3.5.2 Provision of Agricultural Credits in the Study Area

Agricultural credits in the Study area are provided in their great majority through FIRA's channel. FIRA has two agents within the area, in Tapachula and Huixtla: the former covers 10 municipalities (Cacahoatán, Frontera Hidalgo, Huehuetán, Mazatán, Metapa, Suchiate, Tapachula, Tuzantan, Tuxtla Chico and Unión Juárez), while the latter covers 6 municipalities (Acacoyagua, Acapetahua, Escuintla, Huixtla, Mapastepec and Villa Comatitlán).

The credit amount in the Soconusco had plummeted from 198 million pesos to 90 million pesos (in nominal terms) between 1994 and 1998 at constant price of 1994, which intimated that the level of credit amount in 1998 had declined to only 19% of that accomplished in 1994 in real terms.

During the period 1992 – 1997, close to 47% of the agricultural credit amount had disbursed to fruits production, which is followed by cattle farming (23%), annual crops production (18%) and agro-industrial development (11%). Livestock activities except for cattle farming represented as small portion as 1% of the total credit amount. It is worth while to point out that the credits outlaid to cattle farming had dropped remarkably after the year of 1994, meanwhile those for annual crops had attained a notable growth (the comparison between the years of 1994 and 1997 discloses that the former had shrunken to 34% and the latter, on the contrary, had expanded by 274%).

FIRA's credits are forked in principle to those who engage in profitable business, so small and marginal farmers are less eligible as beneficiaries of FIRA's credit line; the proportion of the small and marginal farmers with income inferior to 1,000 times of the minimum salary occupies less than one-quarter of the total users of FIRA's credit line. This is reflected by the fact that the share of BANRURAL (generally its clients are smaller farmers) remains 13.4% of the FIRA's discounted credits on average for the period covering 1992 through 1998.

3.6 RURAL SOCIETY AND FARMERS' ORGANIZATION

3.6.1 Rural Society

Rural society in the study area has three type of social organization: rural society of the ejido, rural society of small-scale farmers, rural society of indigenous people and rural society of enterprise. The rural society of enterprise excludes from this chapter because of that is plantation, which come not into this category.

(1) Rural Society of the Ejido

In the area, there are existing 243 communities of the ejido which distribute in each municipality. According to the data 1992 of SRA, the total number of ejido farmer is 20,571.

Rural society of the ejido is composed of farmers, who were farm worker of the plantation (finca or hacienda) before the agrarian reform, are settled by obtain the land use right, and landless farmers who settled from within the Chiapas State or the surrounding states. Rural community (village) of the ejido is managed by autonomous organization of the ejido, which is established under the Article 3.1.21 of the Agrarian Law. Management and coordination of the community differs greatly from leader's capabilities, and, in a part of the communities the socioeconomic differentials among communities are appeared. Out of this organization, there are existing health committee and DIF group, which carry out the activities of health and

hygiene and social welfare for villagers. As the farmers' organizations such as the Ejido Union (Unión de Ejidos), Social Solidarity Association (SSS), Local Agricultural Association (AAL) and Rural Women's Agricultural Industry Unit (UAIM) are performing their activities. However, in most communities of the ejido, organization of ejido farmers is not in progress caused by lack of relationship among farmers and low cooperative awareness.

With respect of the religion of ejido farmers, the catholic is predominated, but the protestant is spreading gradually into the community.

Main income source of ejido farmers obtains from agriculture and small-scale livestock. However, owing to the limited farming by small farmland, their earnings from farm are low. Therefore, most of young family members are supporting family finance by earn the income from other labor markets. Most the cacao and coffee producers earn the income from farming equivalent to the minimum wage ($26.00/day) or more than that of the wage. In case of maize producers, it dominates producers who earn less than the minimum wage, and then their living expenses depend on earnings from other labor markets. Besides, fruit producers obtain stabilized earnings from their farms. From these circumstances, the economic differentials are widening among rural community of the ejido.

(2) Rural Community of Small-Scale Private Farmers

According to the data 1992 of SRA, number of the small-scale private farmers is estimated 4,613 and the Tapachula occupies the largest number of 1,655 farmers. Generally, small-scale farmers form the village with group type and it distributes among the ejidos, but most the small-scale livestock farmer forms by the scattered type.

Rural society of small-scale private farmers consists of farmers who purchased the farmland by allotment of big plantations and ranches after agrarian reform in the 1930s, and the community is managed by autonomous organization in farmers themselves. However, the community management has the difference by leader's ability as well as the community of the ejido. Out of this autonomous organization, there are health committee and DIF group in the community. As farmers' organization, Rural Production Association (SPR) and Local Agricultural Association (AAL) are organized and doing their activities.

The small-scale farmers in the area have generally strong individualism, low cooperative awareness and lack of relationship among farmers. Consequently, there are not many farmers' organizations in the area. On the other hand, farmers who have interesting in the organization with strong cooperative awareness, participate to farmers' organization. The difference of their consciousness appears to their farming and productivity. Religious orientation among farmers dominates the catholic, but the protestant can be seen in some farmers.

In general, the income of them is higher as compared with the ejido. Most the farmers live in urban area and/or nucleus of village. Main income source of these farmers produces from agriculture and livestock. It is found that the income differential among farmers occurs by their farming size and consciousness for farming. In case of low income farmers, young family members complement the family economy by income obtained from other labor markets as same as the ejido. Most the cacao and coffee producers earn the income, which is over the minimum wage. On the other hand, maize producers who practice mono-culture farming, depend on the income from other labor markets owing to lower income than the minimum wage. The fruit farmers earn the income stabilized from their produces.

(3) Rural Community of Indigenous Group

Regarding the indigenous groups in the area, the Mame group belongs to the Maya family, which is settled in the Soconusco region before the Mayan age, occupies the majority. The other groups moved from the central mountainous region as labor force for coffee production, which started at the end of last century, and they form their communities in the coffee production area and/or its surrounding area.

Though the social organization of indigenous people maintains some traditional social system, almost of the custom, language, traditional costume and behavior was missed by the policy of cultural integration in the age of Lazaro Cardenas. Therefore, the shape of social management (autonomous organization, election system, health control, etc.) is presently almost the same as small-scale private farmer's case. Welfare and social assistance for indigenous people in the area is conducted by Cacahoatan office, INI. Th indigenous groups have strong feelings of identity to the group and point to the revolution of traditional thought. On this account, they have cooperative awareness, high moral, diligence and moderate. They do not deviate from traditional thought though acculturation of the outer culture is high. Religious orientation is the Christianity and the protestant is dominant.

In general, the indigenous people forms the communities isolated in the remote areas, and they practice self-sustenance agriculture. The income earns mainly from farm work in the coffee plantation. However, in these communities (villages), the K'nan Choch Group, production group organized by the Mame group, supported by ISMAM (Social solidarity association of organic coffee producers organized by the Mame group, aiming to improve the living conditions of the indigenous group) is carrying out the organization of indigenous people. This activity aims to elevate the income by organic vegetable production, to improve the community and life environments and the social status of indigenous people, and it contributes to improve the living conditions of them.

In the remote area, the roads are poor arrangement so that it is impede the traffic. Electricity covers around 80%, and drinking water depends on the stream or well.

3.6.2 Education

(1) Basic Education

Basic education services the responsibility of the Education Secretariat of the federal and state governments. The regional educational office (SECH) in Tapachula manages the services within the study area. The basic education includes kindergarten (1 year), primary school (6 years), secondary school (3 years) and tele-secondary school (3 years). The educational facilities in the area are comparatively provided, and in rural area the facilities and number of teachers are sufficient, but the multiple classes in some schools of urban area are existed because of numerous pupils.

According to the statistics, the basic education (1996/1997 course) in the area is as follow:

	Pupils enrolled	Pupils attended	Pupils approved	Pupils graduated	Teachers	Schools	Class rooms
Kindergarten	24,495	23,178	22,995	10,264	951	541	961
Primary	119,252	113,489	100,583	14,724	3,897	801	4,152
Voc. Training	2,716	2,341	2,030	276	146	28	125
Secondary	47,388	44,689	35,990	11,018	2,601	2,656	1,586
Voc. Course	885	835	582	ND	153	5	55

Source: State Statistics 1998, 1996/1997 course

(2) Secondary Education

At secondary education level, there are high schools (of the State and of the Private), and high schools of the State with a course for enter the university. The schooling term is 3 years.

	Students enrolled	Students attended	Students approved	Students graduated	Teachers	Schools	Class rooms
High school	16,158	15,204	11,046	3,113	1,257	59	609

Source: State Statistics 1998, 1996/1997 course

(3) Vocational Education

Regarding the vocational education, at basic education level, there are technical secondary schools of agriculture and livestock, fishery and industry, respectively. At secondary education level, technical high schools (of the Federal and of the State), technical high schools of industry (of the State and of the Private), technical high schools of agriculture and livestock of the Federal and technical high school of fishery of the Federal.

Technical secondary school of agriculture and livestock is provided to rural areas and it performs the role in secondary school with general course. But the educational facilities among schools have a great difference despite of poor facilities. There are two technical high schools of agriculture and livestock (C.B.T.A.) in the area. The C.B.T.A. in Suchiate has sufficient educational facilities and equipment and high rate of enter the university (Faculty of Agriculture). On the other, the C.B.T.A. in Mapastepec places emphasis on livestock education due to the school is located at the livestock production area.

Educational institutions	Number of schools	Number of teachers	Number of students
Second. school of Agr.*	15	134	4,678
Second. school of Fish.	1	13	189
High school of Agr. **	2	44	1,044
High school of Fish.	1	30	204

Source: State Statistics 1998
Note: * SEP 1999, 1997/1998 courses
** JICA Survey Team

(4) Superior Education

The superior educational institutions in the area are the Autonomous University of the Chiapas State (UNACH) Campus IV, College of Southern Frontier (ECOSUR) Tapachula Campus – graduate course, Normal College of the Federal (Colegio Normal), Institute of Technology of the Chiapas State (Instituto de Tecnologia del Estado) and some private universities. Among these institutions, the Agricultural Science Faculty (Huehuetan), UNACH, and Institutes of Agro-ecology, Socioeconomic Science and Technology of ECOSUR carry out the superior education of agriculture, livestock and fishery. Number of students is 414 (UNACH) and 6 (ECOSUR- Master course 2, Doctor course 4), respectively.

(5) Adult Education and Literacy Rate

The Federal and State Governments is conducted adult education for person who is uneducated and illiterate of over 15 years old, through the Institute of Adult Education (INEA). However, the participants is few in rural area, especially, most the people have low participation awareness with the advance of age.

According to the statistics of INEGI, the illiteracy rate in the area is 17.4% (male 15% and female 28%). Traditional male-dominated society and low social status of women in rural society cause the high illiteracy rate of women.

3.6.3 Health and Public Welfare

(1) Health Services

The public health system consists of SSA, IMSS, ISSSTE and ISECH, and these institutions are responsible to the people. The related institutions to these health services are DIF, INI and Red Cross. The provision of health services in rural area, is principally responsibility of SSA and IMSS-UMR.

As public health and medical service institutions in the area, are 2 regional hospitals of IMSS, 1 rural general hospital of IMSS (in Mapastepec), 2 general hospitals of ISSSTE, 3 hospitals of ISECH and 1 hospital of SM. In rural area of the area, there are 17 health centers of SSA and 89 rural medical units of IMSS. A rural medical unit carries out its service in 1 to 5 villages (based on population). The traveling health service conducted by SSA is carried out regularly at the health house (Casa de Salud), with the first-aid medicines, established by the community in the remote area. For these health services in rural area, DIF and INI are supported. Each village has a health committee organized by volunteers, and the committee support health and hygiene, and health control of the people.

(2) Public Welfare

The DIF in each municipality strives to solve the problems on poor family, mother and children and handicap persons as the social weak, and juvenile delinquency. The DIF regional office in Tapachula is managed in coordination and consultation of the activities in the municipality.
The DIF carries out the following activities for improvement of the rural living:

1. Distribution of vegetables seeds and orientation of vegetable garden, with the collaboration of SAGAR, in order to improve the family alimentation.
2. Provision of school meals with the collaboration of SEDESOL.
3. Health and hygiene orientation, uterine cancer examination and family planning in cooperation with SSA and IMSS.
4. Improvement of the living condition with the provision of toilet, improvement of kitchen, as cooking and sawing.
5. Assistance of community development, as formation of women's group, community work and construction of rural parks.

The source for these activities is maintained by the budgets of the related public institutions and the municipality (15% of the municipal budget). The activities of DIF are indispensable to develop rural community and families.

3.6.4 Farmers' Organization

(1) General

In the study area, the producers' organization established under the Agrarian Law and the water users' association, which conducts operation and maintenance of the facilities in the Irrigation District, and the association for operating agricultural infrastructure (drainage, roads, etc.) which constructed by C.N.A. are organized.

The producers' organization formed by ejido farmers and small-scale private farmers are as follows.

1. Social Solidarity Association (Sociedad de Solidaridad Social - SSS)
2. Rural Production Society (Sociedad de Producción Rural - SPRR)
3. Local Agricultural Association (Asociación de Productores Local – AAL)
4. Ejido Union (Unión Ejidal)
5. Rural Women Agro-industry Unit (Unidad de Agrícola Industrial de la Mujer Campesina – UAIM).

On the other hand, there is cooperative (Sociedad Cooperativa – SC), which is organized by comparatively large-scale farmers. These agricultural associations are organized the central organization at the State level. These organizations are registered and approved legally by SAG, SAGAR, Agricultural Prosecutors Office, C.N.A., SRE, COPLADE, FIRA, etc. Number of farmers' organizations is tabulated as follow:

	SSS	SPR	AAL	UE	UAIM	SC
Number	23	25	59	18	35	39

The producers' association is organized by crop and its member participates in more than one association.

(2) Farmers' Organization of the Ejido

The Ejido Union acts as an united body of production organization formed by the ejido community (village). Besides, the SSS is also active as farmers' organization in the ejido. The activity of organization among farmers is generally sluggish caused by farmer's unconcern and no enthusiasm for organization. Most the existing farmer's organizations are established in order to obtain the credit. However, by default of the credit, most the organizations are inactive.

On the other hand, the association, which has strong cooperative awareness and harmony of members and leadership of principal members, is performing brisk in the activities. The association is contributed to improve farming environment of members through the joint purchasing of farm input (seeds, fertilizers and pesticides), and joint use of farm machinery. The Ejido Union in coffee production area carries out technical and marketing supports for ejido farmers participated to the Union. Simultaneously, the leaders of the Union strive to enlighten farmer's awareness for the organization.

In the past, the strong supports from the public institutions had been carried out to farmers' organization of the ejido. However, except for the example of success to improvement of farming environment in some organization, most the organizations could not obtain the effects from the supports. It caused by leader's capabilities and farmer's consciousness.

(3) Producers' Organization

The producers' associations registered legally are organized by crop. Though the organization formed by large-scale farmers is generally active, most the organization of small-scale farmers is stagnated and/or suspended in their activities. The stagnating factor of the activities is generated from strong individualism and low cooperative consciousness of members. In particular, the associations organized aiming to obtain the credit and the associations which are unable to work jointly despite it has marketing facilities, have been seen such situation.

On the other hand, in active association, members have high sense of collaboration and are keen on improvement of farming environment. Although the numerous farmers were participated to the association in the initial stage of its establishment, the majority of them were seceded from the association caused by traditional farmer's consciousness in the area. Further principal members of active association have a leadership and persons who obtained confidence among members manage the association. The activities of the association are supply of farm input, technical support, machinery service and consultation of the credit. However, the association has not any marketing system, so that the members are dealing with middleman directly.

The united organization among producers' association is coffee producer's association as biggest, and its activity is mainly to request a support of the government. The association, which has many members is join to the united organization through the group formation by village.

(4) Water Users' Organization

The water users' organization is organized in accordance with the regulations of the National Water Law (Ley de Aguas Nacionales). In the area, the Suchiate water users' association and the Cacahoatan water users' association are established in 1991, and these associations carry out operation and maintenance for the irrigation facilities of the No. 46 Irrigation District. These associations were organized simultaneously at the completion of the construction of irrigation facilities, and water control and operation and maintenance works for the facilities was transferred from C.N.A. to these associations. Present member of these associations is Suchiate (652) and Cacahoatan (492), respectively. The water charge is set up based on irrigation times of crop, and average charge is estimated $25/ha in Suchiate. In addition, $70/ha adds to the charge annually as machinery depreciation cost and the federal government subsidies half the purchasing amount of machinery at the time of renovation of the o/m machinery. Average charge is estimated $60/ha in Cacahoatan.

On the other hand, with the implementation of the rain-fed agricultural development project in coastal area of the Pacific Ocean (mainly drainage works including road and dike with road), the regulation on organization for operation and maintenance of the facilities constructed was enacted in December, 1993, as formation of "Southern Chiapas Water User's Association". In three drainage districts (Tapachula, Huixtla and Acapetahua) in the Soconusco region, there are established 3 associations in 1994. These associations are composed of 3,505 members (Tapachula), 4,879 members (Huixtla) and 4,462 members (Acapetahua), respectively. Presently, C.N.A. is being carried out an orientation on the transfer of operation and maintenance works for principal members of the associations. As operating expense of these associations make a rough estimate of $15/ha at present.

3.6.5 Rural Women Organization

There are three type of women organization in rural area of the region such as SSS established by only rural women, UAIM in the ejido, and DIF group in each village.

(1) Production Association (SSS) Organized by Only Women

Presently, active production association organized by women is promoting group formation of women at each village in four municipalities in the border area, and appeal to participate the association. This association is managed by only women, and is composed of 32 groups with 800 women. Average number of a group is around 35, and the biggest is 105. The association aims to realize the improvement of the social status of rural women through group activities (improvement of home economy, family nutrition and living condition, and creation of job opportunities). The main group activities are generation of sub-income source from domestic

animal raising, by means of fattening of pigs in each member's home and joint selling by the association. In the area, there are three women associations (SSS) excepting this association. These associations are organized in each village and promote fish farming (tilapia, shrimp, etc.), local chicken and pig raisings for improve family nutrition. In the one of these associations, participation of men is found and it performs an important role to change the consciousness of men through its activity. Members of the groups are rural women over 18 years old, supported positively by DIF.

(2) UAIM Organized in the Ejido

There are organized 35 groups of UAIM in the ejido of the area, and the groups perform their activities obtained from the budget of assistance to women of SRA. The activities include baking and selling of tortilla, dressmaking, production of daily necessities, etc., as rural industry. However, most the groups are presently inactive caused by lack of operating funds. Women who join to the group are active women and they have much interest in the activity. In the traditional rural society, women who participate the activity are limited.

(3) DIF Women's Group

DIF in rural area is promoting the rural life improvement through group formation of rural women and already organized women's group in every village. DIF conducts the guidance of community vegetable garden and poultry farming by women's group. Also, in the group activities, guidance and consultation of basic health and hygiene, nutrition, childcare, and family planning are carried out regularly. Besides, some women's groups have a small shop of daily necessities, which manages by joint investment. The age of participant of women's group is over 18 years old, and married women are over 15 years old.

3.6.6 Development in Women

Although the activities aiming to improve living conditions by rural women in a part of the area are carried out briskly, the women's social status remains low because of the traditional male-dominated society. Therefore, it cannot find out the women's participation to the social activities. Generally, most the rural women are incomplete the primary school, and have a high birth rate and poverty condition, and these circumstances constrain to participation to rural community organization.

Concerning the gender based division of labor in the agricultural activity, principal labor of farming, including land preparation, practices by men, and women participate in fertilizing and harvesting works as equal with men. In addition, post-harvesting work depends principally on women. Domestic activities, i.e., housekeeping, childcare and feeding for domestic animals, are an essential part of women's work. According to the interview survey of gender, rural women's working hour is from 5:00 a.m. to 9:00 p.m. The high birth rate hinders the rest in home and participation in the society, and it prevents the opportunity of school attendance of girls due to a help mother with her works (housekeeping, childcare, etc.) inevitability. Also, it is an impediment to the opportunity of participation to the adult education.

Rural women who live surrounding the banana or mango plantation are working at their plantation and packing shops in order to supplement home economy. After the work from 6:00 a.m. to 2:00 p.m., they are under the hard workload due to perform housekeeping, childcare, handling and feeding of animals.

As a course of the rural living improvement, a part of rural women's leaders in the border areas promotes organization of women's group by appeal to women in the villages, aiming to improve

the rural living environment. Leaders conduct practical training such as generation of cash income of women through pig raising and poultry farming in home garden, basic health and living improvement, and perform enlightening of rural women. Besides, some women's groups are being carried out the improvement of community environment. These movements promote rural development, involving in men of the village. This shows that the women's participation to rural development has the possibility to be big driving force. On this account, it is desirable to conduct the leaders training of rural women, aiming to enlighten the rural women's participation to rural development.

3.7 COMMERCIALIZATION OF THE AGRICULTURAL PRODUCTS AND DEVELOPMENT OF AGRICULTURE-INDUSTRY

3.7.1 Balance of Supply - Demand of Agricultural and Livestock Products in the Region

According to the study on the balance of supply and demand in the Soconusco Region, the region depend on the most of the agricultural products from other regions of the state or from other states of the country. These products include, but not limited to,: maize, beans, pineapple, tomato, orange, lemon, pork, chicken, lamb and milk. On the other hand, the region ships such agricultural products as coffee, cacao, banana, mango, cashew nuts, papaya, cut flower, etc. to the rest of the country.

The market share in the Socunusco region before 1980 had been relatively in small scale with total population about 300,000, but the population has been burgeoning since then in such manner as to be projected to reach 700,000 in 2005. In parallel with this expansion of population the demand for the variety of foodstuff represented by vegetables and fruits will have a significant growth in the future.

3.7.2 Agricultural Marketing System

(1) Coffee

The coffee constitutes the main product that the Soconusco markets, not only for the area that occupies in 11 of the 16 municipalities, but for the volume of sales that are carried out in the national and international markets. The main countries importers of the coffee of the Soconusco are the United States (80%), Germany (8%), Holland (5%) and South Korea (2%).

The process of commercialization of the coffee is shown in Figures M.1 and M.2, where the flow chart of the production of coffee in the Soconusco is presented from the reaping until the benefit of the grain and the channels of commercialization. The intermediarios appear since the production of the coffee, because they lend money that enable the crop works, charging high interests and demanding the payment with product that they will benefit. The biggest properties lend under similar conditions and they receive like payment the product, which allows them to use the capacity installed to transform, store and export coffee. In many communities commission agents of the companies take advantage of the shortage of resources of the producers and they make the premature purchase of crops. The volumes of coffee not committed with the commission agents, are transported to the benefits plants located in the biggest cities and are sold to the best bidder.

(2) Banana

In 1996, México was the seventh country producing banana in the world and the Soconusco is the main area producing the fruit in México.

The production system used influences on commercialization process. These systems can be semi-intensive or intensive. The first one, is carried out in surfaces smaller than 10 ha, without irrigation, technical assistance and packers and focused the sale to the national market. The second one, uses irrigation and high technology, is carried out in surfaces average 80 Ha, has cable system and packer and it exports at least 25% of their production.

The banana exports have gone totally to the market of the United States, taking advantage of their geographical proximity and the high level of imports of that country. The main introduction place is MacAllen Texas, continued by Otay, California.

To have a clear concept about the banana market, it is necessary to know the manager or farmer is who cultivates the plant, crop it, packs the fruit, transports it and sells it to ex-works price to an intermediary exporter than in general is a transnational or national company. The company hires and makes the terrestrial or marine transport and sells the banana to price F.O.R. (Free on Rail) to wholesalers and supermarkets, not without before subject it to a storage process and maturation. In the supermarket is carried out the sale to the consumer. In general, the wholesalers are the same chains of supermarkets that distribute the product among the branches of their chain.

The packing of the banana, is the answer to the demands of the markets in the presentation of fruits of good quality. In the sixties the fruit was exported to the main markets in clusters, causing losses for contusions of until 40% of the volume. It is certain that the packing of the banana in cardboard boxes offers the best option for the transport and marketing of the product, which has been generalized and unified in the banana world. The boxes are in general of sizes of 18.14 Kg (40 Pounds) and 12.5 Kg (26.5 Pounds) according to the countries of marketing companies.

In the Soconusco exist 4 main companies that market the banana volume that fluctuates between 200 thousand boxes and 600 thousand boxes yearly.

(3) Maize

The main municipalities producing of the grain were Escuintla, Tuxtla Chico, Mapastepec, Tapachula, Frontera Hidalgo and Metapa, which contributed 75% of the regional production, although the maize is harvested in all the municipalities of the region. Most of the production is harvested from September to November.

The participation of CONASUPO inside the national purchases of maize has been up to 1998 every smaller. Starting from March of 1999, CONASUPO stops to operate in the Soconusco as buyer of maize, The warehouses of Boruconsa, branch of that company, are in transfer process to the state government, which doesn't still define how they will be operated.

The nixtamal industry had in 1993 according to data of the Industrial, Commercial and Services Census a total of 224 mills, most of them located in Tapachula, Huixtla, Suchiate, Cacahoatán y Mapastepec. These mills are supplied from corn harvested in the region, and from the facilities of Maseca and Minsa located respectively in the State of Chiapas in the towns of Ocozocuautla

y Arriaga.

When CONASUPO left the corn market, it began to operate at national level a market of "físicos" where the grain is quoted according to supply and demand, but the contracts are still small although the prices are higher of those of indifference.

The maize that is harvested in Mexico competes with yellow corn of import, since more than half of the national production is dedicated to the tortilla industry or the rural self-consumption and almost 10 million tons to the livestock consumption becoming deficit of this product. When passing the corn for human consumption to the livestock consumption becomes a commodity, basic product not differentiated, what originates that the strategy of competitiveness is guided to focuses of productivity and allow that the value of the corn in the Gulf Coast local market placed in Chiapas reached $ 1,239.00 per ton, including entrance and exit maneuvers as well as storage, freight railroad to consumption centers and production and financial costs. The white corn as is consumed in Chiapas reached a price of $1,350.00 per ton in the local market.

(4) Bovine livestock

During three decades of 1950 at 1980, the cattle rising of Chiapas registered a vigorous growth, so much for the enlargment of the surface as for the number of heads. However, in the eighties, this sector enters in crisis for the limitations of the land resource, the structure of prices and in general, for the economic situation of the country that enhance the inputs and credits, but mainly it reduces the meat consumption in the population"s wide strata. During the lapse 1980-1990, the tendency of the cattle raising is toward the drop, the herd falls to an average yearly rate of -1.1%, the meat production to -7.7% and the milk in -4.0%.

In the Soconusco, the commercialization of the livestock is carried out through intermediarios that buy in each municipality the young bulls in foot of around 250 Kg of weight, to a price of $10/Kg, to fatten them outside of the region. Other producers also buy livestock in foot to fatten it during a term of 18 months in farms located in the region, using in rainy season natural and induced grasses and in the dry season balanced foods with the help of shorgum, banana, soyabean pasta, gallinaza, corn and molasses; once the animal arrives at 450-500 Kg, it is sold to introductory to a price of $10/Kg to $12.5/Kg.

The Soconusco is not distinguished for the production of milk; in 1996 they were only obtained 16 million liters (44 thousand lt/day), that is to say 8.2% of the production of Chiapas. The company Nestlé has created a market for the fresh milk in the municipalities of Acacoyahua, Acapetahua, Villa Comaltitlán, Huixtla and Mapastepec. In these municipalities existed storing centers of this company were changed by cooling centers that the producers have in its farms; every two days a recolector truck transport the milk to a plant located in Chiapa de Corzo, for the production of powdered milk. The price paid by the company to the producers, varies from 2 to 2.50 pesos per liter, depending on the fat content.

The producers also sell the milk to the local cheese dairies or intermediarios that resell it to consumers without control of quality. It is considered that aproximately 40% of the produced milk is dedicated to the Nestlé, 40% to the local cheese dairies and 20% to the consumption like fresh milk.

It is necessary to point out that the region is not self-sufficient in milk and that has to import from the wholesale market of México City increasing quantities of this product, estimated 37 thousand tons per year. The price of the milk to the consumers in stores and supermarkets,

packed in tetrapack is of 5.80 pesos per liter.

The diagnosis about commercialization with regard to the rest of the agricultural and livestock products appears in Annex M.

3.7.3 Agroindustries

(1) Processing plant of coffee

They exist in the Soconusco a great number of beneficts of coffee that process the grain, the biggest capacity is in the biggest properties that have modern humid benefits with machinery for despulpado and fermented, laundry and drying that it allows an appropriate quality of pergamino coffee, what elevates the prices of the same one in important form; some of them have dry benefits where the morteado, classification of the coffee gold is made and packed. The capacity of these humid benefits is more than enough, being able to manage bigger volumes. The social sector on the other hand, has small humid benefits, with manual and fixed despulpados of one to three disks, rudimentary facilities for fermented, laundry and drying of the grain in the sun in reduced patios, what causes that the quality of the pergamino coffe diminishes, nevertheless that as cherry coffee its quality is satisfactory.

The social sector and small producers has received subsidies from the Programa Alianza para el campo, what has allowed to enlarge the capacity of benefits of these groups. However, it has not improved the quality of the benefitted grain substantially, since the producers has not been qualified to operate these facilities optimally to eliminate grains wrong despulpados, vain grains and impurities and to know well the process of fermentation, key point to achieve better remunerated quality in the market.

(2) Other agroinduatrial facilities.

Apart from the beneficts of coffee, there are in the region 5 plants to ferment cocoa, 4 extractors plants of palm oil, a refining oil plant, a processing marañón fruit plant, a sugar mill and a mango packer. The profile of these facilities is summarized in Annex M.

3.7.4 Marketing infrastructure

In 1996 the infrastructure of official storage for the handling of the crops in the region, ascended to 20 warehouses, of which three belonged to Almacenadora del Sur, five at DICONSA and 12 to Boruconsa. The combined capacity of the same was of 58,100 tons. Starting from final of 1998 the official warehouses passed to depend on the state government and their final destination is ignored.

The demand of products that require storage in the region in 1997 ascended to 161 thousand tons, considering corn exclusively (143 thousand Tons.), sorghum (7,600 Tons.), soyabeam (9,200 Tons.), rice (566 Tons.) and bean (890 Tons.). Taking into account that at least 20% of the production of corn and the entirety of that of bean, is for self-consumption and therefore, it doesn't require of official warehouses, it would only be needed to store 132 thousand tons a year.

On the other hand, according to standard international, the rotation of the warehouses allows an increment in its physical capacity; this rotation is of 1.5 times the static capacity. That is to say,

the final capacity of the cellars would be of 87 thousand tons, or in other words that a deficit exists of around 45 thousand tons.

On the other hand, 4 official warehouses have become operated by the state government, but don't operate for diverse causes. One in Huixtla, belonging to Almacenes Nacionales de Depósito with capacity of 5,000 Ton. and three property of Boruconsa; one to store 6,150 Ton. in Frontera Hidalgo; another in Huehuetán with capacity of 3,100 Ton.; and one in Villa Comaltitlán with capacity of 3,950 Ton. They are also two warehouses property of SAGAR that neither operate. This capacity could take advantage to reduce the necessities.

3.7.5 Infrastructure for transport of agricultural products

The agricultural production of the Soconusco, except the crops of corn and sorghum, flows in its biggest part outside of the region toward other states of the country and intrnational markets. To this movement it has contributed the development of quick roads of terrestrial transport, as the toll freeway Tapachula - Huixtla - Escuintla - Mapastepec - Pijijiapan - Tonalá – Arriaga, and the Federal highway No. 200 that follows a parallel line with the previous one until Arriaga, where connects with the Federal highway No 190 that unites it to Tuxtla Gutiérrez and Juchitán in the Isthmus of Tehuantepec, linking this way to the trasportation net of the country. These roads have allowed that the products that thi región sends toward other parts of the country and those that receives arrive with readiness to Tapachula, the most important commercial center in the Soconusco. A trailer with commodities travels the route Tapachula - Federal District in one day (24 hr) and the route Tapachula - New Laredo, in the frontier with United States, in two days (48 hr).

On the other hand, it is also used the Pan-American railroad to move corn, sugar, sorghum, coffee, fertilizers, etc. This railroad goes from Ciudad Hidalgo of the municipality of Suchiate in the frontier with the Republic of Guatemala, until the ports of Salina Cruz in the Pacífic Ocean and Coatzacoalcos in the Gulf of México, linking this way the Soconusco with countries of the basin of the Pacific and Europe. The railroad is in bid process to be transferred to the private sector, that will make possible its improvement and increment in the speed of journey of the convoys. To medium term it will allow it the goods to move quicker to the markets.

In the Southwest end of the region is located Puerto Madero marine terminal that mobilized banana shipments toward the exterior up to 1993, but starting from that date it doesn't register load movement, in spite of having protection infrastructure, jetties and warehouses facilities.

3.7.6 Marketing information system

The market information of the agricultural and livestock products of the region is operated by SAGAR through the organism ASERCA, which compiles and publishes weekly prices of the main agricultural and livestock products of the country, so much at level of central of wholesale markets of the most important cities, like in entrance ports to the United States, as well as the prices that govern in the international markets of futures. This information is supplemented with the National System of Markets Information (SNIM) that also publishes prices of the main agricultural products.

3.8 ENVIRONMENT AND ENVIRONMENTAL PRESERVATION

3.8.1 Vegetation

Owing to a influence of the altitude difference in the Study Area, the vegetation shows the significant variance of vegetation, existing tropical, highland, Savanna and swampy type. However, in the term of the vegetation, the native vegetation is scarcely. Original vegetation were cut down in a first stage of 20 centuries and converted to the pasture, agricultural land and coffee plantation. Original vegetation exist only in the reservation area and the around the Tacana Mountain. Other vegetation which cover the mayor part of the Study Area is a secondary vegetation converted by the industrial activities introduced, such as coffee and cacao plantation. Because of these activities, the greened area, including coffee, cacao and others fruit plantation covers the mayor part of the Study Area.

3.8.2 Preservation Area

Two reserved area, one as the "Reserva de la Biosfera el Triunfo" in the northern highland of the Study Area, and other as the "Reserva de la Biosfera la Encrucijada" in the lower swamp area are significant reservation area located in the Study Area, in term of the legal reservation. These reserved Area are composed by the nucleous area and amortization area. The nucleous area is a part of federal land and amortization area is the private land designated for the preservation purpose. Because of the private land, in the part of the amortization area, agricultural production are common in a small scale.

The "La Encuricijara" reserved area is covered by the mangrobe vegetation and formed as a lowland swampy area, having precious natural resources in flora and fauna. Its altitude covers less than 5m.

The "El Triunfo" reserved area in the northern part highland with the elevation of more than 1,000m, covers the tropical rain forest and foggy forest. The vegetation of his reserve is a native vegetation, with diversified flora and fauna.

These reserved area are administrated by the INE and IHN, working with the world bank aid and the environmental reservation fund, in a small scale. However, because of the dificulty of capital resources procurement, the administration of these area are facing in serious problems for the administration of preserved area.

3.8.3 Others Specific Area

In the Study Area, beside the reserve area, important considerable area for the preservation of precious natural resources, are the forest covering in a Tacana Mountain and Southern part of the Study Area. The diversity of the vegetation of the Tacana mountain is abundant with native vegetation.

3.8.4 Environmental Problems

From the viewpoint of environmental problem, the erosion and water pollution are representing in whole area, either the specific problems are differ from each region, because of the diversified regional characteristics.

The erosion problem caused by the topographic factor, inadequate farming practice and inadequate construction method, is a deterioration of fertilies in the upper and middle basin, and

a sedimentation problems for the lower basin, specially in a swamp area, causing a serious damage for the reserved area "La Encrucijada".

The water pollution problems has a origin in a inadequate treatment of the sewage water and coffee plant at the upper basin, because of the water supply of the urban area are depending on these water resources as a font. At the plain area, the water pollution caused by the urban sewage water and the agrochemical use for agricultural practice are resulting water pollution at the lower swamp area.

Beside in these problems, disposal of the plastic bag used for the Banana plantation and disposal of the waste solid are the salient problems.

3.9 PUBLIC FINANCE AND EXISTING DEVELOPMENT PLANS AND PROGRAMS

In 1998, the state government of Chiapas earmarked a total of 18,875 million pesos for public investment and these resources were originated from the following sources: allocation of the federal government's budget (48.5%), state government's own fund (33.8%), allocation of the federal government fund for social development – "Convenio de Desarrollo Social" (2.2%), loan (6.8%) and others (8.8%). The Zedillo administration gives higher priority to social development and greater portion of the public finance is directed to this sector accordingly.

In the state of Chiapas, 32% of the public finance in 1998 were covered by the educational sector and 16.3% by the public health / social welfare sector, which in sum represent close to half of the total budget of the public finance. An allocated budget to the agriculture and forest sector amounted to 2,511 million peso, which accounts for 13.3% of the total budget of the state government of Chiapas. On the other hand, regional distribution of the public finance is as follows: 44% for development programs of respective region and 56% for inter-regional programs or comprehensive programs to cover whole state; the share of the Soconusco region was 3.7% of the total budget of the public finance.

According to the information of COPLADE, the amount of public finance earmarked to theSoconusco region was 1,4970 million peso en 1998, of which Ramo 33 (transfer of the federal resources to development of municipal social infrastructure) represents 49%. The said finance was allocated by sector in the following manner: education (46.2%), municipal governments (23.6%), housing (8.8%), agriculture (6.7%), transportation and communication (4.3%) and others (10.5%). And, about 40% (596 million peso) of the public finance is covered by the public investment.

The source of finance for the agricultural sector at the state level is represented by the budget for agricultural credit channeled through FIRA and Banrural accounting for 40% of the total finance. The great majority of the transfer from the federal government were allocated to PROCAMPO, meanwhile about half of the state government's finance were for the subsidies used for the Alianza para el Campo.

The budget allocated to the agricultural sector of the Soconusco region reached 94 million pesos In 1998, which was distributed by institution as follows: SAGAR (40%), CNA (36.1%), Banrural (14.8%) y SAG (5.9%). Approximately one-thirds of this public finance for the agricultural sector were destined for the subprograms of the Alianza para el Campo; the Alianza para el Campo comprises a total of 17 subprograms in 1998, but its budget allocation is heavily concentrated on only two subprograms, Coffee Program and Oil Palm Program, contributing

more than 50% of relevant budget. The share of livestock sector within the total agricultural finance was as small as below 5%.

The development of social infrastructure at municipal level is carried out through FISM (Municipal Social Infrastructure Fund), which is one of the transfers from the federal government. As for 16 municipalities in the Soconusco region, a total of 86 million pesos of budget were allocated under the FISM with breakdown of: rural roads development (20.4%), rural electrification (19.0%), urbanization (16.3%), educational infrastructure (14.0%), etc. 34% of this budget were for the municipality of Tapachula and allocated budget for the rest of municipalities in Soconusco were 4 million pesos on average.

SAG of the state government of Chiapas has just exposed to the public its Agricultural Development Program 1998 – 2000 in the Coastal Area of Chiapas (Soconusco and Istomo-Costa Regions) on September 3, 1998. In this program, state government's action to be pursued, production targets, etc. are proposed in relation with coffee, soybeans, cotton seed, oil palm, banana, mango, cacao, cattle raising, plants and animals health and so on. Apart from this program, FIRA has elaborated Financing Program for Rural Development in the State of Chiapas 1998 - 2000, which comprises a number of development projects and programs classified into five components: Agriculture, Livestock, Agro-industry, Forestry and Fishing including some ones related with the Soconusco Region as given below:

a. Agricultural mechanization
b. Production and Industrialization of Tobacco
c. Expansion of sugar cane production
d. Renovation of cacao trees
e. Establishment and operation of farm for production of cashew
f. Establishment of farm for production of oil palm
g. Cattle farming development
h. Poultry farming development
i. Selection and packing of mango with equipment for hydro-thermic treatment
j. Wet processing plants for coffee
k. Oil extraction plant of oil palm
l. Commercial forestry of primavera inter-cropped with coffee
m. Establishment and maintenance of rubber tree

3.10 FLOOD SURVEY

In the beginning of September, caused by the continuous tropical torrential rainfall "Isis" and "Javier", the concentrated heavy rain hit the Soconusco Region located in the Pacific coast. As a result, many hillside collapsed and debris flowed in the upstream area. The downstream area was affected by inundation, damaging roads, social infrastructures, communication/energy facilities, agriculture, etc. The scale of the calamity could be compared with the earthquake occurred in 1985 in the Mexico city. The characteristics of the inundation and the damage conditions are as follows.

3.10.1 Characteristics of the Torrential Rainfall

A comparison between one day, two and three consecutive days maximum rainfall of the September 1998 inundation with the maximum rainfall of 200 years of return period (calculated

with the collected data until 1997) is shown in the following table. The rainfall on Margaritas and Despoblabo rivers, situated on the north-western part of the Huixtla river, reached a scale exceeding 200 years of return period. The daily rainfall isohyetal map of the inundation peak on September 8th is presented in the Fig. 3.10.1. The upstream of Novillero and San Nicolas rivers, with the most severe inundation, reached a torrential rainfall of more than 300 mm. On the other hand, the maximum hourly rainfall measured in Tapachula and Arriaga stations was 24.1 mm and 30.0 mm, respectively, considered not too high. The accumulated rainfall during the period from 3rd to 11th of September of 1998 reached 800～1,200 mm in some locations, representing about 25 to 30 % of the annual average rainfall.

(unit: mm)

Item	Station	Margaritas	Escuintla	Despoblado	Huixtla	Tapachula
Maximum Daily Rai	Set/98	341.9	263.6	271.5	194.2	149.5
	200 years	279.4	317.3	264.4	253.3	261.5
Two Consecutive	Set/98	565.4	311.8	400.0	238.7	267.1
Days Rainfall	200 years	442.7	386.7	383.8	324.0	368.7
Three Consecutive	Set/98	715.2	329.4	488.5	323.1	402.6
Days Rainfall	200 years	471.6	547.1	455.4	420.0	433.3

Source: Survey Data

As mentioned above, the characteristic of the present torrential rainfall was that the peak daily rainfall reached more than 300 mm, the duration was long and the rainfall before and after the peak was heavy. It means, the large accumulated rainfall occurred before the peak slackened the soil to make it saturated, and the torrential rainfall occurred after that increased the debris flow and inundation damages.

3.10.2 Estimation of the Inundation Discharge

The peak discharge at the bridge on the federal road as big inundation occurred in Novillero, San Nicolas, Cacaluta, Vado Ancho, Comaltitlan and Huixtla rivers were calculated by the unit hydrograph and the rational formula methods . Results of calculation is summarized below.

River	Drainage Area (km^2)	Maximum Discharge (m^3/s)	Specific Discharge ($m^3/s/km^2$)	Probability
Novillero	284.5	1,874	6.59	> 200 years
San Nicolas	125.1	850	6.79	100～200 years
Cacaluta	165.7	1,056	6.37	100～200 years
Cintalapa	227.9	1,271	5.58	100 years
Vado Ancho	170.6	795	4.66	20～50 years
Comaltitlan	240.2	1,161	4.83	100years
Huixtla	364.5	1,541	4.23	50 years

Source: Sruvey Data

3.10.3 Disaster Conditions

(1) Inundation Damages in Chiapas State

According to the disaster report of the CNA, the following damages occurred in the 23 municipalities in Chiapas state.

No.	Item	Quantity
1	Damaged Inhabitants	about 700,000 persons
2	Damaged Farmers	about 40,000 persons
3	Dead – Disappearance	207 persons
4	Damaged Agricultural Area	about 100,000 ha
5	Washed / Damaged Residences	about 16,000 families
6	Damaged Federal Road	712 km
7	Damaged Regional Roads	7,000 km
8	Damaged Railways	260 km
9	Damaged City Water Facilities	22 locations
10	Damaged Rural Water Facilities	207 locations

Source: CNA - :Operativo Costa de Chiapas, Sep.1998

(2) Agriculture Damages in Soconusco Region

According to the SAGAR documents, the damaged agricultural area and farmers in the largely damaged municipalities are as follows. Approximately 24% (98,000 ha) of the total agricultural area and 47% (22,500 families) of the farmers suffered from the flood .

Community	Agricultural Area (ha)	Famers	Total Damage		Partial Damage	
			Area (ha)	Famers	Area (ha)	Farmers
Mapastepec	94,167	6,409	49,389	2,504	0	0
Escuintla	24,551	4,635	5,579	1,919	0	0
Villa Comaltitlan	29,483	4,400	5,098	1,397	4,017	824
Huixtla	26,151	3,492	4,272	1,204	2,441	268
Acapetahua	47,212	2,392	3,924	1,390	600	185
Socunusco Region	409,534	47,464	49,389	13,195	48,995	9,273

Source: SAGAR

The main agricultural products affected by the flood are as follow, and the total amount of damage was estimated at about 544,000,000 pesos (about 6,500,000,000 yen).

Crop	Cultivated area (ha)	Damaged area (ha)	Damaged harvest (ton)	Amount of damages (peso)
Banana	12,325	3,876	116,293	325,619,280
Maize	51,527	26,209	52,419	68,144,440
Pasture	210,121	17,386	1,130,090	56,504,500
Mango	12,588	691	8,467	28,788,800
Soybean	11,713	3,908	7,035	16,180,500
Total	405,553	68,635		543,755,000

Source: SAGAR

According to the report of the UGRCC (Union Ganadera Regional de la Costa de Chiapas), the study area lost 4,097 cows, 308 horses, 3,583 pigs and 50,954 chickens. The total amount of damages was estimated at about 11.000,000 pesos (130,000,000 yen).

3.10.4 Recovery Conditions

Now, six (6) bridges namely Novillero, San Nicolas, Cacaluta, Cintalapa, Vado Ancho and Comaltitlan, are under construction in the part of the federal toll road in the Study area.

The bridge length is going to be 2 to 3 times longer after the recuperation, with the increase of the span numbers, but due to the utilization of the remaining piers and abutments, their height will be not changed. The railway had 8 bridges damaged between the Novillero and Huixla

rivers, but the recovery works had finished on 10th of November of 1998 and all lines is working at the moment. However, the works were provisional, necessitating an appropriate recovery in the future.

According to the documents from the Urban and Housing Division of the Chiapas state government, there were 4,692 houses totally destroyed and 596 houses partially destroyed in the Study area.. A project called "Nuevo Milenio" has being created to recover those residences by the SEDESOL and INPROVICH. It is planned to build 4,011 houses in the Soconusco region. The size of each house will be 38 m^2 (5.86 m x 6.48 m) with a cost of 22,000 pesos.

3.10.5 Disaster Causes

The last disaster had the following factors as causes :

1) **Meteorological Factor:** Torrential rainfall with return period over 200 years and a long duration of the rainfall.

There was a torrential rainfall of more than 300 mm with a return period of over 200 years in the upstream region on 8th of September (flood peak). Moreover, the occurrence of a heavy rainfall between 3rd and 7th elevated the water retention capacity of the soil more than the limit.

2) **Geographical Factor:** Steep relief and river slope

Due to the steep relief and river slope, many hillsides collapsed and debris flowed in the upstream basin. Because of the steep river slope suddenly changed to a gentle slope at the foot of the Sierra Madre de Chiapas mountains, there were points of sand and gravel sediments from upstream basin which reduced the flow capacity of rivers. As a result, it induced the floodings. Moreover, there were many unstable temporary deposits flowed during old floods, causing big damages at the downstream of the main rivers.

3) **Geological Factor**

Weak layer of weathering and faults

The thick weathered granite layer was founded widely at the upstream basin, meanwhile, the weak fractured rock layer distributed near the big faults. Those layers increased the debris disaster.

Geological structure of the bedding plain dipping toward ground-surface slope

The geological granite structure of the Novillero river basin is formed by a sheeting joint in parallel to the ground-surface slope (or bedding plain dipping toward ground-surface slope), which occasioned the collapse of the surface rock.

4) **Human Factor:**

Lack in the flow capacity at the road bridges and railway bridges

The lack in flow cross sections under the road and railway bridges accumulated driftwood and rocks at their piers and abutments. These accumulations dammed up the flood water, increasing the damages of the corresponding bridges and roads.

Existence of Environmental Conservation Areas

The 7 rivers between Novillero and Huixtla do not flow directly to the sea. They flow to La Encrucijada marshland including the lake and swamp. As San Juan is the only ordinary estuary to the sea, the flood elevated the water level of the swamp and increased the inundation damages. Moreover, La Encrucijada marshland (353 km^2) and it's buffer zone (511 km^2) are considered as environmental conservation areas, where the development is prohibited by a federal law, dredging of the malignant sediment in this area was not carried out and was left as being presently.

Weak measures for the flood, erosion and sediment control

The flood control works were not done in the downstream region due to the conservation area of La Encricujada marshland. Moreover, there were few erosions and sediment control works in the upstream area. Therefore, the inexistence of revetments and consolidation works of river increased the river bed erosion during the flood.

Deficient measures against disasters in the hill roads and river margin communities

Lot of the connection roads to the coffee farms, at the upstream area, were constructed in the river channel or in steep hills, without measurement considerations against disasters. So, the roads had a weak structure for being easily damages. Also, because of deficient measures for disaster, many houses and lands of river margin communities were washed away in upstream-middle basin and were buried by sedimentation in downstream basin.

3.11 RIVER SEDIMENT / DISASTER PREVENTION

3.11.1 River Sediment Prevention

(1) Flood History

The main caused of disasters in the study area are the hurricane and tropical atmospheric depressions. The documents of CNA show that the main floods occurred after 1960 were: Sept/63, Sep/67, May/72, Aug/73, Sep/74, Aug/81, 1982, Sep/84, Sep/88, Aug/95 and Sep/98, in a total of 11. It means that has a occurrence of 1 time in about 3.5 years.

(2) Flood Probability in the Main Rivers

The probable flood discharge was calculated, by the unit hydrograph method, for 2, 5, 10, 20, 50 and 100 years return period, utilizing the probability rainfall intensity equation derived from the hourly rainfall records in Tapachula. The flood discharge and specific discharge of the main points of each river are shown in table 3.11.1 and figure 3.11.1.

(3) Existing Works of Sabo and Basin Conservation Project

The responsibility of the river management in the study area is of the CNA. There are no sabo installations in the main rivers of the study area, but rehabilitation works of floods and drainage improvements. Moreover, there are no permanent installations of irrigation and electrical energy, excepting the electric generation dam in the Coatan river. As a basin conservation project, the CNA is improving the water management/earth flow conservation project in Acapetahua , Huixtla and Tapachula. The main contents of the works are utilization of agricultural products residues, rehabilitation and construction of drains, introduction of sustainable agriculture methods, terrace works, subsurface dam and installation of vegetation fence in hills.

(4) Problems on the Elaboration of the Sabo Project

The problems related to the elaboration of river sabo projects are as follow.

1) Lack of Basic Data

- The information of the 1:50,000 map was taken from aerial photographs of 1974. Moreover, there are no cross and longitudinal sections information of the main rivers.
- There are no data concerned to the water level variation in the lake of La Encrucijada swamp.

- There are few rainfall data of the upstream region. Principally concerned to hourly data.
- Long periods of not measured discharge data in main rivers. Also, there are no hourly discharge data.

2) Conservation of the La Encrucijada Swamp (Environmental Conservation Area)

The main rivers in the study area do not flow directly to the sea. They inflow to a big swamp that included the La Encrucijada lake. So, the flood water in momentaneously retained in this swamp, flowing after to the sea. The La Encrucijada swamp is composed by several lakes, canals that link them and mangrove vegetation surrounding it. It is very difficult to know the flow conditions of the water that inflows to the swamp area, due to it's complex hydraulic system. The only ordinary exit of the water is at San Juan and San Jose. There are other exits during great floods, but they are closed immediately after the flood. The La Encrucijada swamp (about 353 km^2) and the surrounding buffer zone (about 511 km^2) are conservation areas, not being allowed development works. So, the river improvement works includes only construction of banks outside the river stream, and no sediment removal was realized.

3) Deficiencies on the Approach Roads for the Upstream Region

The immediate sabo measurements are necessary on the upstream region, but the access to the work site is complicated by the low conditions of the road. The road condition does not allow transit of heavy machinery.

3.11.2 Geological Study Against Sediment Disasters

(1) Topography and Geology in the Study Area

The sediment disasters were occurred in the northwestern plane areas from the Huixtla River basin in september 1998. Many slope failures and inestable huge sediments are distributed in the upper and middle reachs of the main river channels. The main rivers run from the northeast to the southwest, but some river courses flow along geological lineament, which is located in parallel to the main mountain range. The primary streams in general have steep inclination of over 15° gradient with slope failure in their origin. In the other hand, the terciary and quaternary river courses flow gently of below 3° gradient showing inclosed meanders in some river sections. The main channel slope changes according to geological structure, lithological characteristics, etc. The river course shows rapid and slow current section alternately where coincides with hard outcrops or cobbles /boulder distribution and fine sediments, respectively. Many river courses have the alternate section of open waste-filled valley and narrow gorge, which makes a barrier to flow smoothly during the flooding. The coastal plane was shaped by th sediment supplied from the mountain area. Alluvial fan, swampy area, lithoral area, etc. are extended along the coastal line with 20-30km of range.

The geological component is divided into hard rock distributed in the mountain area and soft sediment in the plane area. According to the lithological distribution, about 70 percent of the hard rock correspond to granitic rock, 20 percent to volcanic rock and 10 percent to sedimentary rock. The northwest area from the Huixtla River basin is underlain by the granitic rocks, while the southeast area is mainly covered by the volcanic rocks. The sedimentary rocks are sporadically distributed in piedmonts. The granitic rocks are exposed to the weather with the soft crust reaching more than 10 meters in thickness, the reasons for which are taken out many slope failures in high inclinated slope and cuttings along roads. The acidic volcanic rocks, being distributed only in the upper reach of the Huixtla River basin, are susceptible to weathering and

alteration to turn fragile. The intermediate volcanic rocks show relatively hard, while the sedimentary rocks have comparatively stable lithofacies.

The crush zones extend in the mountain area, which are considered tectonically weak line, are idetifiable as lineament. The striking direction is WNW-ESE, and secondary NW-SW, ENE-WSW. The most notorious lineament corresponds to normal fault, extending by El Triunfo and Reforma village located in the upper reach of the Cacaluta River, to be traceable for a distance of about 50 kilometers. Some fault basins are intermittently distributed along this normal fault.

(2) Condition of the Sediment Production and Movement

The configuration of sediment production can be classified into the following: ① Surface Failure, ② Large.scale Slope Failure, ③ Slope Failure by Road Cutting, ④ Failure of Undercut Slope and ⑤ Debris Flow. The detailed description of cada type is shown in the Table 3.11.2. The slope failures are principally distributed in the upper reachs of the Novillero River, Cacaluta River, Cintalapa-Vado Ancho River and Huixtla River as shown in Fig.3.10.2 Disaster Map. Above all, the heavy erosions with many small-scale slope failures, the large-scale denuded hillside and huge sediments in the river bed are distributed in the the upper reach of the Novillero River and circumference of the confluence between the Gobierno and Golondrinas Rivers

Due to the afinity between the studied rivers and japanese rivers in the sense of basin conditions in upper reach, MURANO's method, which is common method in Jpan, has been applied to obtain the specific sediment as shown in the following table:

River Catchment	Sub-area	Area(km^2)	Specific Sediment (m^3/year/km^2)
Novillero	Golondrinas	30.4	2868.4
San Nicolás	Mazapa	23.9	1967.9
Cacaluta	Brazo de la Mina	12.6	2724.7
Cintalapa	El Rosario	83.5	1304.0
Vado Ancho	Jordan	37.2	1397.2
Comaltitlan	Candelaría	61.8	898.4
Huixtla	Chevolcan	38.7	997.2

Source: Study Team

(3) Conditions of Transport and Sedimentation of Collapsed Materials

The slope failures make a gradual retrocession of the slope and advance of river-head to upper side. The collapsed materials fill in the river bed containing a lot of water while some fine particles flow out to the down stream. The large-scale sediments, which are supplied from slope failures, temporally deposit in the primary and some secondary streams, but afterward the sediments are flowed down by debris flow. Some debris flows form the natural dams consisting of ordinary sediments and floodwoods, which prevent the smooth current. The destruction of those dams should be due to the sediment disaster in september 1998. The flooding water tiggers the failure of undercut slope to enlarge waste-filled valley, where river channels frequently change showing reticular and meander courses. As the valley widen, the flooding water makes a raising of rive bed, runs without control and causes great damag to the villages and agricultural and pastures lands.

(4) Hazard Evaluation of Debris Flows

The debris flow causes sediment disasters through sudden flow of sediments deposited in the upper reach. From viewpoint of geological and topographical factores, the hazard evaluation of debris flows was taken out based on the " Study Points for Hazardous Stream and Hazardous Area by Debris Flow" issued by the Sabo Department of the River Bureau of the Ministry of Construction of Japan. The results of the hazard evaluation reveal as very dangeorous stream for the majority of upper streams.

(5) Considerations

The present mountain area is covered by heavily weathered crust of granitic origen. The eroded area with slope failures will increase acceleratelly under the climate condition of rainy season from may to octuber. Simultaneously denuded hills will extend after the stripping of weathered soft crust such as arid zone. The number of slope failures will increase in the future even actual slope with few failures. Subsequently, slope failure scarps retrogress to upper side conecting with anothers, in this manner the denuded area will enlarge. Moreover, gully erosion and small-scale filures progress as far as the relatively hard rock. Otherhand, deep weathering is carried out in the granitic rock body. The slope failures area enlarges paralely with the increasing of number of them instead of enlargement of each failure.

The Novillero River basin, including their tributaries Gobierno River and Golondrinas River, shows clearly this tendency. If any works against sediment disasters are not implemented, eroded area will surely widen and get worse in the future. Consecuently, this phenomenon brings about the reduction of water holding capacity and raising of river bed in the basin to make overflowing. Finally, drastic measures against floods and sediment disasters should be taken, besides of the restoration project for social infrastructures, as soon as possible.

3.11.3 Possibles Measures against Flood and Erosion / Sediment Disasters to be Introduced

The measures against disasters are divided into flood control and sediment control. Possibles works for flood control and erosion / sediment control to be taken are shown as follow:

Object	Concrete Method	Outline	Setting Place
Flood Control	Flood Control Reservoir	A dam is constructed in the upper reach to store the peak discharge of flood and reduce the discharge.	Upper basin
	River Channel Improvement	Improvement of river channel is taken to modify the river course, section and embankment.	Middle and Lower basin
	Retarding Basin	A retarding basin has object to store temporally the flood discharge and cut the peak discharge.	Middle and Lower basin
	By-pass Channel	By-pass channel is constructed to separate the flood discharge in case when the enlargement of river section is impossible to be taken.	Lower basin
	Training Dike	A training dike is setted in the river-mouth to stabilize the river channel and prevent the river mouth closing.	River-mouth
Erosion and Sediment Control (Sabo)	Hillside Works	A protection of slope with drain, vegetation and structures is taken to prevent from the slope failure and sediment movement.	Upper basin
	Check dam (Sabo dam)	A checkdam is constructed to control the production and movement of sediments, and the debris flows.	Upper basin
	Slit Dam	A open type slit dam is setted to control the movement of large stones and flood woods.	Upper basin

Object	Concrete Method	Outline	Setting Place
	Channel Works	A channel work is constructed where running water makes a disordered flow. Revetment work and groundsel works are carried out to prevent the erosion of river-bed and rectify the meander.	All basin
Non-structural Measures	Warning and Eacuation System	Warning system such like rainfall station, river observation system and siren, etc. is required. Systematic evacuation plan is also necessary.	Upper and Middle basin

The integrated preventive measures against sediment disasters should be necessary though the combination of some methods before mentioned. The implementation of preventive works are occasionally difficult due to the restrictions arised from the land acquisition and compensation, the environmental conservation, the consciousness of local peoples and economic problems, etc. To reveal the concerning problems previously, the study for flood/ sediment control in the Soconusco Region should be realized as soon as possible.

3.12 POTENTIALES AND CONSTRAINTS ON DEVELOPMENT

3.12.1 Development Potentials

The Soconusco Region boasts of its prodigal natural resources represented by its abundant precipitation and fertile soils at national level, very favorable for the agricultural and livestock production. Since it is an important region for agricultural and livestock production for the State of Chiapas, the basis for this type of production achieve a higher level than the rest of the state; for example, there is a bountiful inventory on investigation and technical development, and the equipment of the productive infrastructure has developed relatively. The topographical diversity, together with the biodiversity contributes to the agricultural and livestock exploitation in variable lines and to the ecological conservation. The development potentials of the Soconusco Region are exposed by area, in more detail as follows.

3.12.2 Governmental Policies

Mexico is affiliated to the North American Free Trade Agreement (NAFTA). NAFTA went into effect on January of 1994, pretending to eliminate, by stages, regulations and customs tariffs on imports with agricultural and livestock origin, which will facilitate the export of Mexican products toward the United States and Canada markets. Under this situation, agricultural products of the region which are produced under this peculiar climatological condition and which employ relatively cheap labor, will constitute a comparative advantage in the NAFTA framework.

It is expected an increase in trades with the participation in the NAFTA. But in other hands, the free market will induce to competitions with the American and Canadian products affecting the market.

From the agricultural policy point of view, there is a low tax loan to small farmers for fixed guarantees per hectare, to produce grain and vegetal oil by the PROCAMPO. And the farmer can receive economical and technical assistance from the Alianca para el Campo. Also, the article 27 of the revised constitution allowed the increase in lands and agricultural activities for ejido farmers.

As mentioned before, the government is decreasing gradually it's participation in the market and is attenuating it's intervention. The decentralization is also occurring in the agricultural sector

with the transference of responsibilities from SAGAR to the SAG. But, it is appearing superposition of works and insufficiency in the organization due to sudden transference, which is affecting the planning and assistance structure. Also, the revision of the constitution by the article 27 extinguished the agricultural portion, which made not possible settlement programs.

Half of the Chiapas state budget depends on the federal government, making difficult the realization of independent programs. Also, there is no long term development plan, the longest is for 6 years according to the govern period.

The present region is relatively developed socially and economically in the Chiapas state. So, many agricultural development projects and foreigner poverty attenuation programs have not being applied in this region.

3.12.3 Rural Society

Among the past agriculture and livestock development policies of the Mexican government, the importance of producers' organization was emphasized and the nurture of the organization had been enforced. As a result, in the area, each organization of village autonomy, producers and rural women, have an experience of the organization and its management. Consequently, formation of the producers' association is comparatively facilitated. The trend of these organizations depends greatly on leader's nature and quality. Because the several autonomous organizations are managed effectively and rationally, it is expect to development and improvement of the community and democratically management of the organization through the training for group leadership formation.

In rural zone of the area, the ejido is widely distributed and it occupies 42.4% (47% of the rural population) of the total area. The organizations lack group consultation system democratically owing to low farming awareness and unorganized farmers of the ejido. Furthermore, management of the existing organizations has an influence on leader's nature. In the society of small-scale private farmers, strong community sense is constituted from the formation of settlement. Also, the quality of management is determined by leader's nature as same as the ejido. On the other hand, the community activities are restricted caused by lack of staff and facilities and equipment of the public institutions of the federal and state, and lack of staff training for qualification improvement, and lack of operating funds.

Almost the producers' organizations are established aiming to obtain the credit, and it can be seen that most the organizations does not functioning by the default of members. The activities of producers' organization are inactive caused by the traditional farmer's consciousness and behaviors, moreover, poor relationship with producers' organization and the outer system (administration and markets).

In villages of the ejido, voluntary women who have interest in the women's activity organize UAIM. Most of them are not functioning as the organization because there is no leader with strong leadership. In addition, low educational level of rural women and rural society environment (the male-dominated society) cause an obstruction to the organization of rural women, and also hinder rural life improvement and participation to community activities.

Technical secondary school of agriculture and livestock, which educates farmer, has constraint on the educational activities caused by poor educational facilities such as materials and equipment, farm for practical training, animal sheds and animals for education. Low literacy rate and educational level in rural area are restricted in the introduction of new agricultural technology, and organization of farmers and its management smoothly.

3.12.4 Use of Natural Resources

(1) Water Resources

1) Rainfall

The annual mean rainfall in the region fluctuates between 1,000 mm and 5,000 mm; the area of low precipitation is located in the coastal plain, while the middle sector in the mountainous area boasts of high rainfall. The rainfall pattern in the region is characterized by its outstanding inequality in its seasonal distribution, which demands an irrigation system during the dry season if agricultural and livestock productivity wants to be increased and agricultural boundaries are to be widened. As mentioned before, there is an outstanding inequality in the rainfall distribution during the rainy and dry seasons, and most of the annual rainfall is concentrated from the month of May to October. During the rainy season, rainfall overcomes evapotranspiration by a large margin, making it possible for crops to be planted requiring a larger amount of water under seasonal conditions. Soconusco Region can be classified into the following zones, according to the rainfall pattern:

Zones	Annual Precipitation (mm)	Rainfall in Rainy Season (mm, %)	Evapotranspir-ation (mm)
Coast	1,131	1,093	1,653
Plain	1,359	1,304	1,587
Beginning of Southern Plain (Near Tapachula)	2,101	1,964	1,548
Beginning of Plain (Near Escuintla)	3,249	3,059	1,507
Beginning of Northern Plain (Near Mapastepec)	2,407	2,298	1,638
Higher Part	3,876	3,431	1,133
Slopes in the Sierra	1,270	1,156	1,270
Regional Average	2,449	2,254	1,428

2) River Water

Because of the variance of the rainfall pattern with low rainfall in the dry season and the land factor of which has a steep inclination of river course, the exploration of water resources in a upper stream is difficult. Also, the life period of the structure will be short because of the high level of sedimentation volume.

The difference in the dry season and the rainy season is big like the rainfall quantity and there are few rivers with the flow rate which was stable through the year in the flow rate of 13 rivers in the area. The discharge rate in the rainy season isn't utilized as resources and is flowing on the direct sea or at the marsh band. As for the discharge in the dry season, most are used as irrigation and potable water and the new use is difficult. As the possible-ness with the source of water development, small scale intake in the upstream part and the construction of dam in the midstream part are thought of.

River name	Basin	basin(>100m)	Estimated Discharge	Irrigated Area	Estimated Minimum Discharge	Estimated Required Water	Water Balance
	(Km2)	(km2)	(m3/S)	(ha)	(m3/s)	(m3/s)	(m3/s)
Suchiate	196.2	153.9	-	2,551	22.5	10.4	12.1
Cosalapa	299.2	17.1	1.2	7,471	-	-	0
Cahuacan	557.7	192.4	13.4	8,008	4.6	9.0	-4.4
Coatan	469.3	227.2	15.8	6,226	3.1	6.3	-3.2
Huehuetan	726.9	366.8	28.3	3,969	2.2	4.4	-2.
Huixtla	799.9	487.6	14.7	1,072	0.3	1.2	-0.9
Comaltitlan	787.3	307.2	10.6	1,463	1.2	1.6	-0.4
Vado Ancho	333.5	168.2	7.5	155	0.5	1.2	0.3
Cintalapa	483.5	240.6	10.8	755	0.7	0.8	-0.1
Camargo	162.6	44.2	2.0	548	0.4	0.6	-0.2
Cacaluta	450.8	191.2	10.5	681	0.8	0.8	0
San Nicolas	570.2	215.5	11.8	515	1.6	0.6	1.0
Novillero	406.5	281.1	15.3	699	0.5	0.8	-0.3

3) Water from Small Lakes

There are several small lakes in the region, mainly in the coastal plain. In order to use these resources, it is indispensable to count with pumping system equipment, which requires an elevated expenditure for its operation and maintenance. On the other hand, the coastal plain is located near the Protected Natural Area "La Encrucijada" and therefore special attention should be paid on its development from the ecological conservation point of view.

4) Underground Water

Considering the high capacity for aquifer recharge in the upper basin, it is judged that there is a large inventory of underground waters. Nonetheless, in spite of its high potential, its actual utilization is limited to a very low level, leaving many perforated wells without being effectively used. Due to a high cost of equipment for operation and maintenance, the exploitation of underground water for pumping should be oriented to plant crops of high profitability. Therefore, the intensive use of the existing wells is recommended to cut down the investment required for the development of underground water.

(2) Soil Resources

The lad use in the region, the use for the annual crop production occupy 25.3% and forest land occupy 25.1%, following the pasture and coffee cultivation.

The part adequate for the agricultural use ranging from 20 m to 100m is utilized for the cultivation land. Green land is account only 4% in this range. There is no room for new development, because of the 95% of the land are utilizing.

Land Use

Land Use	Occupation rate (%)
Urban Area	1.2%
Green Area	25.1%
Swamp Area	7.8%
Orchard	9.7%
Coffee	14.4%
Annual Crop	25.3%
Pasture	16.6%
Total	100.0%

A green land part is distributed over the area, the swampy area with bad landform condition and the upland part with the elevation of equal to or more than 1200 m and the rate to account for to the whole becomes about 25%. The green land rate in the area which excludes a swamp and an upland part becomes low and is the top of the place to maintain the preservation of the area and the forest in the marsh part and the upland part is charged with a very important role.

From the point of conservation, the coffee plantation which is a major activities of the region, occupy 70% of the land distributed in a ranging from 400m to 1200m. This coffee plantation has a significant meaning in a preservation of lora resources and the control the erosion.

The land utilization area according to the inclination degree (ha) a)

Land Use	0-12°	12-35°	> 35°	The total
Annual Crop	133,763 63	22,089 89	1,992 2	157,844 4
Coffee	35,317 17	51,281 81	3,029 9	89,627 7
Pasture	100,777 77	2,632 32	102 2	103,511 1
The cacao	16,113 13	613 13	3 3	16,729 9
Mango	20,773 73	10 10	0 0	20,784 4
Other Crop	23,090 90	0 0		23,090 0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Swamp	45,827 27	0 0		45,827 7
Othrs Use	77,791 91	74,799 99	14,328 8	166,918 8
Total	453,452 52	151,425 25	19,454 4	624,331 31

In a coffee plantation, the land with the slope more than 12 degree occupy 240,000 has. Owing to the difficulty of the introduction of modernized farming practice and the erosion problem, the productivity in this area are very low, resulting as a reason of poverty. Moreover, the fertility of the soil is low, owing to the lack of the use of organic materials in a long term.

According to the Study for the Land Suitability realized by the Study Team, the crop cultivated in a suitable lands in Class 1 is very scarcely, major of the crop are carrying out the cultivation at the land suitability for crop are not so adequate. According to the Study, the crop of witch are cultivating on the non-adequate land are the coffee, cacao and the annual crop cultivated in a steep land.

The distribution according to land production in the present state crop production area (%)

Crop	Clase 1-2	Clase 3-5	No Adequate
Annual Crop	51.9%	32.3%	15.8%
Pasture	89.8%	18.1%	14.3%
Coffee	4.9%	32.4%	62.7%
Mango	79.7%	19.8%	0.5%
Banana	88.7%	3.5%	7.8%
Cacao	27.2%	24.6%	48.1%
Palma	93.0%	6.5%	0.6%
Other fruiter	0.0%	0.0%	0.0%
The total	53.4%	26.2%	25.6%

(Note: The annual crop was judged having the corn as main product).

Judging from the land suitability for each crop, except for the mango banana, cultivation is done in the low suitability area or unsuitable place. Especially, the cultivation on a steep land resulting the increase of the cultivation expense and the problem of the soil degradation, becomes a main factor for the oppression of the farmer's economy.

3.12.5 Agricultural Production

The Soconusco Region, where a tropical humid climate predominates, is suitable for tropical fruit production exportable to the United States market. Furthermore, the diversity of crops that is achieved by the use of different altitudes on the cultivated fields could constitute the comparative advantage to invade the Central American market represented by Guatemala and El Salvador.

Observing the evolution of the predominant crops in the region, after the drop of cotton cultivation, there was an immediate introduction of soybean, sesame, etc. and this fact suggests that the producers of this region are capable of an adequate management of their property (finca) and that they are very interested in the introduction of non-traditional products.

A green land part is distributed over the area, the swampy area with bad landform condition and the upland part with the elevation of equal to or more than 1200 m and the rate to account for to the whole becomes about 25%. The green land rate in the area which excludes a swamp and an upland part becomes low and is the top of the place to maintain the preservation of the area and the forest in the marsh part and the upland part is charged with a very important role.

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On the other hand, some small producers anxious of employing advanced technology, embark themselves in growing Rambutan or cut flowers, contracting specialized agronomy engineers. In summary, agricultural activity should be oriented towards crop diversification and the intensive use of land, based on advanced technology.

The agriculture of environmental protection type has being introduced in this region too. It has being produced grain with no plowing and coffee with organic cultivation to prevent erosion. Also, the 2 conservation units located in the mountainous and coastal area in the region make necessary the inclusion of the local flora and fauna to make possible a development in harmony with the environment.

One of the factors for the production decrease in the region is the lack of financial resources. This lack doesn't allow the acquisition of fertilizers, improved seeds and chemical products, decreasing the products quality and the soil properties. Moreover, there are location of improper cultivation and, as is cultivated only once a year, it is easily affected by the climate and market conditions.

The lack of agricultural information and techniques (diseases, plagues, new varieties, market, etc) makes the farmer unsure about the investment return. So, they do not invest actively in the agricultural sector.

The lack of economical resources does not allow the contract of labor force, and the cultivation is realized by the farmer's family. So, only part of the land is cultivated and there are lands cultivated with no inputs. Also, with the improper utilization of machines and lack in organic matter result in the soil deterioration.

The soil deterioration occurs not only due to the decrease of the fertility, but to the soil erosion too. The erosion occurs by the improper land utilization, cultivation of steep lands, not enough introduction of erosion protection methods, etc. Also it can be mentioned the lack of protection methods as cover vegetation, improvement of soil physical properties and the introduction of sustainable agriculture. The soil flow from the upstream area not only implies to the deterioration of the soil in this part, but the sedimentation of soil in the swamp area in the downstream region. It will affect the downstream environment of the mangroves and fishery activities.

The inhabitant of the environmental protection area realized the cultivation of grains and coffee, wood extraction and hunting, having low recognition of the environmental conservation. So, as the environment conservation will give few benefits for the inhabitants and the not existence of alternative cultivation methods, not is allowed an effective utilization of the resources of the surrounding environment from the production activity point of view.

The effective utilization of the region's privileged resources must be preceded by the analysis of the present situation to the elaboration of plans. But the actual available information is hold by different organisms, not being published yet, making difficult the transference of this information between them. So, the insufficiency in sharing the information makes difficult the planning of the agricultural development, agricultural production infrastructure, improvement of social infrastructure, environmental protection, etc.

3.12.6 Livestock Production

The number of swine and sheep heads in Soconusco is the highest within the 9 regions in the State of Chiapas and poultry occupies the second place. Therefore, this region could become the supply center for cattle of smaller species for the other regions in Chiapas and for the other

states of the country as well. Since there is a women's association that grows swine in the municipality of Suchiate, cattle growing of smaller species could be promoted between small producers and Ejido farmers taking advantage of the comparative advantage of the region, which is subjected to the formation of farmers organizations as well as to the increase of grain production for cattle feed and the improvement of relative technology.

Accounting for the great amount of fertile pasture, bovine cattle growing will be intensified carrying out silage and by using dry grasses leaving the margins within the pasture land for growing grains for cattle feeding. On the other hand, in this region there has been an introduction of the Central American cattle breed for double purpose, which has a great capability for the climatic condition of Soconusco. By strengthening research, reproduction and diffusion of this breed, making the most of the tropical region advantage, the recovery of the cattle growing boom is expected.

3.12.7 Research and Extension of Agricultural Assistance Technology

The present region has development research capacity with high level in public and private research organisms. They distribution capacity for seeds and seedlings developed in this organisms is high. The private seed firms is producing it's own hybrid corn seed, having a high capacity to assimilate new demand necessities. So, the joint participation of those organisms can increase the agricultural research and assistance capacity.

From the rural extension point of view, the CADER and PEAT extension staff, despite of the limited number, has great knowledge about the area and has good communication with the farmers.

But the technology developed by the INIFAP and the technical transference / extension had being stopped. The main reason for that is the lack of financial conditions and not sufficient organization. The extension service is affected by the responsibility transference from SAGAR and SAG, small budget that incurs in staff lack, lack of equipment, etc. Also, the short term contract with the PEAT not make available a constant and opportune assistance.

3.12.8 Rural Financial Agency

The utilization of PROCAMPO and Aliansa para el Campo loans can reduce the farmer investment with own resource to half. The repayment occurs with low interests. Also, the FIRA loan is composed by a package with the technical assistance, that increases the possibility of a profitable production.

But the present region has several cases of not repaid loans, limiting the benefited farmers due to the severe selection of the receivers. On the other hand, the bank has few resources due to the not repaid loans. Also, the impossibility of future prevision of the agricultural processing sector results, in many times, in delays in the loan supply.

3.12.9 Agricultural Infrastructure

The region has an abundant annual rainfall, but it is concentrated in the rainy season, having a shortage of rain in the dry season. So, the irrigation is necessary for the agricultural production increase during the dry season. There are more irrigation activities than in 1970, the large scale irrigation district, the 46th irrigation district, with a total area of approximately 8,600 ha, and 140 small irrigation units extend to a total of approximately 33,600 ha. It is worth pointing out that of the existing small irrigation units, there is a surface of 9,900 ha where presently there is no irrigation and it is possible to supply water for irrigation to these units by the rehabilitation of

their obsolete installations, invigoration of users association, changing to profitable crops, searching a new water source, etc. The government also offers financial and technical support in the equipment of the irrigation system (ferti-irrigation) under Alianza para el Campo.

The improvement projects for the network of rural roads and drainage system, which CNA is in charge of, are not being sufficiently implemented since the cultivated fields are left in a marshy state during rainy season. These lands, once the drainage works are completed, will be able to improve their agricultural and livestock productivity.

Aiming to improve the operation and maintenance of the irrigation and drainage projects, the government opted to transfer CNA's responsibility of this task to the users at national level.

The majority of the irrigation units in the region are constructed as small scale because there are very few rivers that consistently supply water for irrigation throughout the year. Wherever there is not enough supply of river water, it gets complemented with underground water, increasing the operation cost of a property under irrigation. In the small irrigation units, on the other hand, water is not used rationally due to bad maintenance or deterioration of irrigation facility.

The drainage facilities are not sufficient in low land area, the agricultural activities are stagnated due to flood and inundation problems. There are a few rivers have its outlet all time opened to sea. Many rivers present interruptions in the flux and estuary, decreasing the flux capacity of the river in the drainage outlet and downstream areas. But, the not existence of studies in this type of area, the reasons of bad drainage conditions are not clarified yet.

3.12.10 Rural Infrastructures

The equipping of the infrastructures is being developed and this delay stands out in the road network and in the water supply system in the rural area; in contrast to the development of the main roads, rural roads are not paved and lack the maintenance services. Even so, in order to join the rural sector with the main roads in Soconusco, the road network has accomplished a density higher than the mean of the State of Chiapas and this road system will serve as a base to facilitate the transportation of agricultural and livestock products subjected to the strengthening of the regional roads, as well as to the continuation of the rural roads.

As to the attention of potable water in the rural area, since it is easy to extract water for domestic use from sources such as rivers, streams, springs and deep wells, the piped water projects will be started without confronting severe obstacles.

The rural roads become impassable during rainy seasons. This is the case of the delayed paving as well as the lack of machinery to maintain the roads. The road maintenance machinery is not sufficient for the periodic maintenance in the rainy season.

The coverage rate for piped water is very low (around 10%) in rural communities and as a result, there are many registered cases of epidemics caused by the low quality of water that is being consumed. The present installations for drinking water are not operated nor maintained appropriately due to the lack of knowledge and technology of the personnel in charge. River water, on the other hand, does not maintain the quality demanded for domestic use, and is being contaminated with domestic and industrial wastes. Meanwhile, the underground water, in spite that its quality is considered as healthy for domestic use, lacks information on its exploitation stage.

There is hardly any rural housing equipped with drainage system and in the urban zones the drainage system does not operate satisfactorily due to the lack of maintenance. The scarcity of

financing constitutes another factor that leaves the municipalities in the development of drainage system.

Electricity arrives to almost all of the communities of the region, although some rural communities lack equipment for the distribution of electricity.

3.12.11 Commercialization System

The 4-lane highway (Pan-American Highway) goes from the west region to the east and a trailer with merchandise travels this road towards the United States border in 48 hours. On the other hand, the Pan-American railroad, in spite of its slowness and bad rail maintenance, is also used to move corn, sugar, sorghum, coffee, fertilizers, etc. and it goes from Ciudad Hidalgo, in Suchiate municipality, up to the ports in Salina Cruz in the Pacific Ocean and Coatzacoalco in the Gulf of Mexico. Apart from these two systems, in the southwest end of the region is located the seaport of Puerto Madero which has protection infrastructure, wharves and warehouses, although it does not register cargo movement since 1993. Therefore, the Soconusco region has the necessary infrastructure for transportation to move agricultural and livestock products to other states of the country and abroad.

Unlike the rest of the country, the Soconusco region boasts climatic and topographical diversity, which facilitates the diversification of agricultural and livestock activity; in particular, the region occupies the first place in the production of crops such as coffee, cocoa, palm oil, soybean, sesame, cashew, sugarcane and sorghum, and the production of tropical fruits represented by banana, mango and papaya also flourishes. With this crop diversification there is enough supply of raw materials in order to promote a better development of the marketing and agroindustry system. On the other hand, in the cattle sector, bovine cattle breeding stands out and raising of smaller species (swine and poultry breeding), which is at the same time, a promising activity by making the most of the comparative advantage of the region. The development of the cattle sector will increase the demand of crops for cattle feeding, as well as for the byproducts derived from agroindustry. This stage will contribute to the increase of value added in the agricultural and livestock production of Soconusco. The commercialization of basic grains is carried out utilizing the storage infrastructure of BORUCONSA, DICONSA, etc. and it will be strengthened with the rehabilitation of the existent infrastructure and upon increasing the number of warehouses near the production areas.

In Soconusco there are some agricultural and livestock entrepreneurs who have started non-traditional and innovative businesses, as well as production and export of organic coffee, cultivation and export of cashew, papaya and banana, artificial reproduction of bovines with Australian technology using AFS breed, etc. and these entrepreneurs will be a motivation to promote these successful businesses amongst the farmers of the region. Regarding the institutional services, FIRA grants financing with preferential interest rates and Fondo-Chiapas supports the technical aspect (execution of feasibility study, etc.) in coordination with creating incentives to invest in the development of commercialization and agroindustry system

3.12.12 Conservation and Utilization of the Environment

The region relies on a great wealth of fauna and flora thanks to the topographical diversity: the vegetation cover is so large that it supposedly reaches 60% of the regional average; the vegetation distribution is very variable from the mangrove swamps in the coastal plains to the high Evergreen Cloud Forest, while a large amount of animal species is dispersed throughout the region. Besides this flora and fauna diversity there are zones susceptible for exploitation with ecotourism in the reserves of El Triunfo and La Encrucijada and in the future candidate area for reserve, the Tacana Volcano. Upon exploiting ecotourism in the reserve zones, it is a

prerequisite to pay special attention to the coordination between the environment and its local population.

Also, the local population's conscience on the adequate management and conservation of the natural resources is high and for example, organic coffee plantation and the practice of soil conservation has started in order to avoid erosion. Based on this high consciousness of the local population, environmental conservation projects could be facilitated.

The conservation units have enough resources to sustain the local inhabitants. A development considering the surrounding environment can maintain the living condition of the local inhabitant.

The present area had abundant flora in quantity and area. But the coffee cultivation and other agricultural activities are decreasing it. The traditional coffee cultivation of the local small farmers has low profits. So, they are trying to introduce modern methods and are destroying the natural vegetation, realizing shifting cultivation that incurs in fires, which are decreasing the important natural vegetation. Also, the silviculture, considered to be a profitable sector, has no forestation activities in the present.

The drinking water quality degradation is due to not existence of sewerage facilities at the upstream area and the not treatment of the coffee processing water. The downstream water deterioration is due to the sugar industries and other agricultural activities, city wastes, lack of sewerage installation and agricultural chemicals.

The present region has not sufficient environment measure which is affecting the forest resources. The main reason is the lack of environment information and monitoring structure. The environmental information lack is due to the not sufficient study in this sector and not appliance of the other studies results in this sector. Also, the monitoring system is not well improved in the region.

There are many disasters in the region which has different sources depending to the area. The upstream area has soil erosion due to agricultural and silvicultural activities. The middle stream has flood occurrence and farmland deterioration due to the sedimentation of eroded soil from upstream. The downstream is affected by the aquifer and eroded soil from the upstrream, that is affecting the conservation area too.

There is no facilities to prevent natural disaster in the region. So, the need of studies in this sector, to elaborate perpetual measures and plans, is evident.

3.12.13 Summary of Development Potentials and Constraints

The potentials and constraints on development of the agricultural, livestock and rural development of the Soconusco region may be resumed as given in the table below.

Sectors	Potentials	Constraints
Policies of federal and state governments	• Expansion of agricultural exports to the markets of USA and Canada owing to liberalization of trade of agro-products under NAFTA. • Farmers can get fixed amount per ha for production of grains and oleaginous crops under PROCAMPO. • Technical and financial assistance is provided in line with "Alianza para el Campo". • Even ejido farmers can expand their farm land and farming activities as a consequence of the constitutional reform of the article No. 27.	• Competition in agricultural trade with products made in the USA and Canada is reinforced under NAFTA. • Abolishment of guaranties prices for crops other than maize and beans. • No further land distribution projects is carried out as a result of the constitutional reform of the article 27. • Coordination between SAGAR and SAG is inadequate in the process for transfer of functions and responsibility. • Greater portion of the public finance of the state government depends on transfer of fund from the federal government, so planning of development project on the initiative of the state government is difficult. • Development plans are prepared for the term of the administration of the state governor and no medium- and long-term plans are forged. • The economic region of Soconusco is socio-economically developed within the state of Chiapas, so the region is vulnerable to exclusion from social development programs/projects.
Rural society	• Already exist producers' and women's associations which have experience formation and administration of rural organization. • Rural organization may be reinvigorated with empowerment of leaders of associations.	• Leaders of associations are not capable of administrating their organization adequately. • Individualism prevails. • High illiteracy and fertility rates among rural women.
Natural conditions and resources	• Abundant rainfall • The amount of rainfall in the rainy season is so plentiful that makes it possible to cultivate crops which require much water under rain-fed condition. • Small streams and tributaries are distributed widely and an intake of water in small scale from them is possible. • Diversified climate and topographic conditions owing to the variety of land elevation from coast to 2,000 m enable to realize diversification of agricultural and livestock activities.	• Seasonal irregular distribution of rainfall is predominant with extremely small amount of rainfall in the dry season. • Even though high precipitation is expected in the rainy season, the use of this resource for irrigation purpose is not convenient because of significant land slope condition together with limited basin area. • The cultivating capacity of water resources at the upper basin is far small in comparison with the abundance of precipitation. • There remains very small room for additional use of river discharge at the dry season. • Slope of river course abrupt and river courses contain soil sedimentation

Sectors	Potentials	Constraints
		coming from upper reach. • Riverbed at upper reach of the plain basin is composed of gravel, so intake of water there is not easy.
Agriculture	• Climate condition favors production of tropical fruits to be exported to the North American market. • Variation of topographic and climate conditions enable to realized diversification of crops • Farm management ability of farmers is high and farmers are ready to accept innovated farming technologies and to introduce non-traditional crops such as flowers and rambutan. • Farming system is oriented to environmentally friendly agriculture represented by use of organic materials. • Some groups are promoting organic cropping system. • Farmers are highly concerned with soil erosion. • There are many conventional fauna and flora which may be used as regional advantageous products.	• Quality of agricultural products is inferior. • Less farm inputs are used due to shortage of financial resources among farmers. • Cropping activities are incomplete without employment of necessary farm labor force. • Delay in farm mechanization and joint-use of farm labor force. • Crops are not necessarily cultivated according with land suitability. • Natural conditions are not utilized in an adequate manner. • Farming technology is under-developed. • Single cropping and mono-culture are vulnerable to remarkable loss as a consequence of substantial change in climate and market conditions. • Soils are deteriorated in their chemical property without being used fertilizers. • Physical property of soils are deteriorated as a result of farm mechanization and deficit of organic materials. • Farming practice at abrupt lands causes soil erosion.
Livestock	• Consumption of meat is increasing as the change of the diet among Mexican people. • High marketability of livestock products at domestic and neighboring countries' markets • Farmers are interested in raising swine, poultry and other miner animals. • Productivity of pasture is high, so intensified livestock activity is viable. • Medium and small livestock farmers leave some portion of their land without cultivation and they may be used for cultivation of fodder crops.	• Lack of high-quality breeds • Inadequate system of animal health • Livestock farmers are decreasing due to social conflict. • Livestock farming techniques are not appropriate • Shortage of slaughter house and absence of quality control. • Under-utilization of livestock resources biased with conventional livestock farming system. • Inconsistent supply of animal feeds declines livestock productivity.
Research and extension of farm technologies	• Research and development capability of public institutions are high. • Supply of seeds and plants by public and private agents is consistent • Extension workers are familiar with rural conditions.	• Number of extension workers as well as materials and equipment at extension offices are deficient. • Demonstration farms are in shortage without being allocated necessary budget. • INIFAP's budget is deficient • Fruits of research developed by INIFAP

Sectors	Potentials	Constraints
		are not thoroughly transferred to farm level.
Rural finance	• Preferential credit system oriented to small and marginal farmers is available. • Making access to "Alianza para el Campo", farmers can reduce their farm investment by 50%. • FIRA's credit accompanies technical assistance services. • FIRA has a number of qualified engineers and has established valuable agriculture-related information and flexible evaluation system.	• Access to rural credit is difficult because of rigid eligibility of users. • Resources to be allocated to rural finance are not enough. • Soar loans are outstanding. • Banks are declined to provide credit to agro-industry sector, because it is not easy to make precise profitability analysis of the sector.
Agricultural production infrastructure	• An inventory of irrigation projects carried out from 1970. • Operation and maintenance of irrigation system is made by water users' association and institutional arrangement related with this privatization process is made. • There are about 21,600 ha of lands which are irrigable but not put into cultivation. • Land reclamation projects such as rural road network and drainage improvement are developed at plain area.	• Rivers with consistent discharge throughout the year are very few. • Low irrigation efficiency. • Physical deterioration of intake facilities. • Elevated cost in operation and maintenance of irrigation system depending on groundwater. • Lack of data and information relevant to development of groundwater. • Drainage system development is under-developed.
Rural infrastructure	• Trunk road network is well developed and maintained. • Water supply system at urban area and its surrounding zone is consolidated. • Potential on development of groundwater for use of domestic water supply is high. • Electricity is provided to all municipalities. • Supply capacity of electricity is sufficient. • Public telephone system is installed at most of rural communities. • Where public telephone is not installed, radio communication network provided to public health center is available. • Primary school and kinder garden are located at many rural communities. • Educational facilities at urban area attain satisfactory grade in quality. • Public health system at rural area is satisfactory in quality.	• Operation and maintenance of water supply system is inadequate. • Water supply network at rural sector is deficient. • There are some sectors at rural areas in which electricity distribution facilities are not functioning well. • Demand for telephone among farmers is low because of less income level. • Educational equipment is inferior in quality. • Epidemic diseases stemmed from potable water are common.
Agricultural marketing system and agroindustry	• There is a room for expansion of consumption in tropical fruits both at domestic and international markets. • Transportation infrastructure network of commodities is relatively developed.	• Producers are not in a position to make direct access to market and prices of farm products are fixed by middlemen. • Without proper and timely market information, producers can not make

Sectors	Potentials	Constraints
	• A variety of farm produces are potential raw materials for agroindustry. • By-products derived from agroindustry may be used as feeds for animals.	marketing strategies of their products to receive an optimum price. • Exportable crops are vulnerable to significant price fluctuation. • Market-oriented producers' association is not organized. • Deficient value-added of farm products due to under-development of agroindustry. • Processing facilities of farm by-products are scare. • Inferior quality of farm produces discourages their better marketing.
Environment	• Biodiversity owing to topographic variety and land elevation. • Resources for ecotourism (Tacana Volcano, El Triunfo Natural Protection Area, etc) exist. • Proportion of vegetation in the region as a whole is high. • Local inhabitants pay attention to forestation and some of them have realized it. • Development in harmony with environment at the vicinity of natural protection areas is viable.	• Water contamination caused by domestic and industrial sewage. • Air pollution in relation with fire at mountain zone. • Excessive use of herbicides. • Environmental monitoring system is not consolidated. • Investigation on environmental resources such as exotic species is not made satisfactorily. • Legal arrangement regarding ecological reserves is not made. • Low morale of local population relevant to environmental conservation. • Environmental education is under-developed. • Sustainable farming practice to coordinate production activity with environment is not established. • Access to credit for environmental conservation purpose is difficult.