2) Second screening

The area of Patzun municipality was divided into 30 micro-basins by use of the map on a scale of 1/50,000 as illustrated in Figure 4 and shown in Table 3. The number of micro-basins in Patzun is summarized below:

Name of river	Number of micro-basins
1. Sub-basin of Los Chocoyos (Madre Vieja basin)	8
2. Madre Vieja river basin	5
3. San Jorge (Madre Vieja basin)	3
5. Sub-basin of Nican (Coyolate basin)	3
5. Sub-basin of Xaya (Coyolate basin)	11

In Patzun municipality, there are 50 communities. First these communities were assessed by poverty classes. Four communities including Caserios La Trompetilla, El Garabato, Pachut and Popabaj were selected Second, the micro-basins covering these caserios were assessed based on the proposed 8 evaluation factors. However these communities do not pass the evaluation factor No.1; number of households in the community. So the range of class “c” poverty (15-19.99) was extended to 13.5 to 22 (plus/minus 10% of value of “c”) for selection and 9 communities were retained. The micro-basins including these communities were evaluated by the same procedure mentioned above. Then three micro-basins: Caserio Xetziti, Aldea Xeatzán Bajo and Aldea San Jose Xepatan, adequately passed the 8 evaluation factors and were selected as candidate model micro-basins.

(3) Third Screening

The model micro-basin in this province will be the representative land use for vegetables and basic grains. Since availability of irrigation water is one of the most important factors for rural development and reduction of poverty of the people, water potential in the communities concerned was assessed by field survey as described below.

(i) Caserio Xetzitzi is located 7.5 km from the capital of Patzun municipality. This caserio is connected to the capital by unlined roads. According to the 1994 census, there were 66 farm households fully engaged in agriculture. In and around this caserio, there are few suitable lands for farming. The farmers in this caserio grow basic grains and vegetables on reclaimed

steep lands. At present several springs in and around this caserio provide less than one lit/sec of water can be obtained from the river reclaimed the steep lands and grow basic grains and vegetables. At present there are several springs in and around this caserio provide less than one lit/sec of water for drinking and washing purposes. The only new water source can be obtained from the river located about 3km far away, but it is necessary to pump up water to a height of 200 m , which suggests a huge investment for construction of irrigation facilities and O&M costs.

(ii) Aldea Xeatzán Bajo is located 8.2 km from the capital of Patzun municipality. This caserio connected to the capital by unlined roads. According to the 1994 census, there were 212 farm households fully engaged in agriculture. Farmlands in and around this caserio are relatively undulated. The farmers in this caserio grow basic grains and vegetables. There is a spring in this caserio with a discharge of about 20 lit/sec. About half of this discharge is used for drinking by local people in this caserio. The remainder that is discharged to the downstream area at present can be used for irrigation purpose.

(iii) Aldea San Jose Xepatan is located 5.4 km from the capital of Patzun municipality. This caserio is connected to the capital by unlined roads. According to the 1994 census, there were 169 farm households fully engaged in agriculture. Farmlands in and around this caserio are relatively undulated. The farmers in this caserio grow basic grains and vegetables. Since this aldea is located at an elevation of over 2,300 m and soil moisture is assumed to be supplied by fog that often occurs even in the dry season, culture for vegetables without irrigation is prevailing at present in this aldea. Though there are plenty of water sources from springs in and around this aldea, these water sources are reserved for drinking water supply to Guatemala City. This situation constitutes a limitation for development of water sources for irrigation purpose.

Among the above three communities, the micro-basin covering aldea Xeatzán Bajo was considered the most appropriate as shown in Table 4.

Needs for development of the Xeatzán Bajo micro-basin were surveyed and identified. It was also confirmed that the heads of the relevant local authorities of Patzun municipality, and Xeatzán Bajo Aldea, and local people of the Xeatzán Bajo micro-basin desire the development of the basin.

As a result, the Xeatzán Bajo micro-basin was selected as the representative one from Chimaltenango province.

4.2.2 Sololá Province

(1) First Screening

There are 19 municipalities in Sololá province. As shown in Table 5, there is only one municipality, San Juan La Laguna , with a poverty class “c”. On the other

hand, coffee is grown mainly in 11 municipalities including San Juan La Laguna. Therefore, San Juan La Laguna municipality was selected.

(2) Second Screening

The area of San Juan La Laguna municipality was divided into 6 micro-basins as illustrated in Figure 5 and shown in Table 6. There is one micro-basin in the Quebrada Seca river basin and fivemicro-basins in the Yatza river basin.

There are five communities in San Juan La Laguna municipality: Pueblo San Juan La Laguna, Panyebar, Palestina, Pasajquim, and Finca la Dicaha. First these communities were assessed by poverty classes. Pueblo San Juan La Laguna was selected. Second, the micro-basin covering Pueblo San Juan La Laguna was assessed based on the proposed 8 evaluation factors. However this community has 585 total households, which do not pass the evaluation factor No.1: number of households in the community. So the range of class “c” poverty (15-19.99) was extended to 13.5 to 22 (plus/minus 10% of value of “c”) for selection and Panyebar community was thus selected. The micro-basin covering Panyebar (Panyebar, Y-3) was evaluated by the same procedure mentioned above and its appropriateness was confirmed as shown in Table 7.

(3) Third Screening

Needs for development of the Panyebar micro-basin were surveyed and identified. It was also confirmed that the heads of the relevant local authorities of San Juan La Laguna municipality and Panyebar Aldea, and local people of the Panyebar micro-basin desire the development of the basin.

As a result, the Panyebar micro-basin was selected as the representative one from Sololá province.

4.2.3 Totonicapán Province

(1) First Screening

There are 8 municipalities in Totonicapán province. As shown in Table 8, Four municipalities: San Crisobal Totonicapán, San Andres Xecul, Momostenango, and Santa Maria Chiquimula were selected because they are in class “c” poverty. On the other hand, since Totonicapán province is characterized by forests, the forest coverage rate was used as one of the selection factors in this study. A municipality to be selected should be in class “c” poverty and also have the highest forest coverage rate among the municipalities. As a result, Santa Maria Chiquimula municipality was selected.

(2) Second Screening

The area of Santa Maria Chiquimula municipality was divided into 40 micro-basins as illustrated in Figure 6 and shown in Table 9. The number of micro-basins in the river basins is summarized below:

Name of River	Number of micro-basins
Alajsimier	1
Pacaranat	4
Tzancorral	1
Sajcoclaj	2
Pachac	10
Sacmequena	9
Sacbaj	4
Tzununa	9

There are 66 communities in Santa Maria Chiquimula municipality. First these communities were assessed by poverty class and 13 communities were selected. Second, the micro-basin containing 13 communities was assessed based on the proposed 8 evaluation factors. Three micro-basins covering Chipu, Pachum and Chicaxul communities were retained as shown in Table 10. Other communities were excluded because of their inappropriateness with respect to the evaluation factor No.1: scale of community and/or No.2: (a scale of micro-basin.

(3) Third Screening

Santa Maria Chiquimula municipality is one of the areas where roads are mostly undeveloped. The roads and road network are very poor and inadequate. Most roads are unlined and become muddy in the rainy season. It is considered that the condition of roads to a micro-basin and its location are prerequisites for final selection of a micro-basin for demonstration of the ripple effects of the project, easy access to market, easy implementation of the projects, etc. And also the representative micro-basin should have potential water resources for development, especially agricultural development to increase farm income of local farmers.

The final selection was made from the geographical situation including roads and water potential in the micro-basin covering communities.

The situations of the selected three municipalities are summarized below:

	Pachum	Chipu	Chicaxul
Conditions of forests	Dense forest	Forest with low density of pine trees	Forest with low density of pine trees
Availability of river waters in dry season	Yes	No	No
Access to main road connecting municipality capital with Inter American Highway (km) and condition in the rainy season	4.6 km roads become muddy in the rainy season	9 km and there is no access road to this community by car. 30 minutes are needed to reach walking from the road connecting with municipality capital	5.5 km
Access to Inter American Highway	15 km	33 km	30 km

The above table indicates that the Pachum micro-basin has the most advantage from both geographical and water potential viewpoints. Thus the Pachum micro-basin was selected.

Needs for development of the Pachum microcuenca were surveyed and identified. It was also confirmed that the heads of the relevant local authorities of Xesana municipality and Pachum Aldea and local people of the Pachum micro-basin desire the development of the basin.

As a result, the Pachum micro-basin was selected as the representative one from Totonicapán province.

4.2.4 Quetzaltenango Province

(1) First Screening

There are 24 municipalities in Quetzaltenango province. As shown in Table 11, the three municipalities: San Francisco La Union, Flores Costa Cuca and Palestina De Los Altos, are in class “c” poverty. Though the main land use is cultivation of maize in San Francisco La Uion municipality, there are none community with class “c” of poverty within it. Then, this municipality was eliminated. Flores Costa Cuca municipality is located in the lowland and coffee is dominant in its main land use pattern. This was therefore also eliminated. As a result, Palestina De Los Altos municipality was selected.

(2) Second Screening

The area of Palestina De Los Altos municipality was divided into 10 micro-basins as illustrated in Figure 7 and shown in Table 12. The number of micro-basins in the river basins is summarized below:

Name of River	Number of micro-basins
Turbala	6
Palana	2
Patzacan	1
Ixchol	1

There are 26 communities in Palestina De Los Altos municipality. First these communities were assessed by poverty class and the following seven communities were selected:

Number	Administrative Units	Name of community
1	Caserio	Tojguabil
2	Caserio	Los Marroquines
3	Aldea	El Socrro
4	Caserio	El Carmen
5	Caserio	Los Cabrera and Molinos Los Cabrera
6	Caserio	San Isidro and Los Diaz
7	Caserio	Los Perez

Second, the micro-basin covering the above seven municipalities were assessed based on the proposed 8 evaluation factors. Among them, the micro-basin with El Carmen was not selected because of its inappropriateness with respect to the evaluation factor No.1: a scale of community. Two micro-basins covering Los Marroquines and El Socorro were eliminated due to the very small scale of an area of their micro-basin (evaluation factor No.2). Since the micro-basin of Tojgualil overlaps the basin of Conception Chiquirichapa municipality (evaluation factor NO.8), it was eliminated. The micro-basin Sanisidro, T-3 covering Los Cabrera/Molinos Los Cabrera, SanIsidro/Los Diaz and Los Perez adequately passed all the 8 evaluation factors and was selected as shown in Table 13.

(3) Third Screening

Needs for development of the micro-basin having three communities were surveyed and identified. It was also confirmed that the heads of the relevant local authorities of Palestina De Los Altos municipality and local people of the micro-basin desire the development of the basin.

As a result, the Sanisidro (T-3) micro-basin was selected as the representative one from Quetzaltenango province.

5. PRESENT CONDITION OF MODEL MICRO-BASINS

5.1 Xeatzán Bajo Area in Chimaltenango Province

5.1.1 Natural Resources

(1) Location

The model micro-basin selected in Chimaltenango province, Patzun municipality, Xeatzán Bajo community is located near 14° 41` latitude north and 91° 10` longitude west; the elevation varies between 2,150 and 2,500 meters above sea level.

(2) Topography and Soils

The topography of Xeatzán Bajo Model Micro-basin is undulated with a slope of 1-10%. The soils are moderately deep, up to 1.25 m. The soil texture varies from loam to clay loam. Internal drainage is good.

(3) Climate

The climate is moderately temperate moderate: Annual mean temperature is about 20;° Monthly mean maximum range, from 25.3° to 29.5° and monthly mean minimum range, from 0° to 9.0° Average annual rainfall is about 1,000 mm; about 90 % of the annual rainfall occurs during the period from May to October; there are about 140 rainy days per year.

(4) Water Resources

There are 5 springs owned the community, and several streams in/near Xeatzán Bajo Community. The features of water sources are as listed below.

Name:	1) *Pachomochai springs*
Composition:	3 springs
Discharge:	12.5 lit/s
Present Usage :	Less than 30 % in annual average; Resource of the community portable water supply system through pumping station.
Owner:	Community
Potentiality:	High
Remarks:	Only 6-8 lit/s of spring water out of 12.5 lit/s are diverted to the pump station, and the remains are discharged to the river. At pump station, water tank is always fulfilled and most of inflow water is spilled out from its tank through spillway to river. In addition, although the discharged water from the spring to stream are presently used as a source of drinking water for Patzun municipality through their pump station located about 200m away from the spring. However Patzun municipality does not have regal right for using spring water itself and depends on the surplus water from Xeatzán Bajo area.

Name:	2) *Chuchuka and Xeatzan Alto springs*
Composition:	2 springs
Discharge:	0.5 lit/s
Present Usage:	100%; water source for the community portable water supply system through gravity conveyance pipes.
Owner:	Community
Potentiality:	Low
Remarks:	It is located outside Xeatzán Bajo village
Name:	3) *Chuacacquix spring*
Composition:	1 spring
Discharge:	0.9 lit/s approx.
Present Usage:	0 % ; No use
Owner:	Community
Potentiality:	Medium
Remarks	It is located near *Chitiyah spring*. *The Chuacacquix* and *Chitiyah* springs were purchased by the Community from private owners in 1994 with finance of the Pump Committee for irrigation in future. (according to the Community Chief)
Name:	4) *Chitiyah spring*
Composition:	1 spring
Discharge:	0.5 lit/s approx.
Present Usage:	0% ; No use
Owner:	Community
Potentiality:	Medium
Name:	5) *Pachor spring*
Composition:	3 Springs
Discharge:	0.3 lit/s
Present Usage:	100% ; Water source for public washing and drinking water supply.
Owner:	Community
Potentiality:	Low
Remarks:	A few families depend on this spring for drinking water and many families use washing facility daily.
Name:	6) Small Streams (no name)
Discharge:	N/A … seasonal flow (no or few flow in dry season)
Present Usage:	Partially ; Resource of irrigation water by small-scale gravity pipelines.
Owner:	Private
Potentiality:	Low
Remarks	See details in the Section 5.1.3 (9) Irrigation Systems.

5.1.2 Socio-economic Conditions

(1) General Conditions

Xeatzán Bajo village belongs to the Municipality of Patzún, Province of Chimaltenango. The population of this area speaks Kaqchikel and Spanish languages.

Most of the population of this area is engaged mainly in contract-cultivation of vegetables for export. This cultivation generates employment inside of and outside of the community, and the tendency is reflected by the permanent presence of the youths in the community. Women also participate in agriculture and more than half of them are engaged in the embroidery and/or knitting for production of

traditional Huipil.

(2) Population and Administrative Structure

Xeatzán Bajo village has a total population of about 1,950 and 325 household in 2000. Most of the inhabitants are Kaqchikel. It is assumed that 60% are catholic and 40% evangelical. Most of the households are engaged in agriculture.

The municipality of Patzún headed by a municipality mayor is the smallest authorized administrative unit. Under the municipality, there is a traditional administrative system (auxiliatura) headed by an auxiliary mayor (AA.) who plays the linking role between the municipality and each community (aldea or village). The auxiliatura comprises AA, two adults and 6 constables. The auxiliary mayor is the representative of each community. The auxiliatura is a real administrative unit in a communities. AA receives claims and solves problems. Also AA works for the development of the community coordinating with committees as mentioned below. He also negotiates for projects and carries out maintenance of the infrastructure. AA is elected by the General Assembly which is the decision-making body of the community.

In the community there is a Communal Council that was formed in the year 1993 and is composed of the representatives of each church. Six councils are on a perpetual appointment basis and are recognized by their experience and knowledge.

Also in the community there exist several committees that have their own objectives. Now in Xeatzán Bajo there are the Committee of Development, Committee of Pump, School Committee, Health Committee, Women Committee, and Sports Committee. The people to fill the positions in committees are nominated by the General Assembly and all the committees work with the support of the entire community. These people participate from any church.

(3) Gender

The role of women differs depending on locations. Generally, their main activities are preparation and cooking of food, acquisition of fuels and water, hygiene, weeding in agricultural farming, child care, hand weaving/other handicrafts, sewing, raising livestock and paid agricultural work

Women are engaged in mainly unpaid domestic work in general in Xeatzán Bajo. Men manage incomes in the household. Cash income sources for women are

limited, tending to be in seasonal, short term, unskilled or semiskilled categories characterized by substandard working conditions and low wages. The limited sources of cash income in Xeatzán Bajo are shown below:

Main sources of cash income of women in Xeatzán Bajo

	Work in charge		Payment / day or per unit or product	Problems
Traditional women's blouse "Huipil" making	Hand weaving and embroidery	Work with patron	Setting thread Q2-3/ huipil/a day Hand weaving Q5,5/ huipil/a day	To work with a patron means less cash income for their labor. However, they do not need cash to buy their own material. Women with no cash tend to work for patrons.
		Working By themselves	Setting thread and Hand weaving Q8-13/ huipil/ a day	There is enough cash at hand for women to buy a large quantity of thread in order to make the cost production lower. cf. Men's Hand Weaving in Salcaja : Q17/ a day
Livestock/ Poultry	Hens, cooks, cows etc		N/A	No appropriate knowledge to grow livestock/ poultry
Agricultural work	Harvesting vegetables Weeding etc.		N/A	Women work mainly for the family and they do not receive cashes.

The women's illiteracy rate in Patzun is 16% higher than that of men. In Xeatzán Bajo, there is a quite limited number of women who can speak Spanish. The rate is estimated at 20 % from the result of two women group meetings.

In Xeatzán Bajo, there is a Women's Committee. It is very active in the village. Main activities of the committee are preparation of school snack and preparation of food for visitors or community activities such as those in the Independence Day of the country.

The women's political participation is quite limited in Xeatzán Bajo. Usually political candidates are only men and the majority of voters are men. One of the biggest reasons why women do not participate in elections is that the majority of women, approximately 57% or more are illiterate in Xeatzán Bajo.

The following matters should be taken into consideration for the development.

- Credit schemes are more successful when they are targeted to women. It is strongly suggested that, if credit schemes are applied in the project, the beneficiaries should be women as the rate of repayment becomes higher and the increase of income earned by women directly

benefit the household.

- Women have less chance to have any form of education and more than half of women do not speak Spanish.
- Women in Xeatzán Bajo have experience in organizational activities. They have enough capacity to manage formal credit or cash-involved projects.

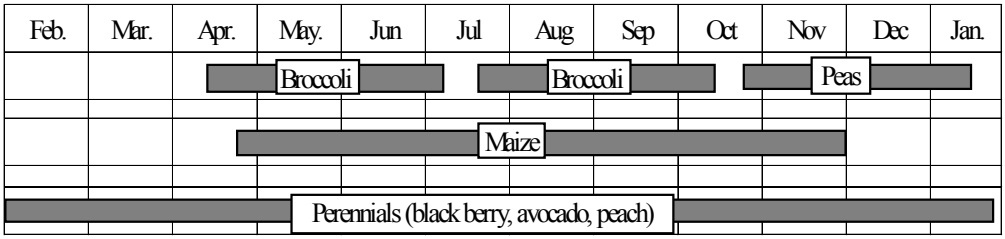
5.1.3 Agricultural Conditions

(1) Land Use

The present land use of the Xeatzán Bajo micro-basin is estimated as follow: 45 % of the land is dedicated to agricultural production; about 30 % is covered by forest; some 10 % is covered by bush and grass, and 15 % is covered by houses, roads and others.

(2) Cropping Pattern and Farming Practices

Vegetables such as broccoli, snow pea, cauliflower, and carrot are the main cash crop planted in the Xeatzán Bajo micro-basin; all farmers plant corn for family self consumption; others crops planted in small areas are black berry, avocado, and peach. The present cropping pattern of main crops is as indicated below.



The common farming practices carried out by farmers in the Xeatzán Bajo micro-basin are described in Table 5.1.3 (1) in Annex-1.

(3) Agricultural Production

Agriculture production in the Xeatzán Bajo micro-basin is summarized below:

Crop	Average Yield (per manzana)	Harvested Area (manzana)	Production
Broccoli	190 qq	170	64,600 qq (2 harvests)
Snow pea	175 qq	100	17,500 qq
Carrot	13,000 dozens	20	260,000 dozens
Maize	25 qq	200	5,000 qq
Black berry (1)	1,200 flats	20	24,000 flats
Avocado	190,000 units	5	950,000 units

(4) Livestock Raising

Livestock production in the Xeatzán Bajo micro-basin is very small, mainly due to the limited availability of land for each farmer family. Only a small percentage of families keep some chickens and/or pigs.

(5) Market System

The marketing route of vegetables in Guatemala is shown in Figure 8. This vegetable marketing channel is common to any producing countries. But the arrangement of the marketing system is far behind and not well functioning, for both market and channel in this country. In this marketing system, it is inevitable that the producer's price of fresh vegetable hangs always around the level of about 1/3 of the consumer's price. It is not rare that the price of vegetables, which are sold in a large quantity in the harvesting season equals to as low as 1/5 of the consumer's price.

(6) Prices

In this community, carrot and snow pea were cultivated under contract cultivation. The farm gate price of these vegetables is shown below:

Kinds of crops	Unit price (Quetzal/lib)	
	Farmgate Xeatzán Bajo price	PAIZ in Guatemala
Broccoli	0.70	3.00
Carrot	0.40	0.8
Snow pea	1.8	5.00

(7) Crop Budget

Almost all the vegetable production in the Xeatzán Bajo micro-basin is under cultivation contract signed between farmers and exporting companies, such as ALCOSA, INAPSA, and NETARESA. These companies provide all farming inputs and farmers provide the labor. The crop budget in the Xeatzán Bajo micro-basin is summarized below.

Crop	Cost of Inputs	Paid Labor Cost	Total Cost	Production	Selling Price	Gross Income
	(Q/manzana)	(Q/manzana)	(Q/manzana)	(qq/manzana)	(Q/qq)	(Q/manzana)
Brocoli	5,800	1,200	7,000	190	70	13,300
Snow pea	11,000	1,000	12,000	175	180	31,500
Carrot	2,800	1,500	4,300	13,000 dozens	2.5 dozen	32,500
Maize	1,000	0	1,000	25	No sale	No sale

(8) Processing of Agricultural Produce

In Chimaltenango province, 12 major companies are engaged in wholesale and

export of vegetables. They operate 50 collecting centers and 12 processing facilities (each employs more than 100 workers).

(9) Irrigation Systems

Regarding irrigation in the area, only several farmers are practicing irrigated cultivation in a small scale with tiny facilities.

5.1.4 Health and Sanitation Conditions

(1) Major Health Problems

Major health problems in Xeatzán Bajo are summarized below:

Morbidity Causes in Xeatzán Bajo	1. Common Cold 2. Tonsillitis 3. Peptic diseases 4. Arthritis 5. Diarrhea
Infant mortality rate and causes at municipality level	47.8 (per 1,000 live births) 1. Neonatal Sepsis, 2. Dehydration
Mortality causes (Xeatzán Bajo)	1. Neonatal sepsis 2. 2.Malnutrition 3. Chronic alcoholism 4. Pneumonia
MMR and the causes (region)	55.7 (per 100,000 live births) 1. Eclampsia, 2. Uterine Atony
Vaccination coverage for children under 1 year old (Xeatzán Bajo)	BCG 48%, Polio 62%, DPT 60%, Measles 58% TT for pregnant women 8.2%
Malnutrition prevalence (municipality)	Chronic malnutrition among school children 66%
Delivery attended by(municipality)	Comadronas 89.63%, Doctor 10.29%, Empiricist 0.06%

Source: Brief Description, Aldea Xeatzán Bajo Municipios Clasificados Segun Prevalencia de Desnutricion Cronica en Escolares de Guatemala, OPS/INCAP
Memoria Annual de Vigilancia Epidemiologica, Patzun, 1999, MSPAS
Memoria Annual de Vigilancia Epidemiologica, Chimaltenango, 1999, MSPAS
Medical statistics from health post in Xeatzán Bajo

(2) Health related Facilities, Personnel and Drug Availability

The present conditions of health related facilities, personnel and drug availability are summarized in the following table.

Health facilities and health personnel,	Health Post in Xeatzán Bajo Health Center, private clinics and Acuala hospital in Patzun
Average number of patients a day at HP	8 to 25 patients a day (In March they have the largest number of patients during the first half of the year 2000)
Referential point	Hospital in Chimaltenango or Health Center and Aculala hospital in Patzun
Distance and transportation to the health facilities	Three days a week, direct transportation to Patzun (2.5Q) There are buses everyday from a near-by village to Patzun (150Q) for hiring the vehicle to the hospital in Chimaltenango.
Drug availability	Appropriate drugs are often not available at HP and HC although offered free of charge.
Traditional and plant medicine	Traditional doctor and plant available at Patzun. There is one NGO in Patzun implementing plant growing project, trained 30 women as plant practitioners.
Health guard	None
Health promoters	20 (10 men and 10 women), Among whom 10 were trained by HC, the others by CARE
Comadronas	2 comadronas in Xeatzán Bajo, 1 in Xeatzan Alto Materials necessary for Comadrona are lacking.
Health committee	9 members (all men), not functioning well
Basic health infrastructure (water , latrines)	Latrines for all the households Potable water for 87% of the households
Other organization implementing health activities in Xeatzán Bajo	Consuder, Acuala hospital, CARE and World Vision used to do activities
Family planning	Majority do not accept due to religious reasons
Vaccination	Available at HP every day
Reproduction health	Prenatal care available at HC, HP and by comadronas and pregnant women of ten with health problems such as anemia and malnutrition
Health seeking behavior	Health post at first, then HC or private clinic in Patzun

5.1.5 Education Service Conditions

(1) Primary School

There is only one primary school in Xeatzán Bajo. The number of school children is 297 in total. The number of school children in Xeatzán Bajo decrease as the grades become higher. The biggest dropout is between grade 4 and 5 where almost 40 per cent of school children dropout, which is one of the most serious problems in the primary education. The reason why children dropout from school can be summarized as follows.

(a) Opportunity cost: at the age of 14-15, school children can contribute to the household by earning cash income such as boys in agricultural work, girls as domestic workers in city

(b) Parents do not see education very important: There is no good work opportunity anyway even if their children graduate from primary school.

(c) The school cannot provide children with good quality of education: lack of teachers and lack of classrooms.

(2) Junior High School

There is no junior high school in Xeatzán Bajo. The closest junior high schools are in Chipiaqul and Chicioi Paradiso. Most students, who are to attend junior high school, go to Chicioi Paradiso, which was founded by the local committee of school in 1996. It takes about 30 minutes and there is no particular problem on the way. The number of students who went to junior high school from Xeatzán Bajo was three in 1999.

(3) Adult Education/ Informal Education

CONALFA (*Comite Nacional De Alfabetizacion*, National Committee for Literacy) gives literacy classes for adults in Xeatzán Bajo. There are three classes in the village and 90 people with age ranging between 15 and 55, were registered in 2000. The reasons of the low rate of women's participation area considered below:

(a) Women's domestic work and raising children at home makes more difficult for women to access to education.

(b) Some women do not understand the importance of literacy

(c) Some women do believe that education is for men not for themselves

5.1.6 Rural Infrastructure

In order to grasp general features of the rural infrastructure, such as water supply, electric power supply, etc., and the household facilities in Xeatzán Bajo, an ad-hoc survey of diffusion of infrastructure was covered out at the site. Interview survey was conducted on 141 houses in the area and the results obtained are shown in the following table. The survey results show that all the diffusion rates are over 80% and the living standard at Xeatzán Bajo community reaches a certain extent rather high level.

Results of Ad-hoc Survey for House Facilities

	Water supply	Electric supply	Drainage	Toilet	Improved stove	Interviewed houses
Diffusion	87%	91%	84%	100%	87%	141 houses

The drinking water system was introduced by NGO 5 years ago and operated by the community. The system is operated and maintained well by the Pump Committee presently and the monthly water charge is also duly collected.

The average consumption is approximately 20-50 litters/person/day, there is not

any claim about this volume. Water quality is not so good according to the result of the water quality test by the Study Team.

Sanitary facilities were installed by NGO at the same time as the installation of the water supply system. As mentioned in the above table, the toilet system is spread among the community and contributes to improvement of the house sanitary condition.

The main purpose of a electricity supply is for lighting, and use of radio and TV. Consumers pay about Q.15-25/month at a rate of Q.0.99/kW.

The condition of roads inside the community and access roads to the community is good even in the rainy season. No problem regarding the roads was found during the site investigation.

5.1.7 Environmental Conservation Sector

(1) Soil Erosion and Subsidence

Deforestation in Xeatzán Bajo is caused by explanation of agricultural lands and, firewood consumption by households, without planning reforestation. As a result of introducing non-traditional cultivation to the zone, the agricultural frontier has been expanded to a point in some area of the community. The soils suffers erosion easily, which in the given moment makes the soils unfertile.

There are no community forests there, but only private ones. However, a person, who wants to cut one tree of his own forest, needs a permit from his mayor.

(2) Water Contamination

Water for domestic use was investigated. Five samples of the water from fountains, wells and a tap were taken and tested. Most samples show that the water is not suitable for drinking without being boiled because of the presence of coliform and bacteria. Nitrate was also detected

5.2 Panyebar Area in Sololá Province

5.2.1 Natural Resources

(1) Location

The Model Micro-basin selected in Sololá province, San Juan la Laguna municipality, Panyebar community is located near 14° 35` latitude north and 91° 22` longitude west; the elevation varies between 1,600 and 2,600 meters above sea level.

(2) Topography and Soils

The topography of the Panyebar Model micro-basin is very undulated with a slope of 15%-60%. The soils are moderate. Soil texture varies from sandy loam to clay loam. Internal drainage is moderate.

(3) Climate

The climate is template moderate; Annual mean temperature is about 20;° Monthly mean maximum range from 27.6° to 29.3° and monthly mean minimum ranges from 6.2° to 12.2.° Average annual rainfall is about 1,500 mm; about 92 % of the annual rainfall occurs during the period from May to October; there are between 140 to 160 rainy days per year.

(4) Water Resources

Major water resources in Panyebar and their characteristics are shown in the following table.

Name: Composition: Discharge: Present Usage: Owner: Potentiality: Remarks:	1) *Panan springs* 5 springs 2.7 lit/s 92 % ; Water Source of the portable water supply system in the area Community Low Water is utilized for both supply systems installed by (1) CARE and (2) FONAPAZ
Name: Composition: Discharge: Present Usage: Owner: Location: Potentiality:	2) *Silberio spring* 1 spring 2.4 lit/s 0% ; No use Private About 150-200 m down from the main road in the east side valley High
Name: Composition: Discharge: Present Usage: Owner: Location: Potentiality:	3) *Juan springs* 2 springs less than 0.1 lit/s approx. and seasonally varied Partially ; Main water resource for drinking and washing when the water system is out of order. Private About 150-200 m down from the main road in the west side valley Low

5.2.2 Socio-economic Conditions

(1) General Conditions

Panyebar village belongs to the Municipality of San Juan La Laguna, province of Sololá. Panyebar is composed of a center and two caserios Panacal and Chuacanac. The population of this area speaks K'iche, Tz'utujil and Spanish. Panyebar's population is related to that to San Juan la Laguna village in the administrative

aspect, however it is more linked to San Pedro la Laguna with regard to work. For some daily trading activity people in Panyebar go to Santa Clara where K'iche is spoken.

Most of the population in this area depends on the daily wage for their work in the coffee fields at the lake's shores in San Pedro la Laguna and San Juan La Laguna for their living. At the same time they grow maize for their own consumption and have small coffee crop lands.

(2) Population and Administrative Structure

Panyebar has about 350 households and a total population of about 1,800 in 2000. All the families are indigenous. Most of the inhabitants are K'iche and there are some Tz'utujil. 60% are Catholic and 40% evangelic. Most of the households are engaged in agriculture and its activities.

The municipality of San Juan La Laguna headed by a municipality mayor is the smallest authorized administrative unit. Under the municipality, there is a traditional administrative system (auxiliatura) headed by three auxiliary mayors (AA.) who play an important role in the linking between the municipality and each Panyebar (aldea or village). The auxiliatura comprises three AAs, six aguacils and constables. The auxiliary mayor is the representative of each community. The auxiliatura is a real administrative unit in a community. AA receives claims and solves problems. Also AA works for the development of the community coordinating with committees as mentioned below. He also negotiates for the projects and carries out maintenance of the infrastructure. AA is elected by the General Assembly that is the decision-making body of Panyebar.

The Principals are not elected, instead people recognize them as so, because of their age of above 50, their knowledge and experience in fulfilling several positions.

In the community there are several committees that have their own objectives. Nowadays in Panyebar there are Social Development Committee, Pro-improvement Committee, Electrical Energy Committee, Elementary Institute Committee, Parent Committee and Health Committee. The people positions to fill in the committees are nominated by the General Meeting and all the committees work should be with the community's total support. There is no relation between these positions and religious positions.

(3) Gender

The main role of women in Panyebar differs from one another according to the source of income of family. Generally, the main activities are preparation and cooking of food including such activities as going to market, acquisition of fuels and water, hygiene, weeding for farming, child care, hand weaving/other handicrafts, paid agricultural work and raising livestock. The work load of women is very hard. Among these activities, the top five activities in which women spend most time are: 1) preparation of food, 2) cooking, 3) water collection, 4) going to market and 5) laundry (hygiene).

Women are engaged mainly in unpaid domestic work in general in Panyebar. Men manage incomes in the household. Cash income sources for women are limited, tending to be in seasonal, short term, unskilled or semiskilled categories characterized by substandard working conditions and low wages. The main sources of cash income for women in Panyebar are shown below

The Main Sources of Cash Income of Women in Panyebar

Main work items	Work in charge	Payment / day or per unit or product	Problems
Coffee field	Coffee harvesting	15Q / day	Seasonal Underpaid compared with Men's wage, 20-25Q
Livestock/ Poultry	Hens, Cooks, Cows etc	30 Q/hen	No appropriate knowledge to grow livestock/ poultry
Handicraft	Hand weaving Beads	15-20 Q (profit only)/ per item	There is not enough money to buy material at once.

The women's political participation is quite limited in Panyebar like in other micro-basins. One of the biggest reasons why women do not participate in election is that the majority of women in Panyebar are illiterate. For those who are illiterate, the act of voting cannot be given priority for them.

5.2.3 Agricultural Conditions

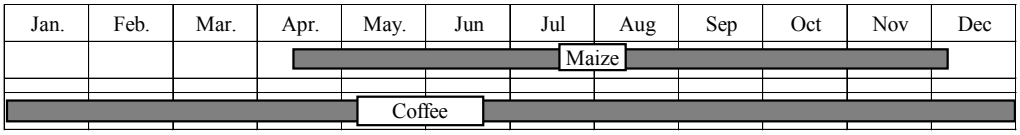
(1) Land Use

The present land use of the Panyebar micro-basin is estimated as follows: 35 % for agricultural production, about 30 % for forest, some 20 % for bush and grass, and 15 % for houses, roads and others.

(2) Cropping Pattern and Farming Practices

Coffee and maize are the main crops planted in the Panyebar micro-basin. The present cropping pattern of main crops is as indicated below. The harvest of

coffee extends for about 2.5 months, the beginning varies from December to February, depending on the start of the rainy season.



The common farming practices carried out by coffee and maize farmers in the Panyebar micro-basin are described in Table 5.1.3 (1) in Annex-1.

(3) Agricultural Production

Agricultural production in the Panyebar micro-basin is summarized below: the average yield of coffee is low because of poor management of coffee plant, due to the lack of investment capacity of farmers and low opportunity of technical assistance.

Crop	Average Yield (per manzana)	Harvested Area (manzana)	Production
Coffee	115 qq	150	17,250 qq (with pulp)
Maize	22 qq	110	2,400 qq
Avocado	200,000 units	8	1,600,000 units

(4) Livestock Raising

The majority of families in the Panyebar micro-basin are engaged in livestock and chicken production on a small scale; most families have 5 to 20 chickens, a few pigs, and 1 to 3 cows. Pigs and cows are kept in small spaces in the backyard of the house.

(5) Market System of Coffee

Ripe cherry harvested by farmers are carried to pulping factories or marketing companies in Panyebar. Small scale pulping at village level had been practiced and marketed up until several years ago. However, the requirement of big quantity of water for processing stage (100Lts per quintal) was causing a constraint factor for coffee bean processing in the area. In addition to the above, the product quality was not uniform and not appreciated in the market. Consequently, almost no pulping process was practiced in rural areas.

(6) Prices

International price of coffee fluctuates according to the production trend in major

producing countries such as Brazil, Colombia, etc. Accordingly, the price of cherry sold by farmers also fluctuates.

(7) Crop Budgets

Most farmers in the Panyebar micro-basin make very little investment for production of both coffee and maize crops. The crop budget of coffee and maize in the Panyebar micro-basin is summarized below. Inputs cost are only for fertilizers; labor cost for coffee is mostly for harvesting.

Crop	Cost of Inputs	Paid Labor Cost	Total Cost	Production	Selling Price	Gross Income
	(Q/manzana)	(Q/manzana)	(Q/manzana)	(qq/manzana)	(Q/qq)	(Q/manzana)
Coffee	2,000	1,200	3,200	115	100	11,500
Maize	950	0	950	22	No	No

(8) Processing of Agricultural Produce (Coffee)

There is one coffee pulping processing facility in Panyebar.

(9) Irrigation System

There is no irrigation system in Panyebar.

5.2.4 Health and Sanitation Conditions

(1) Major Health Problems

Major health problems in this community at present are summarized in the following table.

Morbidity causes at municipality level in 1999	1. Throat infection, 2. pneumonia, 3. Dermatomycosis 4. peptic diseases and dysentery
Infant mortality rate and causes at municipality level.	34.6 (per 1,000 live birth) 1. Premature 2. Grave pneumonia
Mortality causes at regional level	1. Pneumonia 2. Malnutrition 3. Diarrhea 4. Acute myocardial infarction
MMR and the causes at regional level	170.6 (per 100,000 live births) 1. Postnatal 2. Delivery problems, 3. Pre-ecampsia
Vaccination coverage for children under 1 years old at municipality level	BCG 94.95% Polio 96.33% DPT 96.33% Measles 88.53%
Malnutrition prevalence at municipality level	・8Th highest chronic malnutrition prevalence rate for school children among 329 municipality ・5th highest among municipality in Sololá
Delivery attended by municipality	Comadronas 99.31% Doctor 0.69%

Source: Memoria Annual de Vigilancia Epidemiologica, San Juan La Laguna 1999, MSPAS
Memorial Annual de Vigilancia Epidemiologia, Sololá 1999, MSPAS

(2) Health related Facilities, Personnel and Drug Availability

The present conditions of health related facilities, personnel and drug availability are shown below: Currently Panyebar is covered by SIAS programs and health services are supplied by a ONG "*Vivamos Mejor*".

Health facilities and health personnel,	Community Health Center (CHC) supervised by Vivamos Mejor under SIAS program. General consultations, prenatal care, vaccination and growth monitoring available. Health Post in San Juan La Laguna(SJL) and Sta. Clara La Laguna(SCL), Health Center in San Pedro La Laguna(SPL), but few people go to SPL as it takes 2 hours by walk
Average number of patients a day at CHC	CHC-10 to 20 patients a day HP in SCL about 15 patients from Panyebar on market days (Tuesday and Saturday)
Referral point	Hospital in Sololá
Distance and transportation to the health facilities	CHC is located in Panyebar Panyebar to SCL-public transportation available on market days which costs 2.5Q, or 1.5 hours by walk 300Q for hiring the vehicle to Sololá hospital
Drug availability	Limited free drugs available at CHC Health Post in SJL and SCL, not sufficient but minimal drug needs can be provided Cheaper drugs available at Clinic of Santa Clara in SCL Private Pharmacy in SJL and SCL Health Facilitator also sells drugs at his house
Traditional and plant medicine	Traditional practitioner in Palestina who cures evil eyes. Plant medicine available at the market in Santa Clara and Sololá. People often use them Request from health guards for plant medicine growing
Health facilitator	There is one who attends at CHC. His salary is Q375/month
Health guard	15 health guards (6 women 9 men) in charge of health education for 20 households
Comadronas	Two in Panyebar, Two in Palestina trained by VM every month
Health committee	5 members, all of whom are men and catholic
Basic health infrastructure (water, latrines)	95% of the population with potable water 55% with latrines
Family planning (FP)	Family planning activities by Rixin Tinamit every month Hindrance for FP is religion and culture, acceptability in these areas
Vaccination	Vaccination service available once a month at CHC.
Reproductive health	Prenatal care given by the nurse of VM once a month at CHC Available also at HP Main reproductive health problems include anemia, hemorrhage and infection of vagina
Health seeking behavior	First choice is CHC as it is near, otherwise go to HP in SJL or Clinic of Santa Clara, less frequently to HP in SCL. Sometimes, directly to Sololá hospital
Other organizations implementing health activities	Rixin Tinamit (prenatal care, FP) Clinic of Santa Clara (various services)

5.2.5 Education Service Conditions

(1) Primary Education

The total number of the school children in three schools is 519. In the primary schools, drop-outs and stop-outs/repeating are one of the serious problems. 42.5 per cent of school children drop out by the time they reach 6th grade in the province of Sololá. The reason of dropouts and stop outs can be summarized as below. .

(a) Parents consider that contribution to household economy by earning cash income is preferable to education for children.

(b) In the case of female school children, their drop-outs are due to their marriage, engagement in housekeeping work in their house as well as outsides.

(c) Lack of understanding of importance of education by parents

In addition to the above problems, there are problems such as shortage of teachers, poor conditions of salary of teachers, lack of class rooms, lack of materials/equipment for schools.

(2) Junior High School

There is no junior high school in Panyebar. The children in this village have to go to a junior high school in Aldea Palestina in San Juan la Laguna. The school is about more than one hour's walking distance from the village.

In Panyebar, there is a provisional committee to establish a junior high school in the village by inducing fund of NGO or other available services.

(3) Informal Education

In Panyebar, CONALFA is holding literacy classes on every Monday, Wednesday, Friday and Saturday at official school from 17:00 to 19:30. 25 villagers between age of 15 and 28 attend the class. The majority of the students in the literacy class are male (68.0%). According to the list of students, female students are only between 15 and 18 of age. The rest of the older students are all males.

5.2.6 Rural Infrastructure

In order to grasp general features of the rural infrastructure and the household facilities in Panyebar, a site survey of diffusion of infrastructure was conducted on 175 houses in the area and its results are shown in the following table.

Results of Ad-hoc Survey for House Facility

	Water supply	Electric supply	Drainage	Toilet	Improved stove	Interviewee houses
Diffusion	95%	76%	0%	55%	81%	175 houses

- Drinking Water Supply System

In the area there are 2 water supply system installed by CARE in 1978 and FONAPAZ in 1998. Most of the houses have 2 taps from the 2 systems.

Presently the villagers face water shortage in the systems because of a lack of water resource in the *Panan* spring and frequent water stop by physical breakdowns of the conveyance pipeline.

Water charge for the systems is collected each year at a fixed rate, Q 6/year/tap. That is why the villagers' attention on water wastage and awareness of saving tap water are so low and this is likely the cause of chronic water shortage in the systems. Regarding the breakdown in the conduction pipeline, the frequent water stop is closely related to the poor maintenance works by the water committee. However the frequency of the pipe breakdown is also extremely high, in every 15 days according to the water committee. Reinforcement of the system is therefore required.

- Roads and Bridges

The condition of roads inside the community is good, but the access roads to the community are not sufficient, especially in the rainy season.

5.2.7 Environmental Conservation Sector

(1) Soil Erosion and Subsidence

The territory of Panyebar village belongs to the highlands of the volcanic chain, with mountains, hills and volcanic cones.

In the village there is a communal forest encompassing an area of 148 ha where some assorted vegetation, such as kinds of epiphytes, orchids and bromelias or gallitos, can be found. This indicates the complexity and special nature of the area. The lands in Panyebar village are used for agriculture (35%), forests (30%), and for other uses (35%). Some farmers have small forest areas within their lands and, periodically collect a quantity of firewood from the forest for cooking in their houses. Farmers who do not have forest with trees, frequently, collect any kinds of wood for cooking in the area. The collected quantities are so big that currently such wood-able kinds of wood have completely diapered.

The soils in Panyebar are in general poor in the areas with gently waved to strongly inclined topographically, which are eroded year by year, by the clean cultivation. As a result, washing of the lands occurs and concludes the loss of the fertility.

(2) Water Contamination

Water for domestic use was investigated. Seven samples of water from fountains, a tank and a river were taken and tested. The results show waters are not suitable for drinking water use without being boiled.

5.3 Pachum Area in Totonicapán Province

5.3.1 Natural Resources

(1) Location

The Model Micro-basin selected in Totonicapán province, Santa María Chiquimula municipality, Aldea Xesana, Pachum community is located near 14° 56` latitude north and 91° 25` longitude west; the elevation varies between 2,300 and 2,600 meters above sea level.

(2) Topography and Soils

The topography of the Pachum Model Micro-basin is very undulated with a slope of 5% to 25%. The soils are moderately deep, up to 1.10 m and the soil texture varies from loam to clay loam. Internal drainage is good.

(3) Climate

The climate is temperate; Annual mean temperature is about 15;° There are no available data on monthly maximum and minimum temperatures. Average annual rainfall is about 1,000 mm; about 90 % of the annual rainfall occurs during the period from May to October; there are about 140 rainy days per year.

(4) Water Resources

Major water resources in Pachum and their characteristics are shown in the following table.

Name:	1) *Xecandelaria springs*
Composition:	7 springs
Discharge:	10.3 litters/sec
Present Usage:	6% ; Water source for Pachum 1 water system only
Owner:	The Pachum 1 water committee
Potentiality:	High
Remarks:	Only about 0.6 lit/s of spring water out of 10.3 lit/s are diverted to the water supply system, and the remainder flows into the river without using.
Name:	2) *Pachum 2 springs*
Composition:	N/A
Discharge:	N/A
Present Usage:	Water source for Pachum 2 water system
Owner:	The Pachum 2 water committee
Name:	3) *Pachum 3 spring*
Composition:	N/A
Discharge:	N/A
Present Usage:	Water source for Pachum 3 water system
Owner:	The Pachum 3 water committee
Name:	4) *Pachum river*
Composition:	1 main river and 1 branch in the area
Discharge:	Discharge is seasonally varied
Present Usage:	No use in Xesana municipality
Potentiality:	High

5.3.2 Socio-economic Conditions

(1) General Conditions

Pachum is a caserio of Xesaná village that belongs to the municipality of Santa María Chiquimula, province of Totonicapán. The people in this area speak K'iches and Spanish. It is assumed that over half of the population are evangelical and the remainder catholic. The people in Pachum are apt to be on their guard against outsiders. Most of people in this area are engaged in agriculture and trade in the coast. Other groups depend on self-consumption agriculture and wage for their living.

(2) Population and Administrative Structure

The total number of households and the population in Pachum in 2000 were 150 and 900, respectively. The municipality of Santa María Chiquimula headed by a municipality mayor (Alcalde Municipal) is the smallest authorized administrative unit. Under the municipality there is a traditional administrative system (auxiliatura) headed by Alcalde Auxiliares (AA) in Xesana who play an important role of intermediary between the municipality and each community (caserio or aldea). The auxiliaries of Xesaná consists of Auxiliary Mayor, assistants, Forest Keeper, Scholar, Secretary, Treasurer, 4 vocals and a middleman formally called

principal. The assignment of A. A. lasts for one year and they alternate among 4 communities (Center, Pachum, Xoltakche and Chuisiguan). AA. 's main work is to coordinate and receive the population's claims. Assistants (Alguaciles) are elected for each caserio and they work for communication between aldeas and caserios. They are also in charge of carrying out or coordinating some activities in the communities. The general assembly is the decision-making body and is hold 2 times per year.

Within the Pachum area, there is no authorized that representative. A decision-making system doesn't exist either. To hold a general meeting in Pachum a convocation is issued by the auxiliaries of Xesaná. The committees in Pachum are formed for the interested population. and the representatives of these committees are elected only by their members. It is not necessary to have a general assembly neither at the level of Xesaná the level of Pachum.

(3) Gender

The main role of women in Pachum are preparation of food, acquisition of fuel, hygiene, paid agricultural work, raising livestock, agricultural work and child care. Cash income source is quite limited for the women in Pachum. The features of women's cash income are shown below:

The Main Source of Cash Income of Women in Pachum

Kinds of Work	Work in Charge	Payment per day or per unit or product (Purchasing price)	Problems
Agricultural Work	Harvesting crops	15Q/ day	Seasonal Underpaid compared with Men's wage of 20 Q
Livestock/ Poultry	Hens & cooks, Pigs Cows &oxen	N/A	No appropriate knowledge to grow livestock/ poultry

The level of education that women receive in Pachum is quite insufficient. 76.0% of Pachum residents who are 15 years old and over are illiterate, most of which are women. There is one female active member in the Health Committee. Women are usually not involved in social organization and do not participate in decision making of such organizations in Pachum. The women's political participation is quite limited in Pachum. One of the main reasons why women do not participate in elections is that the majority of women in Panyebar are illiterate. For those who are illiterate, the act of voting cannot be given priority for them.

5.3.3 Agricultural Conditions

(1) Land Use

The present land use of the Pachum micro-basin is estimated as follows: 60 % of the land is covered by forest, some 25 % is covered by bush and grass; only about 10 % of the land is dedicated to agricultural production, and 5 % is covered by houses, roads and others.

(2) Cropping Pattern and Farming Practices

Maize is the only crop produced in important area in the Pachum micro-basin; The present cropping pattern of maize is indicated below.

Jan.	Feb.	Mar.	Apr.	May.	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			Maize								

The common farming practices carried out by maize farmers in the Pachum micro-basin are described in Table 5.1.3 (1) in Annex-1.

(3) Agricultural Production

Agricultural production in Pachum micro-basin is summarized as follows:

Crop	Average Yield (qq per manzana)	Harvested Area (manzana)	Production (qq)
Maize	20	50	1,000

(4) Livestock Raising

The majority of families in the Pachum micro-basin are engaged in livestock and chicken production at a small scale; most families have 2 to 10 chickens and a few goats and sheep.

(5) Market System

There is no product for market in the village and no merchant go in and out. Three small shops are selling articles of dairy necessity such as salt, sugar, soap, edible oil, beverage, etc. Villagers buy clothes, shoes, kettle, farming tools, medicine and fuel at the market opened on every Friday and Saturday in Santa Maria Chiquimula.

(6) Prices

About 1/3 families in this village do not own sufficient land and need to buy

maize as a staple food. The price of maize is 60 to 70 Quetzales (local variety) and it does not fluctuate year by year.

(7) Crop Budgets

Most farmers in the Pachum micro-basin make very little investment for maize production; cash expense is only for fertilizer application, pesticides are not applied; all the labor used for maize production is from the family. The crop budget for maize in the Pachum micro-basin is summarized below.

Crop	Cost of Inputs	Paid Labor Cost	Total Cost	Production	Selling Price	Gross Income
	(Q/manzana)	(Q/manzana)	(Q/manzana)	(qq/manzana)	(Q/qq)	(Q/manzana)
Maize	925	0	925	20	No	No

(8) Processing of Produce

In this village, there are two bakeries and four flour mills for tortilla, all of them are of small scale and serve the village people

(9) Irrigation Systems

In Pachum area there is no irrigation system.

5.3.4 Health and Sanitation

(1) Major Health Problems

The present health situation and major health problems in Pachum are shown in the following table.

Morbidity causes in Xesana Bajo	1. Intestinal parasitical diseases (25%) 2. Anemia (15%) 3. Pneumonia (13%) 4. Tonsillitis (13%) 5. Common cold (8%)
Infant mortality rate and causes at municipality level	48.04 (per 1,000 live births) 1. Bronchopneumonia, 2 Premature, 3 Neonatal Septicemia
Mortality causes at municipality level	1. Pneumonia and Bronconeumonia (31%) 2. Malnutrition (2%)
Maternal mortality rate And the causes at regional level	101.7 (per 10,000 live births) 1. Eclampsia at delivery, 2. Puerperal sepsis
Vaccination coverage for children under 1 year old at municipality level	BCG-76%, Polio-80%, DPT-80%, Measles-70%
Malnutrition prevalence at municipality level	SMC has 12th highest rate (80.9%) among 329 municipality with chronic malnutrition prevalence for school children ・Second highest among the municipality in Totonicapán
Delivery attended at municipality level	Comadronas 99.8%, Empiricist 0.18%

Source: Memoria Annual de Vigliancia Epidemiologica, San. Maria Chiquimula 1999, MSPAS
Memoria Annual de Vigiancia Epidemiologica, Totonicapán, 1999, MSPAS
Medical statistics for Aldea Xesana 2000, CDRO
Municipios Clasificados Segun Prevalencia Denutiricion Cronica en escolares de Guatemala, OPS/INCAP

(2) Health related Facilities, Personnel and Drug Availability

The present conditions of health related facilities, personnel and drug availability are shown below:

Health facilities and health personnel,	A Minimal Health Unit (MHU) attended by a doctor and a nurse of CDRO once a week. Consultation for every body, but drugs only for children under 5 years old and pregnant women. MHU in Xotache (30minutes by walk) attended by health facilitator HC in SMC, not easily accessible Nearest public health facilities is HP in El Rancho(8km) Ambulance available only at the hospital for transporting the patients to Quetzaltenango or Guatemala City Hospitalization available only at the hospital In Totonicapán, some health post are attended by Cuban doctor although they do not exist in SMC.
Average number of patients a day	15 to 20 patients on every Thursday consultation
Referral point	Health Center in SMC or Hospital in Totonicapán depending on the severity of the disease
Distance and transportation to the health facilities	MHU is situated in the primary school in Pachum. HC is located one hour walk to catch the bus at AutoRoute. On market days, there are direct transportation to San Francisco(3 days a week) and SMC(once a week), both costs 5Q
Drug availability	Free drugs at HC in SMC, Cheaper drugs offered at Catholic Church Clinic in SMC. Private pharmacies in SMC and San Francisco. Children under 5 years old and pregnant women can get free drugs at MHC
Traditional and plant medicine	No traditional doctor, but there are Maya priests exist. CDRO gives training of plant medicine to health guards. Comadronas sometimes give plant to pregnant women
Health guard	5 health guards (4men and 1women), Regular training by CDRO
Health facilitator	One facilitator living in Xesana although he does not attend to MHU in Pachum regularly
Comadronas	2 in Pachum, 4 in Xesana, Regular training by CDRO
Health committee	7 members, among whom 2 are from Xesana and all of them are health guards as well
Basic health infrastructure (water source, latrines)	Majority(85%) with no latrines, some have informal ones 70% with potable water, 30% with water from spring
Family planning (FP)	CDRO sells FP materials at 70% of the market price while free of charge at HC in SMC. The majority do not accept FP according to comadronas and health guards
Vaccination	Household vaccination visits every month by CDRO. Vaccination is also available on the fixed date at MHV
Reproductive health	Prenatal care available once a week at MHU by CDRO Not sufficient MCH equipment available at MHV
Health seeking behavior	MHU for children under 5 years old and pregnant women The others go to HC or catholic church clinic in SMC or private pharmacy in SMC and SF
Other organizations implementing health activities	Intervida (school children health activities), CARE (food distributors and Catholic Church Clinic in SMC (various health activities)

5.3.5 Education Service Conditions

(1) Primary School

There is only one primary school in Pachum. The number other data on school children are not available in this survey. Based on the data in municipality of Santa Maria Chiquimula and a information by school teacher in Pachum, the most significant dropouts are seen between grade 2 and 3 in the primary education. The main reasons of drop-outs are considered to be as follows:

1) Custom: In Pachum it is almost a custom to use primary school for only one or two years. Parents take primary school as kindergarten.

2) Language: While children speak only K'iche, there is only one school teacher among three who can speak the language. This discourages mostly school children to continue their study.

3) Parent's requirement: Parents want their children only to read and write simple Spanish. Therefore children are not encouraged to continue their study anyway.

4) Low quality of education: The number of school children per teacher is more than 40, classes are inevitably combined with several grades together, and lack of materials.

Due to the lack of understanding of the importance of education for children, parents simply use their children as daily labor force in order to replace their parents. For example, on the market day, Thursday in Santa Maria Chiquimula and Friday in San Francisco, more than a half of children do not attend school, as they have to work while their mothers are away. Collecting fodder and selling them is an important work for them.

(2) Junior High School

There is no junior high school in Pachum. There was no student who actually went to Junior High School in the past three years from 1997 to 1999.

The reason why children cannot go to junior high school can be summarized as follows.

1) Transportation is very bad: It takes more than 1 hour and 30 minutes' walk and 30 minutes' ride
2) Transportation is very expensive at a cost of Q10 a day
3) There are not many students in grade 5 and 6.
4) Parents do not see higher education as an important one.

(3) Adult Education/ Informal Education

CONALFA is giving literacy classes for adults in Pachum. There are two classes in Pachum and 42 people are registered.

The age of literacy class is between 15 and 55. The majority of students are between 15 and 19 of age. About 60 % of participants are female and 40 % are male. According to CONAMA, the illiteracy rate in Pachum is as low as 20% in 1999, which is very lower than that in Santa Maria Chiquimula.

5.3.6 Rural Infrastructure

In order to grasp general features of the rural infrastructure and the household facilities in Pachum, the survey of diffusion of infrastructure was made at site. The interview survey was conducted at 75 houses in the area and its results are shown in the following table.

Results of Ad-hoc Survey for Housing Facilities

	Water supply	Electric supply	Drainage	Toilet	Improved stove	Interviewee houses
Diffusion	80%	28%	0%	14%	2%	75 houses

- Drinking Water Supply System

Presently the villagers face water shortage in the systems because of shortage of capacity in the conveyance pipeline that delivers spring water from the spring to the storage tank.

The daily water consumption in Pachum is estimated at 106 lit/day/person. The water charge collected by year at a fixed rate of Q.50/year/house. Low attention about water wastage and low awareness on saving tap water is one of the reasons for the chronic water shortage in the system.

- Sanitary System

The diffusion of toilet and drainage facilities, 14 % and 0 % respectively, is

remarkably low among the 4 selected pilot model areas. However it could not be observed as much as the diffusion rates indicate at site investigation in terms of sanitary condition. It might relate to the low population density in the Pachum area.

- Roads and Bridges

The road condition in/around the community is very poor and severely deteriorated in many portions. In the rainy season, the condition is worsted and even a 4WD car can hardly run in mud and rainwater. the roads are also frequently cut by slope sliding in the rainy season. It is said the road traffic is interrupted every year and repair of the damaged section might take more than 1 month in the worst case.

- Improved Stove

Diffusion of the improved stove in the Pachum area is so low and the people cook meals with open fire. They have quite large forest in the area and they extract firewood from the forest.

- Sauna Bath "Temascal"

There are ethnic sauna bath called "*Temascal"* in the Pachum area. According to villagers, the diffusion of Temascal in the area reaches almost 100%. Compared with that of electricity (28%), toilet (14%) and improved stove (2%), it is very clear that the popularity of *Temascal* is so high and it relates closely to the living condition in Pachum. The villagers enjoy the *Temascal* twice or three times a week. It is composed of a dome made of blocks and clay and firebox. The dome is hearted by wood fire in the box. According to the villagers, consumption of firewood for the *Temascal* is bigger than for daily cooking and the *Temascal* push up the consumption of firewood in houses. Taking into consideration the heavy duty of manual firewood hauling, improvement of the *Temascal* is an effective way to alleviate heavy work.

5.3.7 Environmental Conservation Sector

(1) Soil Erosion and Subsidence

The forest is a communal place where most local people come and collect wood products and by-products daily. Forest management has been conducted for approximately for 10 years in the Pachum area with technical assistance under the DIGEBOS - CARE Project, where reforestation on extension area of approximately 20 hectares was achieved and the land has been shown with colored pine, white pine and cypress. To date CDRO has been supporting the

community in forest activities.

As a consequence of wood and firewood collection from the communal forest, in parallel with shepherding, some areas are deprived of vegetable cover. This may provoke erosion or degradation problems of the forest, mainly in the upper-washes of the Pachum river basin. Severe erosion can be observed in carcavas. To restore carcavas in the area, the use of agroforest and conservation structures is a primordial measure.

In the Pachum area, the slope and the thin layer of organic material lying over relatively waterproof hard clay stratum, have little capacity of storing humidity during the long period of drought. The soil in the area is of Tertiary origin compacted of volcanic rocks. This soil is closely related to the soils of "Patzite" series, which are characterized by small depth and are very susceptible to erosion, these limiting mechanized and intense agricultural production.

The principal risk is landslide that can occur on the slopes in great areas of the micro-basins. Erosion usually occurs inside the woods, on the slope along a road and in a farmland although the scale of erosion is small. To prevent erosion in a farmland, terrace and trench are set.

Some forest fires break out in a year. The cause of forest fire is spontaneous combustion in the dry season.

(2) Water Contamination

Water for domestic use was investigated for fountains, a tap, a well and rivers. A half of the water sample collected show that water is not suitable for drinking without being boiled because of detection of coliform and bacteria. Nitrate was also detected in a half of the water samples.

5.4 Palestina Area in Quetzaltenango Province

5.4.1 Natural Resources

(1) Location

The Model Micro-basin (hereinafter so called as the Palestina model area) selected in Quetzaltenango province, Palestina de los Altos municipality, Los Cabreras, Los Díaz, Los Morales, sector-I and Loz Perez communities, is located near 14° 54` latitude north and 91° 36` longitude west; the elevation varies between 2,600 and 2,800 meters above sea level.

(2) Topography and Soils

The topography of the Palestina model area is very undulated in the entire area. The slopes of the basin vary in a range between 15° and 45° . The soils are relatively shallow, less than 1 m. The soil texture is sandy loam to loam. Internal drainage is fast.

(3) Climate

The climate is temperate; Annual mean temperature is about 15;° Monthly mean maximum range from 19.1° to 25.5° and monthly mean minimum range from 0.3° to 10.1.° Average annual rainfall is about 1,300 mm; about 91 % of the annual rainfall occurs during the period from May to October; there are about 140 rainy days per year.

(4) Water Resources

Major water resources in the Palestina area and their use are shown in the following table.

Name: Composition: Discharge: Present Usage: Owner: Potentiality: Remarks:	1) *Los Molinos springs* 2 springs 25 lit/s 30 % ; Water source of the Rural Portable Water system and laundry tank. Municipality High Located outside the project area
Name: Composition: Discharge: Present Usage: Owner: Potentiality: Remarks:	2) *Monteroso spring* 1 spring less than 0.01 lit/s approx. and seasonally varied Partially ; Water source for drinking water supply when tap water is not available in the area. Private Low Spring drying up in every dry season
Name: Composition: Discharge: Present Usage: Owner: Potentiality:	3) *Los Diaz public tank's spring* 1 spring less than 0.01 lit/s approx. and seasonally varied 100% ; Water source for the public water tank for laundry Caserio Los Diaz Low
Name: Composition: Discharge: Present Usage: Owner: Potentiality:	4) *Sector I spring* 1 spring less than 0.01 lit/s approx. Main source of drinking water in Sector I area - Low

Note: If spring does not have specific name, the name of the owner is indicated.

5.4.2 Socio-economic Condition

(1) General Condition

Five caserios:Los Cabrera, Los Morales, Los Perez, Los Dias and Sector I are under of the municipality of Palestina de Los Altos. The Palestina area can be divided into a non-native area (ladinas) and a native area (Mam). The population speaks Mam and Spanish languages.

Most of the people of this area depend on agriculture, especially potato and maize cultivation for their living. Some people don't have enough land, so they have to go down to the coastal areas and rent lands for cultivation of maize from large farmers (hacienda) and/or work as seasonal labors to earn money. They immigrant from end of March to December. Usually during their migration they are deprived of the services that they are entitled in their villages such as services in health post, informal education, formal education, village midwife, and so forth. Additionally, they have to get their own water source, search for fuel for cooking, cheaper food, and other necessities for daily live in a strange place. The living conditions of these immigrants in the coastal area are very severe.

Also the migration to the US has increased recently.

(2) Population and Administrative Structure

The Palestina area has a total population of about 3,000 and of 325 households in 2000. The population is mostly composed of Mam and Ladinas as mentioned above. It is assumed that 80% of the population is evangelical and the remainder catholic. The municipality of Palestina de Los Altos headed by a municipality mayor is the smallest authorized administrative unit. Under the municipality, there is a traditional administrative system (auxiliatura) headed by an auxiliary mayor (AA) who is responsible for coordination with the municipality. Within the last 10 years the importance of the AA has been decreasing.

There are no authorities that run the community. The people create "Committees" as an organization with an objective depending on the necessity. The Committees are not elected by the general assembly of the community, but they're forms by among the interested groups. The members hold a meeting and choose the representatives. Normally a committee is composed of a President, Vice-president, Secretary and treasurer and sometimes some vocals. In some cases one committee is formed by several caserios and there are also cases where the community forms two separated committees for the same objective. The Committee negotiates with the Municipal Mayor and competent institutions depending on the necessity.

(3) Gender

The role of women differs depending on locations. The major roles of women in the Palestina area comprise preparation of food, acquisition of fuel, raising livestock, weeding for agricultural farming and childcare. The workload of women is very heavy and their average working time is estimated at 16-17 hours a day.

Cash income source is quite limited in for the women in the Palestina area. Women do not obtain any constant cash income source and receive low wage compared with men's one. The features of cash income are shown below:

The Main Source of Cash Income of Women in Palestina

	Work in Charge	How much per day or per unit or product (Purchasing price)	Problems
Agricultural Work	Harvesting potatoes etc	15Q/ day	Seasonal Underpaid compared with Men's wage of 20-25Q
Livestock/ Poultry	Hens & cocks, Pigs cows & oxen	Q25-35(Q10-15) Q150-200(Q250-400) Q150(Q250-275)	No appropriate knowledge to grow livestock/ poultry
Handicraft	-	-	-

In the Palestina area, there are some formal committees and some informal groups of villages with purpose of solving problems for community welfare. None of the women is current active member of the committees. The women's political participation is quite limited in Palestina some as in other micro-basins. One of the biggest reasons why women do not participate in elections is that the majority of women in Palestina are illiterate. For those who are illiterate, the act of voting cannot be given their priority for them.

With regards to decision making, men are the stakeholders of the household.

cooking, cheaper food, and other necessities for daily live in a strange place.

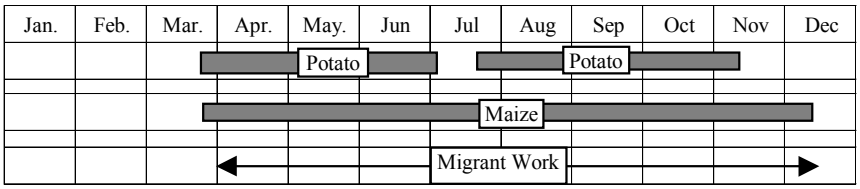
5.4.3 Agricultural Conditions

(1) Land Use

The present land use of the Palestina model area is estimated as follow: 45 % is for agricultural production, about 30 % is covered by forest; some 10 % is covered by bush and grass, and 15 % is covered by houses, roads and others.

(2) Cropping Pattern and Farming Practices

Maize, potato, and bean are the main crops planted in the Palestina model area. The present cropping pattern of main crops is as indicated below.



The common farming practices carried out by maize and potato farmers in the Palestina model area are described in Table 5.1.3 (1) in Annex-1.

(3) Agricultural Production

Agricultural production in the Palestina model area is summarized below.

Crop	Average Yield (qq per manzana)	Harvested Area (manzana)	Production (qq)
Maize	24	140	3,360
Potato	240	45	21,000 (twice)

(4) Livestock Raising

The majority of families in the Palestina model area are engaged in livestock and chicken production on a small scale; most families have 5 to 20 chickens, a few pigs, and 1 to 3 cows. Pigs and cows are kept in small spaces in the backyard of the house.

(5) Market System

The potato marketing system and its function are as shown in Figure 9. It is said that in Guatemala, there are over 30,000 dealers engaged in the marketing of agricultural produce. These dealers operate mainly in the collecting centers in producing areas, wholesale market in consuming areas, and engage in collection, assorting, packaging, transportation, brokerage and sales. Their functions in each stage of the above mentioned are explained in section 5.4.3 in Annex-1:

(6) Prices

In Palestina area, potato is harvested twice a year. Potato price lowers at the time of the first harvest in June to July and the second harvest in October to November. On the contrary, price rises in January to May, when the marketed quantity

decreases. The average farm gate prices for the past five years at Conception Chiquirichapa municipality near the Palestina area are as follows:

Harvest months	Name of Harvest	Farm gate price (Quetzales/quintal)
Jan. to Apr.	Off season	90-140
Jul. to Aug.	First harvest	45-70
Sep. to Oct.	Mid way	80-90
Oct. to Nov.	Second harvest	60-70

(7) Crop Budgets

Most farmers in the Palestina model area make very little investment for production of both potato and maize crops. The crop budget of potato and maize in the model area is summarized below. Inputs cost are only for fertilizers.

Crop	Cost of Inputs	Paid Labor Cost	Total Cost	Production	Selling Price	Gross Income
	(Q/manzana)	(Q/manzana)	(Q/manzana)	(qq/manzana)	(Q/qq)	(Q/manzana)
Potato	4,900	640	5,540	240	25	6,000
Maize	900	0	900	24	No	No

(8) Processing of Produce

There is no agricultural produce processing facility in Palestina and its vicinity. Presently, various processed foods including potato chips, fried potato, etc. are imported from U.S.A., Canada and Mexico in large quantity.

(9) Irrigation Systems

There is no irrigation system in the area.

5.4.4 Health and Sanitation

(1) Major health problems

The present health situation and major health problems in this area are shown below. In addition it seems that the problems of HIV/Aids are not yet recognized as serious health threat. It is reported that Mayan agricultural workers are at increasing risk for contacting HIV/Aids.

Morbidity causes at municipality level	1. Pneumonia 2. Common Cold 3. Intestinal parasitic diseases 4 Acute diarrhea 5 Tonsillitis
Infant mortality rate and causes at municipality level	39.40 (per 10,000 live births) 1. Bronchopneumonia (95%) 2. Anemia(5%)
Mortality causes at municipality level	1. Pneumonia(28%) 2. Intoxication for pesticide, Acute Myocardial Infarction, Diabetes
Maternal mortality rate and the causes at region level	132.51 (per 100,000 live births) 1. Post-delivery hemorrhage, 2. Eclampsia
Vaccination coverage for children under 1 years old at municipality level	BCG 70%, Polio 81%, DPT 81%, Measles 78%
Malnutrition prevalence	176th highest rate among 329 municipality of chronic malnutrition prevalence for school children
Delivery attended by	Not confirmed

Source: Memoria Annual de Viligancia 1999, Palestina de los Altos, MSPAS
Memoria Annual de Vigilancia 1999 Quetzaltenango MSPAS
Municipios Clasificados Segun Prevalencia de Desnuticion Cronica en Escolares de Guatemala

(2) Health related facilities, personnel and drug availability

The present conditions of health related facilities, personnel and drug availability and mayor problems are summarized below.

Health facilities and health personnel	1 Health Center(HC) and 3 Health Post(HP) 1 doctor, 1 professional nurse, 1 health inspector, 4 auxiliary nurses A private doctor at a pharmacy twice a week
Average number of patients a day(the month with largest number of patients)	HC-40-50 people(January to March) HP-15-40 people(January)
Referential point	Hospital in Quetzaltenango in principle
Distance and transportation to the health facilities	Palestina to Quetzaltenango: Red Cross Ambulance: 80Q daytime, 100Q night time Hiring the transportation:125Q Public transportation: 4Q Los Díaz to Palestina:40 minutes by walk Los Cabrera to Palestina:15 minutes by walk
Drug availability	5 private pharmacy and 1 municipality owned pharmacy in Palestina. Lack of drugs in public health facilities is significant.
Traditional and plant medicine	No traditional practitioner in these three villages Woman trained by Acordimam (NGO) comes to sell the plant medicine in Los Cabrera. Several kinds of plant available at the market. Cheaper than modern drugs. People often treat themselves by plant for common diseases.
Health guard	None
Health promoter	There used to be health promoters trained by CARE(3 in Los Díaz, 3 in Los Pérez, Los Cabrera-na) for water project, however since CARE left the area, the majority dropped out.
Comadronas	Los Díaz-1, Los Pérez-0, Los Lopez-1, Los Cabrera-2, Los Morales-2, Training suspended, some of them do not have basic equipment More than 60 comadronas exist in whole Palestina area
Health committee	It does not exist in Los Diaz, Los Cabrera , Los Perez
Basic health infrastructure (Water source, latrines).	Los Pérez-Half the population with tap water, all with latrines Los Díaz-Half the population with latrines Los Cabrera-n/a In total, 60% with water, 73% with latrines among 112 households
Family planning (FP)	Acceptability is as low as 15%. Contraceptive available at HC and HP free of charge. Women expect for more information.
Vaccination	Household vaccinators service by HP and HC every month
Reproductive health	Prenatal care available at HC and HP as well as by comadronas Majority of delivery attended by comadronas Anemia prevalent
Health seeking behavior	Generally to HC or HP, where drugs is not sufficient, then go to municipality pharmacy or private pharmacy
Other organizations implementing health activities	Intervida for school children and equipment for HC Red Cross for emergency transportation and first aid CARE already terminated their activities

5.4.5 Education Service Conditions

(1) Primary School

Within the Palestina area, there are three primary schools located at Los Diaz, Los Cabrera and Las Rosas in the outskirts of Loz Perez. It takes 5 to 20 minutes for the children to go to these schools by foot. The number of teachers in the three schools is as small as 5 in Los Diaz, 4 in Los Cabrera and 5 in Las Rosas. The problems for primary schools in the Palestina area are the prominently high dropout rate, especially for grades 4 and 5 at Las Rosas and Los Cabrera schools and for grades 2 and 3 grades at Los Diaz School. In the case of the primary school in Las Rosas, the total number of students is 174 of which 46 % are females. About 80% of the attendants drop out till the grade 6. Based on the results of interview of teachers that the main causes are assumed as summarized below:

(a) Opportunity Cost

As the students grow old, they play an important role in contributing to family's work and paid works to obtain cash income, which becomes one of the causes of drop-out.

(b) Migration to the Coastal Area

Migration to the south coast is common in the Palestina area. Many families with all members migrate to the south between April and December keeping them children out of education. In the south, the lack of school and the severe likely conditions often prevents the children from attending school.

(c) Others

Generally females in the community marry at the age of 16 to 17. When the attendants attain grade 5 to 6, some of them become more than 15 years old and married, which is another cause of drop-out. In this case, both parents and children sometime consider that receiving education services after marriage is not important.

In addition to the problem of drop-out of students, the number of teachers is insufficient and the terms of employment are unfavorable for teachers.

(2) Junior High School

There is no junior high school in the Palestina area. Those who want to attend junior high school have to go to Palestina de Los Altos. There was no strong and urgent demand for junior high school from parents. The number of classrooms and

educational materials is in shortage.

(3) Informal Education and Literacy Rate

In the Palestina area, CONALFA holds literacy classes. There are 75 participants to those classes in total.

5.4.6 Rural Infrastructure

In order to grasp general features of the rural infrastructure and the housing facilities in Pachum, a site survey on diffusion of infrastructure was conducted on 112 houses in the area and its results are shown in the following table.

Results of Ad-hoc Survey on Housing Facilities

	Water supply	Electric supply	Drainage	Toilet	Improved stove	Interviewee houses
Diffusion	60%	73%	22%	73%	70%	112 houses

- Drinking Water Supply System

There are 2 potable water supply systems in the Palestina area. One is called "Rural Portable Water System" and the other is "Urban Portable Water System". The Rural System covers all the project area and also the surrounding area. The Urban System was mainly constructed in order to supply water to the central settlement area of Palestina Municipality and only Los Cabrera and Los Morares communities, which are located beside the central settlement area, have water supply from the Urban System.

5.4.7 Environmental Conservation Sector

(1) Soil Erosion and Subsidence

(a) Los Pérez

The few existing forest areas in Los Pérez are found by 30%. Generally, there are no community forests. The forests consists mainly of young trees and to a extend by cypress and pine. Farmers have two or three cuerdas in their small forest areas but that is not enough for all the firewood they consume. The cultivation lands are inclined or in pending and are not provided with any structures for soil conservation, therefore they are easily eroded.

(b) Los Díaz

The forests that exist in the community are mostly composed of young trees and do not belong to the community. The lands have slopes varying from 20% to 90%. 65% of agricultural areas have slopes from 35% to 80%. A few lands

are inclined and since there is not any structure for soil conservation, they are easily eroded.

c) Sector I

Forests in the Sector I, do not belongs to the community, but are individual property. The young trees consisting predominantly of Aliso and, to aminimun extend, of cypress and pine. The current forest problem is that it does not guarantee a sufficient supply of firewood to satisfy the demands of the inhabitants. The land is used for agricultural production. Severe erosion is observed in steeply sloped lands and the soils are found quite degraded.

d) Los Cabrera/Molares

There are 2 forest areas. Generally they are not community forest. The forests are formed by young trees consisting of 40% of Aliso, 30% of cypress, and 30% of pine. Moderate to severe erosion is observed in steeply sloped lands and the soils are sound quite degraded.

(2) Water Contamination

Water taken from fountains, well, tanks and rivers for domestic use was investigated and tested. All samples except that of the river water show that unboiled water is unfit for drinking because of the presence of coliform and bacteria. The river water was no tested but it is considered unfit for drinking. Nitrate was detected from all the water samples.

In Palestina model area, farmers use a lot of agricultural chemicals. It has been reported that the farmers make an inadequate use of the pesticides, specially in the dosage, applying season, handling of leftovers and containers, which results in increased production cost, deficient plague control and risk of contamination and/or poisoning.

6 RESULT OF THE PARTICIPATORY SURVEY

6.1 Objectives

The participatory survey was conducted with the following objectives.

(1) To analyze the present condition of the community in the selected four micro-basins,

(2) To identify problems, needs, and potentials from the farmers' viewpoints , and

(3) To extract potential development approaches from the community members through participatory approach.

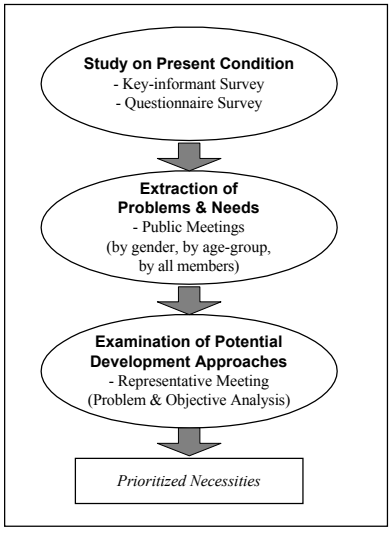
6.2 Methodology

To conduct the survey, local NGOs were used as the sub-contractors in consideration that they are more familiar with the community people in terms of working experience, cultural background, and local language. For the selection of NGOs, following criteria were taken into account.

(1) Working experience in the selected community or area nearby;

(2) Experience in participatory survey; and

(3) Expertise scope covering the fields of socio-economic development, infrastructure development, health and sanitation and environmental conservation



The survey itself was basically composed of three components, namely, "Study on present condition", "Extraction of problems and needs", and "Examination of potential development approaches". Firstly, overall view of the community was grasped through the key-informant survey and questionnaire survey. Then, problems and needs are extracted through a series of public meetings. During this stage, attention was also paid to gender-specific issues and age-specific issues, for example, decision making, job opportunity, access to education and so on. Lastly, examination of problems and potential development approaches was made among the community representatives by applying the Project Cycle Management Method (PCM). At the end of these activities, a final public

meeting was held for all community members in order to rank their necessities.

Practically, the survey was conducted in five steps shown below and the details are explained in Table 14.

Steps	Activities
1. Explanation of the survey	1) Public Meeting I (Plenary)
2. Study of present situation	1) Key-informants Survey, 2) Questionnaire Survey
3. Extraction of problems and needs	1) Public Meeting II (by Gender) 2) Public Meeting III (by Age-group) 3) Public Meeting IV (Plenary)
4. Investigation of problems, needs and potentials	1) Field Inspection, 2) Representative Meeting I (Problem Analysis)
5. Examination of potential development approaches	1) Representative Meeting II (Objective Analysis) 2) General Public Meeting V (Plenary)

6.3 People's Participation

(1) Overall Participation

The number of participants in the activities for each micro-cuenca is summarized below and details are shown in Table 15.

(person)

Activities	Xeatzán Bajo	Panyebar	Pachum	Palestina
a) Public Meeting I	240	160	70	190
b) Public Meeting II	220	178	80	195
c) Public Meeting III	290	172	39	153
d) Public Meeting IV	245	203	73	141
e) Public Meeting V	170	159	84	158
Average participation	233.0	174.4	67.2	167.4
Number of households	325 (212)	360 (206)	160 (68)	297 (222)
Participation Rate	71.7 % (109.9 %)	48.4 % (84.7 %)	42.0 % (98.8 %)	56.4 % (75.4 %)

Note 1: Number of households are obtained through the interview of the community representatives.

Note 2: Numbers in parenthesis are the data of FIS, 1994 and the participation rates in parentheses are the figures calculated with 1994 data.

Th average participation rate was roughly estimated by dividing the average number of participants by the total number of households in the communities.[1] Through this estimation, following points were observed.

1) Approximately half of the total households participated in all communities.

2) Assuming that the present number of households is correct, the highest rate of participation was observed in Xeatzán Bajo and lowest rate in Pachum. Reason for high participation in Xeatzán Bajo would be a) well-organized community and b) high enthusiasm for the community development. Low participation in Pachum would be due to a) business outside the community and b) conservativeness.

3) According to several interviews[2] to community members, major reasons for not participating in the activities are as follows.

a) Busy with their work

Some of the community members have to go out of the community for working. Because of this type of economic activity, they were not able to attend the meetings. This tendency was observed especially in Pachum and Palestina de Los Altos.

b) Religious reason

There are some religious extremists who show no interest in development activities. Those extreme sectors are often established among *evangelicos*. This case was observed in Panyebar and Palestina de Los Altos.

c) Doubt in survey activities

Some people mentioned their experience that past surveys did not realize any projects in their community. Therefore, those who think so do not show any interest in participating in survey activities. This answer was heard in Sector I of Palestina de Los Altos.

d) Conservativeness and insufficient communication about the activities

There are people who were not well informed about the survey activities. Because of this unsatisfactory communication, combined with people's conservativeness, people did not attend the survey activities. This tendency was observed especially in Pachum. It should be noted, however, that the number of participants had increased as the activities continued in Pachum. This indicates that people came to participate, as they understood the objectives and contents of the survey.

4) In the case of Pachum, because of improper date setting (Tuesday) and of heavy rain, the number of participants dropped to 39 persons in the public

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[1] It should be noted that these figures would be over estimation, since more than one member might have come from same households.

[2] NGOs tried to persuade those who do not participate and came across these answers. Comprehensive interview was not made to investigate the reason for non-participation.

meeting III.

(2) Participation of Women

The following table shows the percentage of women in the total number of participants in the series of public meetings.

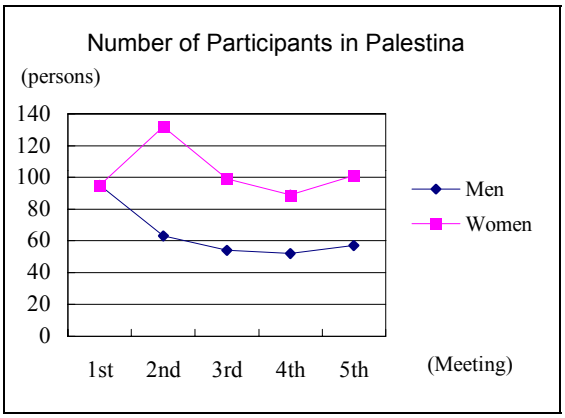
(persons)

	Xeatzan Bajo	Panyebar	Pachum	Palestina
Average number of female participants	101	80.6	25.4	103.2
Average total number of participants	233	174.4	69.2	167.4
Percentage of female participants	43.3 %	46.2 %	36.7 %	61.6 %

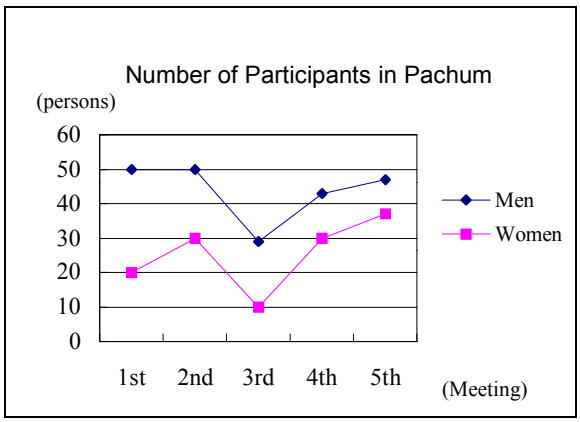
Regarding the percentage of women's participation in the survey activities, the following points can be stated.

1) Nearly 50 % of the participants were women except the case of Pachum.

2) The highest participation rate was observed in Palestina. In this area, many men often go to the coastal area for working. During their absence, they leave domestic matters to their spouses. Considering this fact, it is presumed that many women attended the meeting as a temporary representative of their households. As it is indicated in the figure shown here, the number of male participants decreased as the meeting proceeded, while the number of female participants did not change much.



3) In Pachum, the lowest percentage of women's participation was observed. This may be attributed to the conservativeness in the community. It should be noted, however, that the number of female participants had increased as the meeting proceeded. This fact implies that community members, especially men who usually are decision makers in their family, came to



understand, little by little, the usefulness of survey activities, and noticed the importance of participation for the community development. It can be said that this phenomenon is one of the positive side-effects of participation approach.

(3) Impact of Participatory Survey on People's Awareness

With the implementation of the participatory survey, impacts on people's awareness were observed in terms of 4 points explained below.

(a) Awareness on Community's Problem

By setting a place for discussion on community's problem, community people came to have broader idea regarding the problems of community as a whole. Through the problem analysis of Project Cycle Management (PCM) methodology, it was observed that some people in the representative meeting started to analyze community's problems through its cause-effect relation and try to find major causes for their severe living condition. Besides, through the direct discussion between community people and the study team (or NGO), people's attention came to be paid to the problems that they had not perceived before, such as water quality, heavy workload and so on.

(b) Intention for Participation

At the beginning of the participatory survey, people were generally skeptical about the activity and their attitude in the meeting was not active enough. Discussion among people was dominated by a little portion of participants and the attitude of the rest was passive. As the meeting was held several times, however, other people started to talk their opinions in the meeting, although the tendency was not so remarkable. In Palestina, the people who couldn't attend the meeting because of migration participated in the last meeting, and expressed their intention to participate in the projects with promising their participation in other future necessary activities. Those who couldn't attend the meeting at all asked their wife to attend the meeting to get the information of the meeting, that indicates strong intention for the development. In Xeatzan Bajo, it was observed that several participants were taking note during the representative meetings. Besides, in deciding irrigation beneficiaries, people discussed among themselves and proposed a solution by themselves. These movements indicate that their interest and intention to participate in projects were developed through the participation process of the survey.

(c) Gender

In the rural area where decision-makers are usually men, it is very difficult for

women to raise opinions in public meeting. With arranging meeting by gender, however, women got opportunities to talk freely and more opinions were raised from female participants. That situation helped to develop women's intention to participate in development projects.

Besides, as the public meeting proceeded, women came to raise opinion even in front of male participants. Especially in the case of Panyebar, discussion was made between male participants and female participants in deciding the priority of the approaches. This kind of situation would be a first step to more active discussion among the people regardless their gender. In addition, it should be noted that number of female participants increased through the 5 times of meetings in Pachum area where machismo is relatively strong and conservative. This tendency indicates remarkable impact of participatory approach from the gender points of view.

(d) Voluntary Action

There was a case that people took an action by themselves to improve their present condition in response to the direct discussion between community people and the study team. In Panyebar, collection rate of water charge had been quite low because of lack of beneficiaries' list. After the discussion with the study team, member of the water committee prepared beneficiaries' list and improved collection rate by themselves. It indicates the importance of direct contact between the study team and community people in a sense that stimulation from outside of the community brought about voluntary action of people for improvement of their present situation.

(e) Communication among People

The impacts on communication among people were observed both inside community and among communities.

Within a community, there are some people who usually have little communication with others because of geographical reason and/or social reason (such as religion). Although the chance of communication was not many, people got chances to talk each other. There is a religious group that did not participate in the public meetings in Panyebar. The people who belonged to other sectors of religion set a place for discussion and tried to persuade the group to participate in the meetings with instruction of NGO.

On the other hand, in Palestina, participatory survey provided a place for

discussion for the five communities. Because of this arrangement, people came to pay attention to the problem and constraints that affect communities as a whole.

The participatory survey was conducted within about 2 months. Although the drastic change was not observed because of its short survey period, it can be said that the participatory survey gives positive impact in terms of five points, (a) people's awareness on the problems for community as a whole, (b)intention to participate in project, (c)vitalization of women's activity, (d)voluntary action of community people, and (e)provision of a place for communication among people.

On the other hand, however, it has several disadvantage in conducting participatory survey within a short period. (a) There is a possibility of talking only with a small group of people who are easy to participate in the survey activity such as public meeting. (b) Sufficient follow-up cannot be made for the people who can not attend meetings for some reasons. And (c) it is difficult to spend sufficient time in order to reach consensus.

6.4 Survey Result

6.4.1 Xeatzán Bajo

(1) Gender-specific Problems

Through the gender-wise public meeting, the following points were observed as the gender-specific issues.

1) Basically, both male and females have same understanding on the problems of the community, especially on the infrastructure and living condition.

2) However, female participants focus more on living condition, health, and education, while male participants focus more on infrastructure related to income generation.

3) Female participants mentioned, as their specific problem, that *women have no opportunity for paid work*. And, therefore, they expressed strong intention for producing and marketing textile products.

4) In this community, decision making is usually done by mutual consultation between men and women.

(2) Age-specific Problems

In Xeatzán Bajo, participants were divided into three age groups, younger group (14~18 years old), middle group (19~49 years old) and older group (50 years old

and above). The result of public meeting showed the following points as age-specific issues.

1) No big difference was observed among their perception on problems and needs of the community for all age-groups.

2) It is observed, however, the people under 49 years old pay attention to diversification of their income sources, for instance, textile production, while those above 49 adhere to agricultural production.

3) People in the age-group of 14~18 years old expressed their strong expectation for education opportunity.

(3) Community-wise Problems and Potential Approach

Following are the major problems raised during the series of survey activities.

Category	Problems
1. Socio-economy	- Small land holding size - Deterioration of housing condition - Lack of capital - Limited area for housing - Secondary school is not available in the community - Lack of market for non-traditional work - No paid work for women.
2. Agriculture	- Low price of agricultural produce - Agricultural chemicals are expensive - Use of agro-chemical has increased. - Delay of payment for agricultural produce - Low quality of agro-chemicals - Intervention of middlemen in the market - Only limited crops are produced.
3. Infrastructure	- Lack of adequate drainage system - Lack of irrigation system - Roads are in poor condition.
4. Health & Sanitation	- There are no permanent medical staff and medicines.
5. Environment	- Deforestation - Contamination of rivers because of chemical use.

Based on the problems mentioned during the series of survey activities, a problem tree was prepared as shown in Figure 10[3]. Then, on the basis of the problem tree, an objective tree was prepared as shown in Figure 11 and potential approaches were elaborated. Among those approaches, following are the prioritized

[3] Original problem tree was prepared by the community representatives. Since there are many illogical leaps in the original tree, however, the revised tree was prepared by the Study Team.

potential approaches of the community.

Prioritized Potential Development Approaches for Xeatzán Bajo
1. Installation of mini-irrigation system
2. Diversification of crop and crop rotation
3. Formulation of cooperatives
4. Construction of storage and processing facilities for agricultural produce
5. Establishment of market for selling textile products
6. Vocational school for technical orientation on agriculture
7. Construction of drainage system
8. Paving road with asphalt

Note: Result of Public Meeting V, 28 August. 2000

6.4.2 Panyebar

(1) Gender-specific Problems

Following are the observed issues regarding gender in Panyebar.

1) Basically, both male and female have same understanding on the problems of the community, especially on the infrastructure and living condition.

2) However, women pay more attention to housing, education, and health condition, while men focus basically on agriculture, income generation, and environment.

3) Women mentioned that *they have too many children* as a problem that leads to smaller landholding and less care for children. Besides, *no job opportunity for women* was mentioned as gender issue.

4) During the meeting, it was told that decision making is done by mutual consultation between men and women. However, in several individual discussions, women expressed that the influence of men in decision making is still strong and it is not necessarily by mutual discussion.

5) Women expressed that they have less opportunity for education and, hence, less opportunity for job.

6) Regarding health condition, lack of health training for women before and after child birth was mentioned.

(2) Age-specific Problems

Participants were divided into 2 groups, those who are above 40 years old and those who are less than 40 years old. This grouping was made based on the information that people have to be under 40 years old in to obtain job outside the community and those who are older than 40 limit themselves to stay in the community. Following points are the major age-specific issues.

1) Both the younger group and older group have same perception on the problems in the community.

2) People in the younger group expressed that they have intention to continue agriculture. They think, however, that technical assistance on agriculture would be compulsory for their continuation.

3) People in the older group mentioned that, in the future, they would like to continue agriculture in the form of enterprise farm.

(3) Community-wise Problems and Potential Approach

Following are the major problems listed during the series of survey activities.

Category	Problems
1. Socio-economy	- Lack of capital for working - Lack of formal and informal education - Lack of job opportunity in the community - There is no job opportunity for women
2. Agriculture	- Agricultural credit is difficult to access - Lack of technical assistance for coffee and horticulture - Lack of storage, processing, commercialization facilities - Only limited markets are available. - Lack of fertilizer
3. Infrastructure	- Shortage of drinking water - Poor condition of road - Lack of drainage - Insufficient number of latrines
4. Health & Sanitation	- There is no permanent medical staff and medicines in health post - Lack of ambulance - Lack of health training program.
5. Environment	- Deforestation - Contamination of water and decrease of water resource volume- - No technical assistance is available on natural resource management. - Malnutrition

Based on the listed problems from the series of activities, a problem tree was prepared as shown in Figure 12. From this problem tree, an objective tree was prepared (Figure 13) and potential approaches were examined. Following are the potential approaches prioritized by community members.

Prioritized Potential Development Approaches for Panyebar
1. Installation of water supply system.
2. Credit assistance for agricultural activities and other productive activities.
3. Improvement of road from Panyebar to Santa Clara La Laguna.
4. Improvement of school facilities and utilization of the facility for vocational activity.
5. Provision of technical assistance on production of coffee, vegetables, and soil conservation.
6. Disposition of medical staff, medicines and transportation for patients in serious condition.
7. Establishment of community organization and its strengthening.
8. Implementation of mini-irrigation system.
9. Installation of infrastructure relating to environment such as treatment plant, latrine, and drainage.
10. Protection of water source to maintain available water volume.
11. Implementation of soil conservation program.
12. Implementation of environmental training program

Note: Result of Public Meeting V, 9 August 2000

6.4.3 Pachum

(1) Gender-specific Problems

Following are the observed issues regarding gender in Pachum.

1) Decision is made by men as the head of household. Influence of men in decision making is still strong in their community.

2) Regarding workload allocation, women are in charge of taking care of family, while men usually work as agricultural labor and as merchant outside the community. Women do not have job opportunity for paid work.

3) Women have less access to education compared to men, which leads to less job opportunity for women. Female participants mentioned that they have no opportunity for going out of the community. Among the participants in the Public Meeting II, there were only 2 women (out of 30 participants) who had ever been outside the community. This conservativeness on gender is one of the main causes hindering women from access to education and job opportunities.

(2) Age-specific Problems

In Pachum, people (men) go outside for working as merchants as long as they wants and there is no significant cutting-age in terms of their economic activity. On the other hand, there was information that people will be in a respected position in their family once he or she gets 30 years old and will have strong influence on decision making. Therefore, 30 years old was used as the criteria for division group. It should be noted, however, some women even don't know their own age. For those who do not know age, that her age was judged by appearance or her status whether she is grandmother or not.

1) Decision is usually made by influence of older generation both in family and in community.

2) From 14 years old up to 55 years old, men often work outside the community merchandizing clothes, agricultural products, and other daily goods. They can work as merchants upto the age of 55 years as far as they wish.

3) People of younger generation expressed that they think agriculture unprofitable and do not want to continue unless there is any improvement in profitability.

(3) Community-wise Problems and Potential Approach

Following are the major problems raised during the series of survey activities.

Category	Problems
1. Socio-economy	- Low income - Illiteracy, especially among women - Lack of job opportunity
2. Agriculture	- Low price of agricultural produce - Low production of agricultural produce - Lack of technical assistance for agriculture - Inappropriate application of agricultural technique - Lack of credit for agricultural activities and other activities - Low application of fertilizer to soils - Lack of recreation center
3. Infrastructure	- Poor road condition - Shortage of potable water supply - Poor condition of housing - Lack of latrines and drainage - Non-availability of improved stove - Households do not have proper place to store water - There is no community salon - School yard becomes muddy when it rains - Cemetery is located too far - There is no marketing place in the community. - Local shops do not have enough supply of goods
4. Health & Sanitation	- Malnutrition - High morbidity and mortality of infants - Little access to medical service and lack of medicine - Majority of midwives are not well-trained in terms of medical knowledge - Smoke of firewood affects their health condition
5. Environment	- Excessive consumption of firewood - Occurrence of forest fire - Deforestation - Accumulation of inorganic garbage

Based on the listed problems from the series of activities, a problem tree was prepared as shown in Figure 14. From this problem tree, an objective tree was prepared (Figure 15) and potential approaches were examined. Following are the potential approaches prioritized by community members.

Prioritized Potential Development Approaches for Pachum
1. Improvement and maintenance of road
2. Improvement of agriculture and livestock production
3. Health service program
4. Vocational training for non-agricultural work.
5. Improvement of infrastructure (potable water, electricity, improved stoves)
6. Improvement of amenity facilities (salon, telephone, grocery shop)
7. Improvement of environmental condition (forest management, treatment of garbage)

Note: Result of Public Meeting V, 30 August, 2000

6.4.4 Palestina de Los Altos

The selected micro-cuenca in Palestina de Los Altos is composed of several communities. For conducting survey, communities were divided into 3 groups as shown below.

Group	Community
Group 1	Los Perez
Group 2	Los Diaz & Sector I
Group 3	Los Cabrera & Morales

(1) Gender-specific Problems

Following are the observed issues regarding gender in Palestina.

1) Although significant difference was not observed regarding the perception on problems for each gender, it seems that male's interest goes more to agriculture while female's attention is paid more to health and housing issues.

2) It is still men-dominated society and it is men who usually make decision in family and in the community. However, during the absence of husbands, women will be in charge of domestic matters.

3) Men usually go to coastal area or USA for working. Women expressed their worry about disintegration of their family because of frequent migration.

4) There is little job opportunity for both men and women in the community. Especially for women, finding paid work inside the community is quite difficult .

5) Regarding access to education, women have less opportunity for studying

and, as the result, many of them are illiterate. This could be one of the reasons for the lack of job opportunity for women.

6) In addition, the following issues are mentioned as the problems relating to gender.

- Households in the community have too many children.
- There are many teenage single-mothers.
- Alcoholism of men and domestic violence.

(2) Problems perceived by age-group

Participants were divided into two groups, those who are above 30 years old and those who are below 30, based on the information that job opportunity will be less once they get 30 years old.

1) Both the younger group and older group have same perception on the problems in the communities.

2) Regarding decision making, usually men around 30 to 45 years old make decision among the family.

3) Men under 30 years old have job opportunity in and near the community as agricultural labor, casual worker and so on. Outside the community usually get job in coastal area or U.S.A. Those above 30 years old, they usually work in the community as agricultural paid worker and/or work in their own farmland.

4) For women under 30 years old, although it is not much, they have job opportunity as paid housekeeper near the community. On the other hand, those who are above 30 years have almost no opportunity as paid worker and usually become housewife.

(3) Community-wise Problems and Potential Approach

Following are the major problems of the micro-cuenca raised by community members during the series of survey activities.

Category	Problems for 3 groups of communities
1. Socio-economy	- Lack of job opportunity - Low income - Emigration to coastal area or U.S.A. - Little access to education
2. Agriculture	- Lack of agricultural land - Lack of credit assistance - Lack of technical assistance on agriculture and livestock raising - Low price of agricultural products - Non-existence of market channel - Lack of irrigation - Cultivation is not diversified. - Lack of market for potato production - Drainage is not installed.
3. Infrastructure	- Poor road condition - Network of potable water is not sufficient - Electricity supply is not sufficient
4. Health & Sanitation	- Lack of health post in the community - Little access to medicines. - Shortage of potable water - Lack of medical service - Lack of health program for training - No assistance in primal health care
5. Environment	- Deforestation - Low fertility of soil - Little technical assistance for soil conservation - There is no communal forest. - Few water spring in the community - Inadequate use of agro-chemical

Based on the result mentioned above, a problem tree and an objective tree with potential approaches were prepared for the whole micro-cuenca to grasp the holistic view as shown in Figure 16. Then, based on the problem tree, an objective tree was prepared as shown in Figure 17 and potential approaches were elaborated. Following are the prioritized potential approaches of the communities.

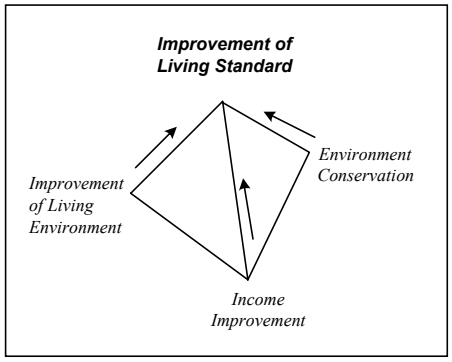
Prioritized Potential Development Approaches for Palestina		
Los Perez	Los Diaz/Sector I	Los Cabrera/Morales
1. Technical assistance for agriculture	1. Technical assistance for agriculture	1. Technical assistance for agriculture
2. Introduction of improved seeds for production	2. Mini-irrigation system	2. Agricultural credit
3. Agricultural credit	3. Agricultural credit	3. Commercialization of agricultural produce
4. Commercialization of agricultural product	4. Commercialization of agricultural produce	4. Mini irrigation system
5. Rehabilitation of water tank for washing clothes	5. Paving road with asphalt	5. Paving road with asphalt
6. Paving road with asphalt	6. Installation of health post	6. Improvement of school facilities
7. Mini-irrigation	7. Installation of potable water supply system	7. Vocational training for productive activities
8. Installation of health post	8. Provision of medical service	8. Strengthening community organization
9. Health training program	9. Establishment of communal pharmacy	9. Education program
10. Disposition of medical staff and medicine	10. Health education program	10. Installation of health post
11. Strengthening community organization	11. Strengthening community organization	11. Medical assistance
12. Vocational training for productive activities	12. Vocational training for productive activities	12. Establishment of communal pharmacy
13. Education program	13. Education program	13. Training on management of agro-chemicals.
14. Forest management	14. Adequate management of agro-chemicals	14. Soil conservation
15. Soil conservation	15. Soil conservation	15. Adequate forest management
16. Management of agro-chemicals	16. Reforestation	

Note: Results of Public Meeting V: Los Perez: 11 September, 2000,
Los Diaz/Sector I: 12 September 2000,
Los Cabrera/Morales : 13 September, 2000

7. SUSTAINABLE RURAL DEVELOPMENT PLANS FOR THE REDUCTION OF POVERTY

7.1 Basic Development Concept

(1) Basic Concept



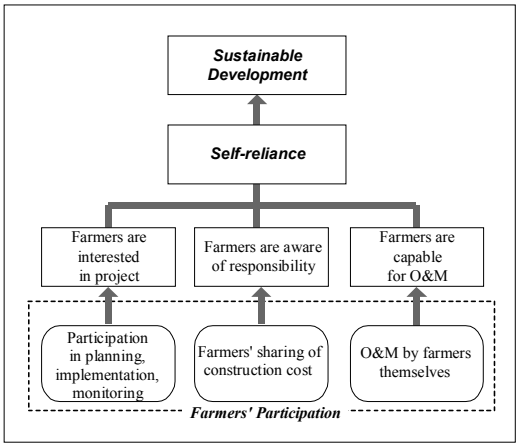
The living standards in the selected four micro-basins are still low in all aspects. Hence, it is necessary to improve the living standards from three aspects, a) Improvement of income level, b) Upgrading the living environment, and c) Conservation of natural resource. These three aspects have to be approached simultaneously, because approaching only one aspect will not be sustainable. Take the case of water supply system as example, construction of the system will improve the living environment. However, if people do not have enough income to pay water charge, necessary maintenance and repair cannot be made and, soon or later, the system will be unusable. On the other hand, if no attention is paid to water quality or forest (which is a requisite for keeping water in soil), the amount of available drinking water would be affected. Therefore, it is necessary to combine these three approaches as one package for upgrading of the living standards.

(2) Farmers' Participation

Aside from the concept of development approaches, "farmers' participation" is another important factor for the improvement of living standards, since sustainability will not be attained without farmers' participation. The basic concept for farmers' participation consists of following three components.

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

Sustainability will be attained by farmers' awareness of self-reliance, which can be achieved when farmers are a) interested in the project, b) aware of their responsibility and c) capable of operating and maintaining the project structures by themselves. Farmers will be interested in a project when it matches their needs. Then, their interest would be developed by being one of the members of the team for project implementation. Practically, farmers can participate in the construction of facilities or in the process of organization establishment, etc.



Awareness of responsibility would be developed by sharing necessary cost. For example, by paying a certain amount of cost for construction of a facility, people will inevitably pay attention to the facility. If it is not utilized, people will try to find a way to utilize it since there is investment from them. Therefore sharing cost will be necessary to give people a kind of responsibility. Cost sharing could be made by paying cash, by offering materials, or offering his/her labor force.

Besides, it is compulsory for farmers to operate and maintain the system or organization by themselves in order to be capable of managing it without relying on others. Therefore, participation in operation and maintenance from the first stage, i.e. the stage when technical assistance is easily available, is quite important.

Through these activities, farmer will develop an awareness of self-reliance and, ultimately, achieve take-off for sustainable development process.

(3) Gender Equality

The importance of gender equality should be underlined in rural development, especially in a male-dominated society such as Guatemala's, and special attention for it should be paid through over the study period. For instance, the opinions of women in terms of gender-specific issues should be obtained through the exclusive gender meetings for women, and be reflected on the overall rural development plans so as not to generate negative impacts toward women. And the development approaches (project components) which orient women's direct benefits, i.e. a plan for improved stoves, a hand weaving project, layer-chicken

project, and so on, should be taken into consideration for formulation of the development plans.

7.2 Needs and Approach to the Development

Through the series of participatory survey activities, the needs of communities were extracted as summarized in the following table.

Aspect	Needs
Income generation	*Agriculture* • Technical assistance on farming practice • Mini-irrigation system • Commercialization of produce • Direct marketing • Storage and processing facilities • Establishment of organization or cooperation • Credit assistance *Non-agriculture* • Vocational training for non-agricultural work such as textile production, handicrafts, carpentry, and so on. • Credit assistance
Living condition	*Education* • Improvement of school facility • Provision of formal and informal education *Infrastructure* • Improvement of road condition • Installation of potable water supply system • Enhancement of electricity supply system • Construction of drainage • Installation of improved stove *Health* • Establishment of health post/unit with permanent staff and sufficient medicines • Betterment of nutrition condition • Promotion of health program • Provision of emergency transportation (ambulance)
Environment	• Proper management of forest • Reduction of firewood use • Proper use of agro-chemicals to avoid contamination • Conservation of soil fertility • Proper treatment of inorganic garbage

Considering these needs, it can be said that the living standards in the selected micro-basin are low in all aspects and people have a strong desire to improve the situation. However, from the needs presented here and the behavior of community people during the participatory survey, it is necessary to consider the following points.

(1) Shortsighted view
People in the communities are basically thinking about short-term return, and attention is less paid to long-term effect on living condition. Therefore, their focus tends to concentrate on facilities such as "*construction of irrigation system*", "*construction of water supply system*" and so on. Because of this tendency, less attention was paid to long term improvement such as environmental issues and educational issues.

(2) Imperfect understanding of the project
As it is mentioned above, farmers' focus is concentrated on *getting facilities*, and less attention is paid to the *after-project stage*. Accordingly, the sustainability of the project will be doubtful when it comes to the operation stage, especially on maintenance of the facilities, collection of fee, or repayment of loan. Therefore, it would be necessary to develop people's understanding on the operation stage rather than just giving what they need. Also, though restoration of the sledded lands and severely eroded lands is a very important factor for conservation of the environment and agricultural production in the long run, they perceive that these facts are less important.

(3) Limited perception of the living condition
Since they are already accustomed to their present living condition, sometimes they don't notice what kind of needs they actually have. In the community, for example, farmers have to transport firewood by shouldering, which is quite a heavy workload for people especially for women and children. However, since they take it as usual daily work, they do not think it needs improvement. In this context, it would be necessary to give some another perception to the farmers. Similarly they could not make proper assessment of the quality of drinking water even if bacteria and coliform contaminate drinking water. Also they don't make proper assessment of improved sauna baths system to be introduced for great reduction of firewood because the preset system of sauna baths is good and is not necessary to be improved.

(4) Lack of technical knowledge
Needless to say, farmers do not have technical knowledge for realization of projects. Because of this, farmers cannot come up with concrete idea for development approach. People have only a vague idea on what should be done but do not have a clear idea on what kind of project components to be implemented. In line with this, assistance from technical viewpoints would be necessary.

Basically, the development plan and community needs must be matched with each other. Based on the needs (approach to the development) of communities and the above 4considerations to be taken into account in development, possible alternative approaches for the development of the model areas and their expected impact were prepared as shown in the following table.

No / Alternative approaches (project component)		Name of model areas[1)]				Impact[2)]		
		Xeatzán Bajo (Chimaltenango)	Panyebar (Sololá)	Pachum (Totonicapán)	Palestina (Quezaltenango)	Environmental Conservation	Increase of Imcome	Improvement living condition
Environmental and Conservation Plan								
a-1	Restoration plan for the collapsed lands	×	×	○	×	1	2	3
a-2	Soil conservation plan for steep farm lands	○	○	○	○	2	1	3
a-3	Reforestation plan	○	○	○	○	2	2	3
a-4	Agro-forestry development plan	○	○	○	○	2	1	3
a-5	Management plan of water quality	○	○	○	○	1	2	3
a-6	Solid wastes treatment plan	○	○	○	○	1	2	3
Plans for Increasing Income Generation								
b-1	Plan for making composts	○	○	○	○	3	2	2
b-2	Plan of model farm on potato production	×	×	×	○	3	1	2
b-3	Potato storage plan	×	×	×	○	3	1	1
b-4	Potato processing plan	×	×	×	○	3	1	1
b-5	Mini-irrigation plan	○	○	○	○	3	1	1
b-6	Layer-chicken raising plan for women's group	○	○	○	○	3	1	1
b-7	Coffee production improvement plan	×	○	×	×	3	1	1
b-8	Coffee processing plan	×	○	×	×	3	1	1
b-9	Agro-processing development plan	○	×	×	×	3	1	1
b-10	Plan of direct sale of vegetables	○	×	×	×	3	1	1
b-11	Improvement plan for maize thrashing	○	○	○	○	3	1	1
b-12	Institutional plan for fostering nucleus farmers	○	○	○	○	3	1	2
b-13	Plan of revolving fund for hand weaving thread	○	○	○	○	3	1	1
Improvement plan for living environments								
c-1	Rehabilitation plan of reads in the village	○	○	○	○	2	3	1
c-2	Rehabilitation plan of regional roads	○	○	○	○	2	3	1
c-3	Plan of rural electricity	○	○	○	○	2	3	1
c-4	Rehabilitation plan for drinking water system	○	○	○	○	1	3	1
c-5	Water quality improvement plan for the existing drinking water supply	○	○	○	○	1	3	1
c-6	Plan of extension use of improved cooking stoves and of sauna bath "Temascal"	○	○	○	○	1	3	2
c-7	Plan of provision toilette facilities	○	○	○	○	1	3	1
c-8	Plan of night time health education	○	○	○	○	1	3	1
c-9	Plan medicine growing plan	○	○	○	○	1	3	1
c-10	Improvement plan of service quality given to comadronas	○	○	○	○	1	3	1
c-11	Plan for installation of minimal pharmacy unit (MPU)	○	○	○	×	1	3	1
c-12	Municipality community health activity plan	×	×	×	○	1	3	1
c-13	Plan for migrant people to the coastal areas	×	×	×	○	1	3	1
c-14	Coffee processing plan for workload reduction in mountainous area	×	○	×	×	2	3	2
	Total number of possible alternative approach in the model area	24	25	23	26			

Remarks: 1) ○: there is a possible alternative approach ×: there is not possible alternative approach
2) 3: High degree of impact is expected
2: Some degree of impact is expected as its secondary effect
1: Very little impact or no impact is expected

7.3 Development Plan

7.3.1 Criteria for Selection of Project Components

In section 7.2, 24 possible approaches to the development (project component)

were clarified for Xeatzán Bajo, 25 for Panyebar, 23 for Pachum and 26 for Palestina. In order to formulate the optimum development plans for the model areas, these possible approaches (project components) in each model area were assessed from the three factors:

(1) Degree of farmers' desire and perception for implementation of projects;

(2) Degree of contribution to reduction of poverty by implementation of projects; and

(3) Possibility of materialization of project in view of capability of farmers

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

Evaluation factor	Grade	Description	Point	Weighted point (*2)
Degree of farmers' perception	1	No(there is no perception according to the participatory survey results)	1	0.4
	2	Strong (less than 6th rank of prioritized development approaches in the participatory survey results)	2	0.8
	3	Very strong (1st-5th ranks of prioritized development approaches in the participatory survey results)	3	1.2
Degree of contribution to poverty reduction (*1)	1	Small (contribution to poverty reduction is small)	1	0.4
	2	Medium (contribution to poverty reduction is indirect and/or partial)	2	0.8
	3	Large (contribution to poverty reduction is direct and large)	3	1.2
Possibility of materialization	1	Low (no organization at present, considerable time necessary for setting up of organization)	1	0.2
	2	Medium (though there is no organization at present, an early setting up organization can be expected due to high capability and intention of farmers)	2	0.4
	3	High (There is farmer's organization (s) at preset that can be used for early implementation of projects)	3	0.8

(*1): The degree of contribution for poverty reduction is graded considering 3 viewpoints, environmental conservation, income increase and improvement of living condition.

(*2): weighted points are calculated based on the following assumption.

Item	Weight (%)
Degree of farmers' perception	40
Degree of contribution to poverty reduction	40
Possibility of materialization	20

The total weighted points evaluated by the three evaluation factors assess the possible approaches (project components) in each model area. In this study, the possible approaches (project components) that have more than 2.0 points were adopted as project components for rural development plans in the model area.

7.3.2 Xeatzán Bajo Model Area

The results of evaluation are shown below; according to which eleven approaches (project components) were selected. As mentioned previously, the rural development for the Xeatzán Bajo model area should be formulated for upgrading the living standards from three aspects, a) improvement of income level, b) upgrading the living environment and c) conservation of natural resources. Then these project components should be taken up as one package for rural development in the Xeatzán Bajo model area. Project design matrixes of each project component are shown in the attachment -PDM.

No	Alternative Approaches (project components)	Farmers' perception	Contribu-tion to poverty reduction	Possibility of materiali-zation	Total points	Adoption
	Environmental and Conservation Plan					
a-2	Soil conservation plan for steep farm lands	1,(0.4)*	2,(0.8)	2,(0.4)	1.6	
a-3	**Reforestation plan**	**1,(0.4)**	**3,(1.2)**	**2,(0.4)**	**2.0**	○
a-4	Agro-forestry development plan	1,(0.4)	2,(0.8)	2,(0.4)	1.6	
a-5	Management plan of water quality	1,(0.4)	2,(0.8)	2,(0.4)	1.6	
a-6	Solid wastes treatment plan	1,(0.4)	2,(0.8)	1,(0.2)	1.4	
	Plan for increasing income generation					
b-1	**Plan for making composts**	**1,(0.4)**	**3,(1.2)**	**2,(0.4)**	**2.0**	○
b-5	**Mini-irrigation plan**	**3,(1.2)**	**3,(1.2)**	**2,(0.4)**	**2.8**	○
b-6	Layer-chicken raising plan for women's group	1,(0.4)	2,(0.8)	2,(0.4)	1.6	
b-9	**Agro-processing development plan**	**3,(1.2)**	**3,(1.2)**	**1,(0.2)**	**2.6**	○
b-10	**Plan of direct sale of vegetables**	**2,(0.8)**	**3,(1.2)**	**1,(0.2)**	**2.2**	○
b-11	Improvement plan for maize thrashing	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
b-12	**Institutional plan for fostering nucleus farmers**	**1,(0.4)**	**3,(1.2)**	**2,(0.4)**	**2.0**	○
b-13	**Plan of revolving fund for hand weaving thread**	**3,(1.2)**	**3,(1.2)**	**2,(0.4)**	**2.8**	○
	Improvement plan for living environments					
c-1	**Rehabilitation plan of reads in the village**	**3,(1.2)**	**2,(0.8)**	**2,(0.4)**	**2.4**	○
c-2	**Rehabilitation plan of regional roads**	**3,(1.2)**	**2,(0.8)**	**2,(0.4)**	**2.4**	○
c-3	Plan of rural electricity	1,(0.4)	2,(0.8)	2,(0.4)	1.6	
c-4	Rehabilitation plan for drinking water system	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
c-5	**Water quality improvement plan for the existing drinking water supply**	**1,(0.4)**	**3,(1.2)**	**3,(0.6)**	**2.2**	○
c-6	Plan of extension use of improved cooking stoves and of sauna bath "Temascal"	1,(0.4)	2,(0.8)	2,(0.4)	1.6	
c-7	Plan of provision toilette facilities	1,(0.4)	2,(0.8)	2,(0.4)	1.6	
c-8	Plan of night time health education	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
c-9	Plan medicine growing plan	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
c-10	Improvement plan of service quality given to comadronas	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
c-11	**Plan for installation of minimal pharmacy unit (MPU)**	**1,(0.4)**	**3,(1.2)**	**3,(0.6)**	**2.2**	○

Remark: (*): 1 means grade 1 and 0.4 (1x0.4) is weighted point.

7.3.3 Panyebar Model Area

The results of evaluation are shown below; according to which fourteen approaches (project components) were selected. As mentioned previously, the rural development for the Panyebar model area should be formulated for upgrading the living standards from three aspects, a) improvement of income level,

b) upgrading the living environment and c) conservation of natural resources. Then these project components should be taken up as one package for rural development in the Panyebar model area. Project design matrixes of each project component are shown in the Attachment of PDM.

No	Alternative Approaches (Project components)	Farmer's perception	Contribu-tion to poverty reduction	Possibility of materiali-zation	Total points	Adoption
	Environmental and Conservation Plan					
a-2	**Soil conservation plan for steep farm lands**	**2,(0.8)***	**2,(0.8)**	**2,(0.4)**	**2.0**	○
a-3	**Reforestation plan**	**2,(0.8)**	**3,(1.2)**	**2,(0.4)**	**2.4**	○
a-4	**Agro-forestry development plan**	**2,(0.8)**	**3,(1.2)**	**2,(0.4)**	**2.4**	○
a-5	Management plan of water quality	1,(0.4)	2,(0.8)	1,(0.2)	1.4	
a-6	Solid wastes treatment plan	1,(0.4)	2,(0.8)	1,(0.2)	1.4	
	Plan for increasing income generation					
b-1	**Plan for making composts**	**2,(0.8)**	**3,(1.2)**	**2,(0.4)**	**2.4**	○
b-5	Mini-irrigation plan	2,(0.8)	2,(0.8)	1,(0.2)	1.8	
b-6	**Layer-chicken raising plan for women's group**	**3,(1.2)**	**2,(0.8)**	**2,(0.4)**	**2.4**	○
b-7	**Coffee production improvement plan**	**3,(1.2)**	**3,(1.2)**	**2,(0.4)**	**2.8**	○
b-8	**Coffee processing plan**	**3,(1.2)**	**3,(1.2)**	**2,(0.4)**	**2.8**	○
b-11	Improvement plan for maize thrashing	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
b-12	**Institutional plan for fostering nucleus farmers**	**2,(0.8)**	**3,(1.2)**	**2,(0.4)**	**2.4**	○
b-13	Plan of revolving fund for hand weaving thread	1,(0.4)	2,(0.8)	1,(0.2)	1.4	
	Improvement plan for living environments					
c-1	Rehabilitation plan of reads in the village	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
c-2	**Rehabilitation plan of regional roads**	**3,(1.2)**	**2,(0.8)**	**3,(0.6)**	**2.6**	○
c-3	Plan of rural electricity	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
c-4	**Rehabilitation plan for drinking water system**	**3,(0.4)**	**3,(1.2)**	**3,(0.6)**	**3.0**	○
c-5	**Water quality improvement plan for the existing drinking water supply**	**1,(0.4)**	**3,(1.2)**	**3,(0.6)**	**2.2**	○
c-6	Plan of extension use of improved cooking stoves and of sauna bath "Temascal"	1,(0.4)	1,(0.4)	2,(0.4)	1.2	
c-7	Plan of provision toilette facilities	2,(0.8)	1,(0.4)	3,(0.6)	1.8	
c-8	Plan of night time health education	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
c-9	**Plan medicine growing plan**	**2,(0.8)**	**3,(1.2)**	**3,(0.6)**	**2.6**	○
c-10	Improvement plan of service quality given to comadronas	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
c-11	**Plan for installation of minimal pharmacy unit (MPU)**	**2,(0.8)**	**2,(0.8)**	**3,(0.6)**	**2.2**	○
c-14	**Coffee processing plan for workload reduction in mountainous area**	**1,(0.4)**	**3,(1.2)**	**2,(0.4)**	**2.0**	○

Remark: (*): 1 means grade 1 and 0.4 (1x0.4) is weighted point.

7.3.4 Pachum Model Area

The results of evaluation are shown below; according to which sixteen approaches (project components) were selected. As mentioned previously, the rural development for the Panyebar model area should be formulated for upgrading the living standards from three aspects, a) improvement of income level, b) upgrading the living environment, and c) conservation of natural resources. Then these project components should be taken up as one package for rural development in the Panyebar model area. Project design matrixes of each project component are

shown in the Attachment-PDM.

No	Alternative Approaches (Project components)	Farmer's perception	Contribu-tion to poverty reduction	Possibility of materiali-zation	Total points	Adoption
	Environmental and Conservation Plan					
a-1	**Restoration plan of the collapsed lands**	**2,(0.8)***	**2,(0.8)**	**2,(0.4)**	**2.0**	○
a-2	**Soil conservation plan for steep farm lands**	**2,(0.8)**	**2,(0.8)**	**2,(0.4)**	**2.0**	○
a-3	**Reforestation plan**	**2,(0.8)**	**3,(1.2)**	**2,(04)**	**2.4**	○
a-4	**Agro-forestry development plan**	**2,(0.8)**	**3,(1.2)**	**2,(0.4)**	**2.4**	○
a-5	Management plan of water quality	2,(0.8)	1,(0.4)	1,(0.2)	1.4	
a-6	Solid wastes treatment plan	2,(0.8)	2,(0.8)	1,(0.2)	1.8	
	Plan for increasing income generation					
b-1	Plan for making composts	1,(0.4)	3,(1.2)	1,(0.2)	1.8	
b-5	**Mini-irrigation plan**	**3,(1.2)**	**3,(1.2)**	**1,(0.2)**	**2.6**	○
b-6	**Layer-chicken raising plan for women's group**	**3,(1.2)**	**3,(1.2)**	**2,(0.4)**	**2.8**	○
b-11	Improvement plan for maize thrashing	1,(0.4)	2,(0.8)	3,(1.2)	1.8	
b-12	**Institutional plan for fostering nucleus farmers**	**3,(1.2)**	**3,(1.2)**	**2,(0.4)**	**2.8**	○
b-13	Plan of revolving fund for hand weaving thread	1,(0.4)	2,(0.8)	1,(0.2)	1.4	
	Improvement plan for living environments					
c-1	**Rehabilitation plan of reads in the village**	**3,(1.2)**	**3,(1.2)**	**3,(0.6)**	**3.0**	○
c-2	**Rehabilitation plan of regional roads**	**3,(1.2)**	**3,(1.2)**	**3,(0.6)**	**3.0**	○
c-3	**Plan of rural electricity**	**2,(0.8)**	**3,(1.2)**	**2,(0.4)**	**2.4**	○
c-4	Rehabilitation plan for drinking water system	2,(0.8)	1,(0.4)	3,(0.6)	1.8	
c-5	**Water quality improvement plan for the existing drinking water supply**	**1,(0.4)**	**3,(1.2)**	**3,(0.6)**	**2.2**	○
c-6	**Plan of extension use of improved cooking stoves and of sauna bath "Temascal"**	**2,(0.8)**	**3,(1.2)**	**3,(0.6)**	**2.6**	○
c-7	**Plan of provision toilette facilities**	**2,(0.8)**	**2,(0.8)**	**3,(0.6)**	**2.2**	○
c-8	**Plan of night time health education**	**3,(1.2)**	**2,(0.8)**	**3,(0.6)**	**2.6**	○
c-9	Plan medicine growing plan	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
c-10	**Improvement plan of service quality given to comadronas**	**3,(1.2)**	**2,(0.8)**	**3,(0.6)**	**2.6**	○
c-11	**Plan for installation of minimal pharmacy unit (MPU)**	**3,(1.2)**	**3,(1.2)**	**3,(0.6)**	**3.0**	○

Remark: (*): 1 means grade 1 and 0.4 (1x0.4) is weighted point.

7.3.5 Palestina Model Area

The results of evaluation are shown below; according to which eighteen approaches (project components) were selected. As mentioned previously, the rural development for the Palestina model area should be formulated for upgrading the living standards from three aspects, a) improvement of income level, b) upgrading the living environment and c) conservation of natural resources. Then these project components should taken up as one package for rural development in the Palestina model area. Project design matrixes of each project component are shown in the Attachment-PDM.

No	Alternative Approaches (Project components)	Farmer's perception	Contribu-tion to poverty reduction	Possibility of materiali-zation	Total points	Adoption
	Environmental and Conservation Plan					
a-2	Soil conservation plan for steep farm lands	2,(0.8)*	2,(0.8)	2,(0.4)	2.0	○
a-3	Reforestation plan	2,(0.8)	2,(0.8)	2,(0.4)	2.0	○
a-4	Agro-forestry development plan	2,(0.8)	2,(0.8)	1,(0.2)	1.8	
a-5	Management plan of water quality	2,(0.4)	3,(1.2)	1,(0.2)	2.2	○
a-6	Solid wastes treatment plan	1,(0.4)	3,(1.2)	2,(0.2)	2.0	○
	Plan for increasing income generation					
b-1	Plan for making composts	1,(0.4)	3,(1.2)	2,(0.4)	2.0	○
b-2	Plan of model farm on potato production	3,(1.2)	3,(1.2)	2,(0.4)	2.8	○
b-3	Potato storage plan	3,(1.2)	3,(1.2)	2,(0.4)	2.8	○
b-4	Potato processing plan	3,(1.2)	3,(1.2)	1,(0.2)	2.2	○
b-5	Mini-irrigation plan	3,(1.2)	3,(1.2)	2,(0.4)	2.8	○
b-6	Layer-chicken raising plan for women's group	1,(0.4)	3,(1.2)	2,(0.4)	2.0	○
b-11	Improvement plan for maize thrashing	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
b-12	Institutional plan for fostering nucleus farmers	3,(1.2)	3,(1.2)	2,(0.4)	2.8	○
b-13	Plan of revolving fund for hand weaving thread	1,(0.4)	2,(0.8)	2,(0.2)	1.6	
	Improvement plan for living environments					
c-1	Rehabilitation plan of reads in the village	3,(1.2)	2,(0.8)	2,(0.4)	2.4	○
c-2	Rehabilitation plan of regional roads	1,(0.4)	1,(0.4)	1,(0.2)	1.0	
c-3	Plan of rural electricity	1,(0.4)	2,(0.8)	1,(0.2)	1.4	
c-4	Rehabilitation plan for drinking water system	2,(0.4)	3,(1.2)	3,(0.6)	2.2	○
c-5	Water quality improvement plan for the existing drinking water supply	1,(0.4)	3,(1.2)	3,(0.6)	2.2	○
c-6	Plan of extension use of improved cooking stoves and of sauna bath "Temascal"	1,(0.4)	2,(0.8)	2,(0.4)	1.6	
c-7	Plan of provision toilette facilities	1,(0.4)	2,(0.8)	3,(0.6)	1.8	
c-8	Plan of night time health education	2,(0.8)	2,(0.8)	3,(0.6)	2.2	○
c-9	Plan medicine growing plan	1,(0.8)	2,(0.8)	3,(0.6)	1.8	
c-10	Improvement plan of service quality given to comadronas	2,(0.8)	2,(0.8)	3,(0.6)	2.2	○
c-12	Municipality community health activity plan	2,(0.8)	3,(1.2)	3,(0.6)	2.6	○
c-13	Plan for migrant people to the coastal areas	2,(0.8)	3,(1.2)	3,(0.6)	2.6	○

Remark: (*): 1 means grade 1 and 0.4 (1x0.4) is weighted point

7.4. Organization and Implementation for Rural Development

7.4.1 Basic Concept

Implementation of the project on the sustainable rural development for the reduction of poverty was studied for the whole area of 4 provinces with a total area of 6,000 km^2.

Though the objective areas are as large as 6,000 km^2, priority for project development should be given to the poor micro-basins that are classified as extreme poverty (a), severe poverty (b) and regular poverty (c) defined by FIS.

The formulated rural development projects in 4 model areas were 59 in total. These cover various development fields for (i) environmental and conservation (6 kinds), (ii) increasing income generation (13 kinds), and (iii) improvement for living conditions (14 kinds). It was planned that these types of the projects would

be applied to the four provinces as much as possible.

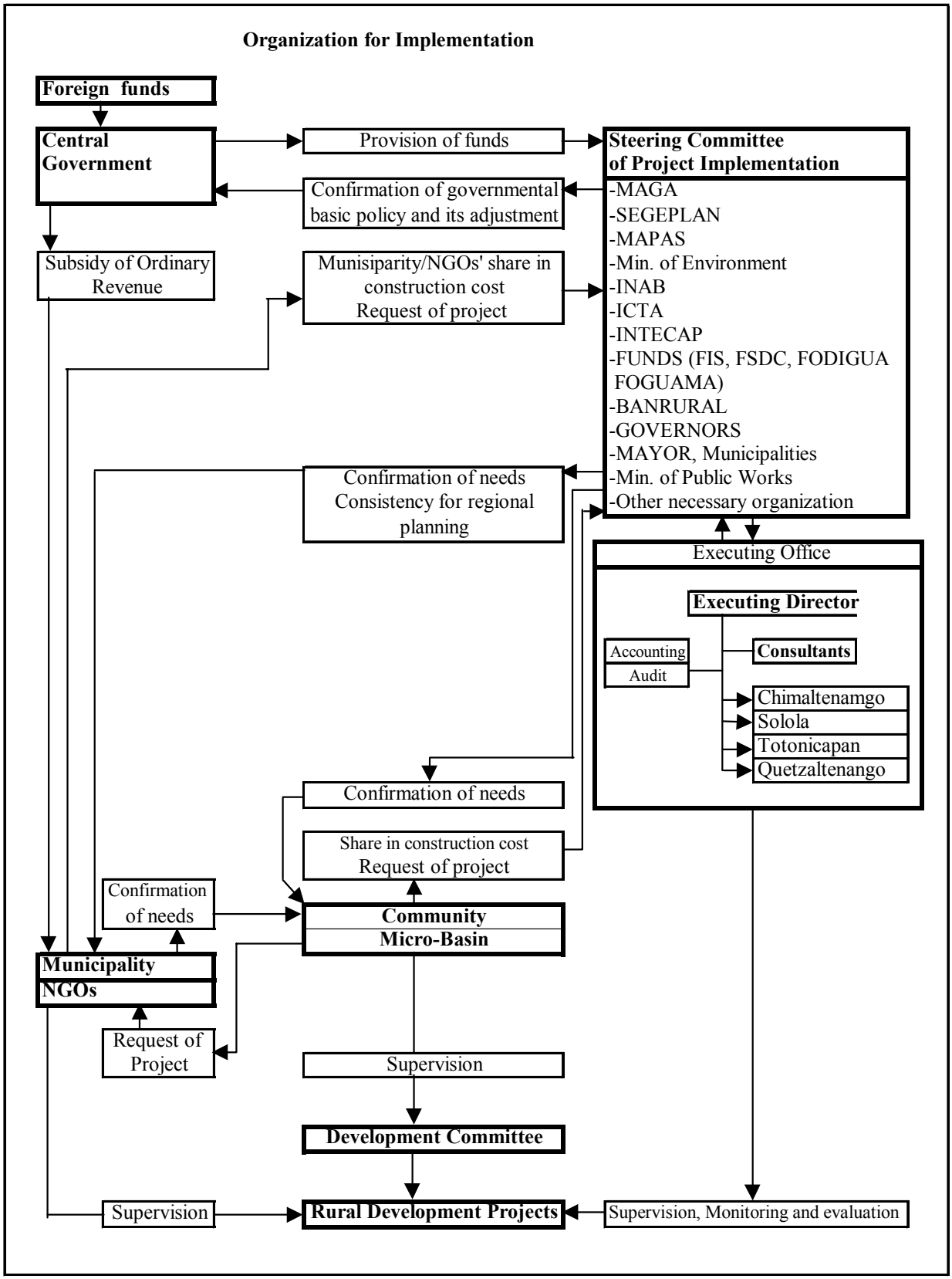
The sustainable rural development project in an area of four provinces is not a top-down project but a bottom-up project. In principle, the project should be formulated entirely based on problems and needs of the community and farmers. Also the project should be executed by farmers' participation.

The development of the project in an area of four provinces will be made based on methodology for sustainable development of micro-basins that was created in this study. A special attention was paid on rapid development of the project by simple methodology and the motivation to farmers' participation to the project. For this purpose, appropriate candidate micro-basins should be adequately and rapidly screened and listed based on evaluation factors. It is also essential to make participatory survey in the community.

In order to implement these projects comprehensively and efficiently, it is considered necessary that an institution with the function of coordination should be established, taking into consideration that implementation of rural development projects are in charge of various existing organizations at present administration system. Also under the committee, an executing office will be instituted and consultants will provide services of supervision and advice of project implementation with an executing office.

7.4.2 Organization

A new steering committee for project implementation headed by the representative of MAGA headquarters will be established in Guatemala City. It will consist of the members from MAGA, SEGEPLAN, MAPAS, Ministry of Environment, Ministry Public Works, INAB, ICTA, INTECAP, Governors of the related provinces, and other organization if necessary. In addition, representatives of organizations for supporting fund and credit such as FIS, FONAPAZ, FSDC, INFROM, FODIGUA, FOGUAMA, BANRURAL should become the members of committee. Under a Steering Committee of Project Implementation, an Executing Office that supervises monitors and evaluate projects will be instituted. Consultants will provide services of supervision and advice to implementation of projects with an Executing Office. A proposed organization for implementation of projects is shown below:


Organization for Implementation
Foreign funds
Central Government
Provision of funds
Steering Committee of Project Implementation
Confirmation of governmental basic policy and its adjustment
-MAGA
-SEGEPLAN
-MAPAS
-Min. of Environment
-INAB
-ICTA
-INTECAP
-FUNDS (FIS, FSDC, FODIGUA FOGUAMA)
-BANRURAL
-GOVERNORS
-MAYOR, Municipalities
-Min. of Public Works
-Other necessary organization
Subsidy of Ordinary Revenue
Munisiparity/NGOs' share in construction cost
Request of project
Confirmation of needs
Consistency for regional planning
Executing Office
Executing Director
Accounting
Audit
Consultants
Chimaltenamgo
Solola
Totonicapan
Quetzaltenango
Confirmation of needs
Share in construction cost
Request of project
Confirmation of needs
Community
Micro-Basin
Municipality
NGOs
Request of Project
Supervision
Development Committee
Supervision
Rural Development Projects
Supervision, Monitoring and evaluation

7.4.3 Selection of Projects

Projects for implementation will be selected based on the following procedures:

(1) To select micro-basins for an area of four provinces

Micro-basins in an area of four provinces (6,000 km^2) are delineated with about 5 km^2 by use of 1/50,000 topographic maps. And community or communities in the micro-basin will be identified. Poverty class of the communities is checked based on the poverty criteria defined by FIS. Micro-basins that do not belong to class poverty "a", "b", and "c" in FIS criteria will be excluded from candidate micro-basins for the project based on the FIS data.

(2) To make potential surveys for micro-basins and selection of micro-basins

The screened micro-basins mentioned above are evaluated based on the following five factors: For evaluation, potential survey of all evaluation items except No.2 will be carried out by an executing office.

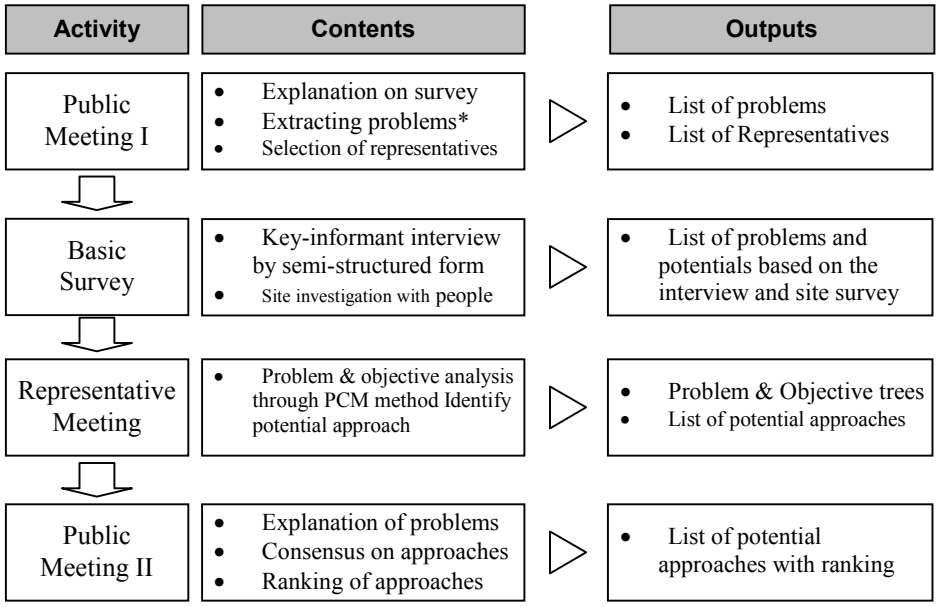
No. of evaluation factors	Evaluation factors	Criteria for community and/or micro-basin
No.1	Number of households in community	Should be between 50 and 250 in number
No.2	Area of river basin (micro-basin)	Should be between 3 to 15 km^2
No.3	Overlapped by other projects	Not overlapped by other projects that other agencies have conducted and/or are carrying out
No 4	Social problems	No serious social problems for implementation of the project
No 5	Overlapping other municipality	Micro-basin does not cover the area of other municipality

(3) Participatory Survey

In order to extract problems and needs of the selected communities from the community people mentioned above, simple participatory survey shall be conducted. The survey itself could be conducted by NGOs or local consultants considering human-resource constraints of governmental organizations.

The survey will be made in 3 steps, identification of problems and potentials, analysis of problems and objectives, and finding potential development approaches. To identify problems and potentials, public meeting will be held together with key-informant interview and site investigation. Identified problems will be analyzed among the community representatives and potential development approach will be formed through the Project Cycle Management

(PCM) method. Then, in the general public meeting, community people will approve the formed approaches and decide their ranking according to the community's needs and urgency. As the final out put, list of potential development approaches with ranking will be prepared. The list will be utilized as the input for formation of micro-basin development plan. The procedure of the survey is shown below.



*: For extracting problems, participants will be divided into group by gender in order for them to feel free to discuss especially for women.

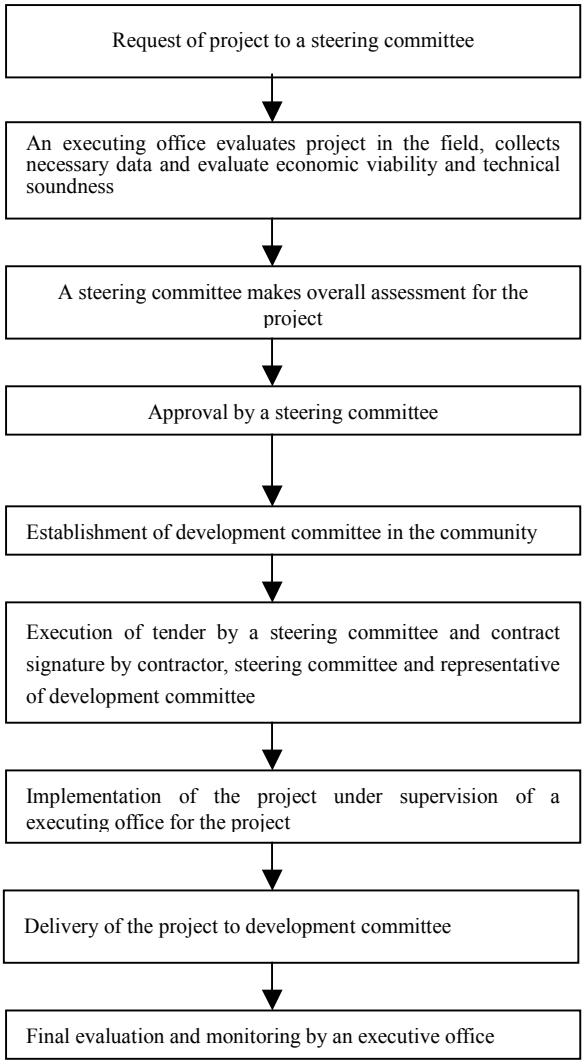
(4) Selection of the Project

List of potential development approaches (projects) with ranking obtained from participatory survey will be assessed based on the following three evaluation factors and weighted points as shown in section 7.3.1. Projects are listed in order. In principle, implementation of projects will be performed based on priority order. If the projects are in the level of the same rank, project for increasing income generation should be in first priority, improvement plan for living environments in secondary priority and environment and conservation plan in third priority. In addition, final selection of the project should be made based on the following screening factors.

No. of evaluation fact	Criteria
1.	Beneficiaries should agree to share construction costs of the project.
2	Lands necessary for project facilities are not private.
3	The project is not legally categorized as private sector's project
4	Project cost should be in the range predetermined by the related organizations.
5	O&M of the project should be surely conducted by a development committee.

(5) Implementation of Projects

General flow of implementation of projects is shown below;

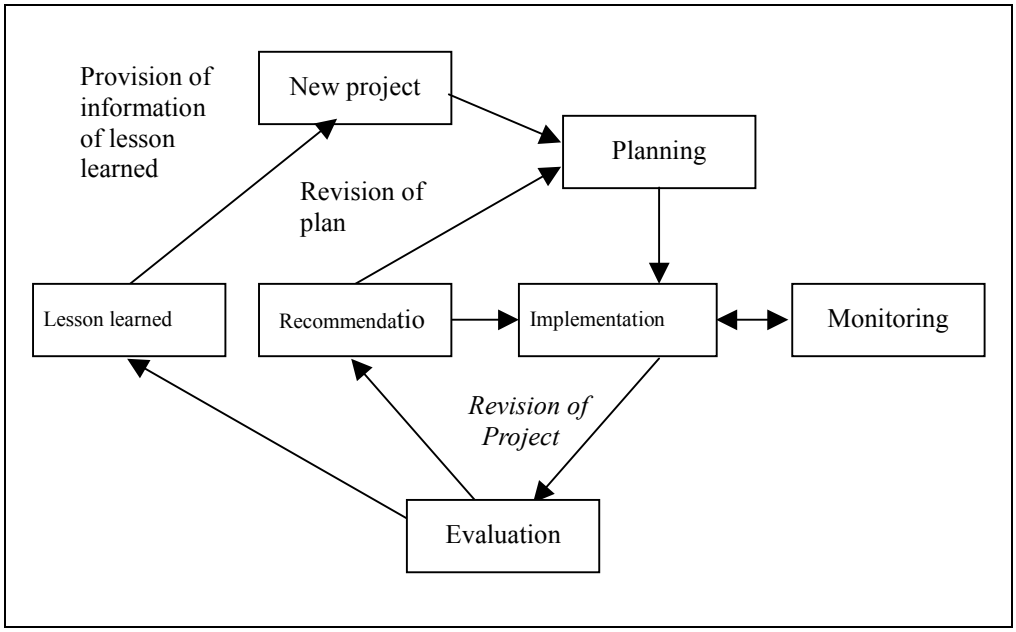


If an average micro-basin has 5 km^2, it is estimated that there are about 1,200 basins in four provinces. While according to FIS data, it is estimated that there are about 210 communities in four provinces that belong to class poverty 'a', 'b', and

'c', and evaluation factor No.1 (the number of households in community: 30 to 250) that mentioned in selection criteria of micro-basins. Regardless, it is expected that a lot of micro-basins will be selected for project implementation. Implementation of the projects would be performed stepwise and the same numbers of micro-basins selected by each province would be executed provincial-wise.

7.5 Monitoring and Evaluation of Projects

The general concept and flow chart for monitoring and evaluation of projects is illustrated below:



Evaluation for monitoring will be done to grasp 1) progress of the activities, 2) status of attainment of the work and 3) target of the project. Monitoring will be carried out stepwise: Before the implementation of the project and after the implement of the project. The monitoring indicators to be used should be easy for monitoring work.

The executing office that is proposed in section 7.4.2 principally undertakes monitoring. Evaluation of these items should be carried out by the third party including the representative farmers to participate in assessment of the projects.

Monitoring indicators and organizations for implementation and management of the proposed projects are shown in Table 16.