CHAPTER 4 DEVELOPMENT PLAN

CHAPTER 4 : DEVELOPMENT PLAN

4.1 DEVELOPMENT SCENARIO

4.1.1 Basic Orientations

Development plans to be forged under the present master plan shall aim to be a viable one, which is suitable to prevailing rural society without confronting any severe obstacle. So the benefits to be produced there from shall be extended to as many strata as possible, covering the whole community of the region. The agricultural, livestock and rural development plan comprises various fields, as well as an extensive area, so an integrated approach in formulation of development plan is critical.

4.1.2 Development Targets

(1) Target Year

The target years of the present master plan shall be 2005 for the short-term, 2010 for the medium-term and 2020 for the long-term. Programs and projects will be set in view to attaining development objectives by the end of respective term.

(2) Development Objectives

The final target of the present master plan is to raise farm income and living standard of small farmers by the optimization of natural resource utilization in the region. The following measures will be taken to accomplish this target by 2020.

1. To ameliorate rural society to shatter prevailing stagnated situation
2. To develop agricultural and rural infrastructure and to strengthen institutional supporting services to farmers
3. To improve marketing system of agro-products with emphasis paid on upgrading small farmers' farm operation
4. To decelerate an environmental degradation

(3) Proposed Beneficiaries

The proposed beneficiaries of the master plan shall be in principle the marginal small farmers and ejidatarios (both farmers, hereinafter referred to as "small farmers"), although farm entrepreneurs are also conceived in view of invigorating economic activities of the region as a whole.

4.1.3 Basic Concept for the Formulation of the Development Plan

In formulation of the development plan of the present master plan, attention is to be paid to coordination with the development policies of the federal and state governments. At the same time, efforts are to be make to a better use of these policies. So the development plan would be formulated within the context of these governments' policies.

(Measures to relax constraints on development)

- Encouragement of agricultural production to eliminate competition with other member countries of the NAFTA (Labor-intensive farming and tropical fruits).
- Supporting policies to small farmers under the progress of deregulation and elimination of intervention of the Federal Government
- Strengthening of the federalization process from SAGAR to SAG
- Implementation of projects not dependent on agrarian reform program
- Reduction of fiscal dependence on the transfer from the Federal government

On the other hand, in view that the external constraints have significant influence in the process of the development plan formulation, thus the development plan contains necessarily measures to relax these constraints.

With the modification of the article No. 27 of the constitution, agrarian reform projects have not been put into implementation since 1992, so agricultural development projects should be oriented to encouragement of small and marginal farmer without taking into account of agrarian reform program.

In so far, as the rural finance system is concerned, the constraint consists of the difficulty in access to rural banking institutions from the part of small farmers or not timely available if credits are provided to farmers. In this connection, the proposal on improvement of rural finance system aims to ease this difficult rural financing channel. Furthermore, banking institutions are reluctant in rendering their credit services to agriculture-related marketing system improvement and/or agroindustry development, because the difficulties in estimating the profitability of these enterprises under unforeseeable marketing conditions in the future; strengthening of marketing information services is thus essential.

(Measures to reflect the actual situation)

- To expand benefits of projects as widely as possible
- To improve access to rural finance system
- To develop market information system so as to make better marketing prospect in the future

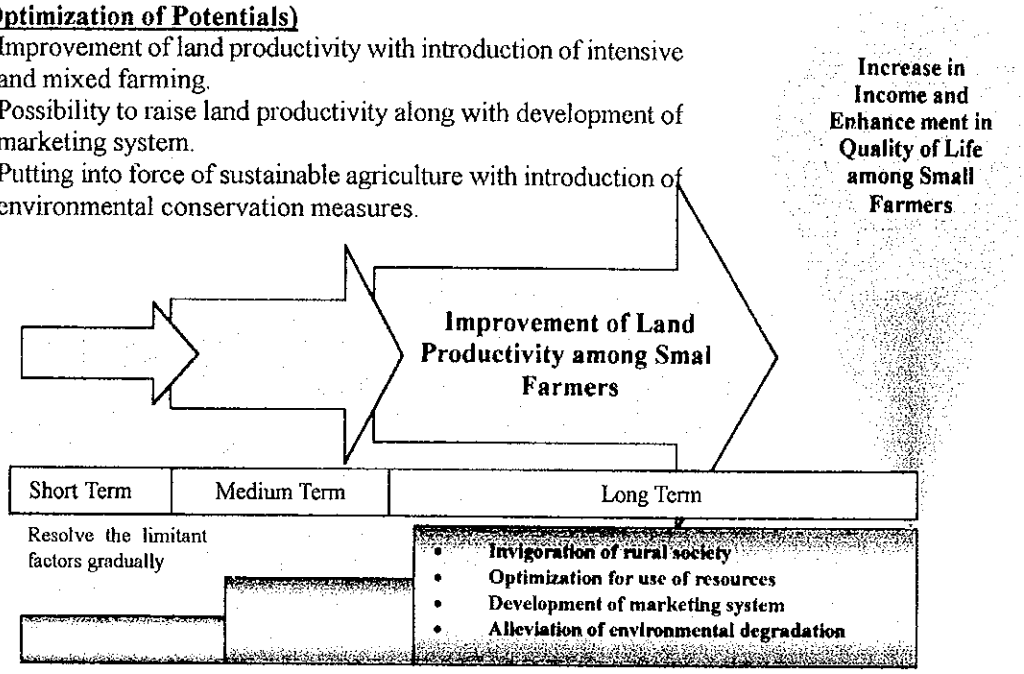
4.2 DEVELOPMENT STRATEGIES

4.2.1 General Development Strategies

Aiming at an accomplishment of the development objectives (raising farm income and upgrading quality of life among small farmers), the development strategies of the present master plan are to be forges in such manner as to make better use of the comparative advantage of the region (abundant natural resources) and to put into measures which may serve to relax prevailing constraints on development.

(Optimization of Potentials)

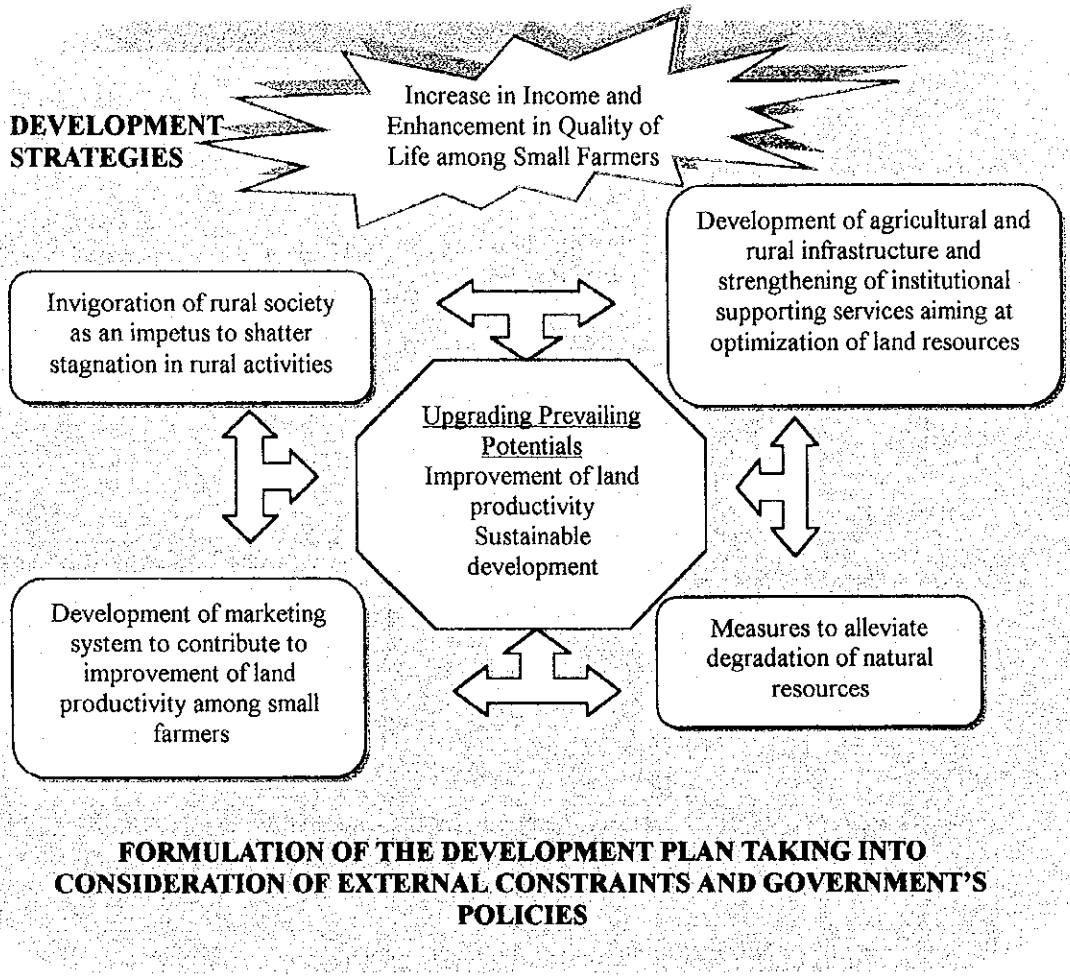
1. Improvement of land productivity with introduction of intensive and mixed farming.
2. Possibility to raise land productivity along with development of marketing system.
3. Putting into force of sustainable agriculture with introduction of environmental conservation measures.



In the development plan formulation, the attention has been paid to resolve the limitation factor gradually, to attaining the upgrading of the agricultural and livestock production by means of intensification of land resources in compliance with their suitability for agricultural use.

The Strategies utilized or the formulation of the Development Plan are as follows;

Development Strategy	Specific Strategies
To ameliorate rural society to shatter prevailing stagnated situation	To facilitate forming rural organization; To encourage rural women to participate more positively in productive activities.
To optimize the use of natural resources	To promote crop farming in accordance with land suitability; To proceed with research and extension of technologies for crop diversification; Strengthening of institutional supporting services; Upgrading livestock technologies and related supporting services; Rational use of water resources with rehabilitation of existing irrigation districts and units; Improve the small irrigation units with utilization of groundwater; To Improve production environment attributable to development of rural road network; Intensification of land use with improvement of land drainage system.
To improve marketing system of agro-products mainly for small scale farmers	Improvement of the marketing channel for small scale farmers; To give incentives for development of agroindustry; To organize small producers; Formation of livestock market and processing sectors.
To decelerate an environmental degradation	Soil conservation; To brake deforestation; To improve quality of water; To promote local population in participation of environmental conservation activities; To reinforce environmental monitoring system; To secure stable farm production by means of measures against natural disaster.



4.2.2 Specific Development Strategies

(1) Improvement of Stagnated Rural Society

Small individual farmers and Ejido farmers are the prevailing portion in the rural population. In order to push forward effectively the improvement of income and stabilization of the living standards of farmers, the development of the rural society to improve the development constraints such as lack of communities conscious, low standard of education, delay of the land reform, and low women's social status and low administrative capacity, are essential.

In order to improve these conditions, change of rural people's consciousness and enhancement of community awareness is desired. In addition, organization of the rural people for the betterment of rural life and of the farmers for the improvement of farming condition is also indispensable. Moreover, organization of rural women for the purpose of participation to the community development through empowerment approach is essential. Hence the improvement of farmer's profits derived from farming will be materialized through formation of producers' association. In particular, formation of producers' association and reorganization of existing associations considering the difference of farmer's nature between the Ejido and small individual farmers.

Otherwise the necessity of upgrading the human resources in a rural society through the

vocational educational strengthening, because of the fact that almost the schools have insufficient educational materials and facilities for learn the basic farming technology, the upgrading is not sufficient. In addition, agricultural education, which makes practical use of the characteristic in regional agriculture, is not well performed due to the insufficient qualified teacher. At high school level, educational materials are not fully used owing to lack of operating knowledge among teachers. From these circumstances, in order to develop regional agriculture and livestock, the strengthening of these vocational institutions for train the backbone of farmers is desired.

(2) Development of Agricultural and Rural Infrastructure and Strengthening of Agricultural and Livestock Production System

The region of Soconusco is featured by diversified topography, which leads to forming specific and different climate and soil conditions for respective zone. Farming systems for respective zone is almost similar without realizing optimum crop production in accordance with land suitability. For example, coffee is planted in lands both higher and lower than optimum attitude, which result in low productivity of the crop. Likewise, land owners at lower swamp lands have not found intensive use of their land and are thereby engaging in extensive farming with low productivity.

Soils, which are a substantial component for crop cultivation, are deteriorated due to deficient use of organic and chemical fertilizers as well as erosion caused by crop cultivation without cover crops. For maintaining soil fertility and raising land productivity as well as for making farming activities more sustainable, it is thus important to take such measures as use of more organic materials, sowing cover crops, alleviating land slide, etc.

1) Diversification of Crop Production

Elevating land productivity is generally attained through intensified crop farming and , for this purpose, it is essential to facilitate diversification of crop production. Although the region has attained to a certain degree diversification of tropical crops, there still remains room for diversification of crops in line with salient feature of topography, climate and soil conditions.

Crops in the region are not necessarily cultivated in accordance with vocation of lands. Farming system in the region is represented by single cropping, which is vulnerable to substantial damage in case of extraordinary climate change or fluctuation of price at international market. Therefore, farming activities must be intensified with realization of crop cultivation in accordance with soil suitability and introduction of mixed farming system.

Taking account of trend at both domestic and international markets as well as characteristics of the natural conditions of the region, the following crops may be identified as candidate non-traditional crops to be introduced into the region.

Candidate Crops	Potentials and Rationale for Introduction
Temperate Fruits	• Lands with an attitude higher than 1,200 m are mainly dedicated to coffee plantation which suffers from low productivity. Hence, shifting of this plantation to other crops is recommended. • Grains production zone at higher lands is represented by maize with low productivity. In addition, lowering of fertility and progress of erosion prevail in these lands, which provokes to an anxiety for sustainability of these land resources. From economic and environmental points of view, an advise is made to reform actual farming system. • Lands higher than 1,200 m belong to temperate zone and thus are suited to cultivation of temperate fruits. • Major portion of grains in the region are cultivated at higher lands and, if appropriate technologies for this cultivation should be established, it may be applied to the rest of the State of Chiapas with similar natural and social conditions.

Candidate Crops	Potentials and Rationale for Introduction
	• Fruits production is a labor-intensive business which requires a number of labor force contributing to generation of job opportunity among local population.
Tropical Flowers	• Tropical flowers are presently cultivated at some lands in the region, but they confront marketability due to inferior quality boosted by low cropping technology. • Climate conditions in the region are preferable to introduction of these crops to the region and there remains less constraint in terms of access to both domestic and international markets.
Paddy	• Abundant precipitation of the region make it possible to cultivate paddy without relying on irrigation system at rainy season. • This crop is proposed to be introduced at lower swamp lands as a measure to their intensified use. • Double cropping of paddy is feasible in the region, which lead to intensification of land use and, in turn, raising farm income.

2) Promotion of Mixed Farming System

The greater portion of small farmers in the region dedicates only to single crops, whether annual or permanent crop. This single cropping system is vulnerable to substantial damage as a consequence of extraordinary climate change or fluctuation of price at international market. It is supposed that prevailing stagnated performance of agricultural production and degradation in quality of life among farmers is closely related with this predominant farming system. The region is endowed with diversified topographic and climate conditions that makes possible the cultivation of several crops at the same land and to consolidate economic basis of farmers accordingly. So as to alleviate deterioration of physical and chemical structure of soils, which constitutes the principal cause for lowering the fertility of soils, as well as to facilitate sustainable farming, an input of organic materials to field, such as use of residual materials and manure of animals, is indispensable. Mixed farming of crops and livestock will promote use of subproducts derived from agroindustry, residual plants of crops weeds at grazing land, so this is favorable proposal from the viewpoint of rational use of available resources.

Breeding of small animals, on the other hand, has an immediate impact on raising farm income and upgrading farmer's living standard boosted by marketing advantage and efficiency in use of feeds. This enterprise also contributes to improvement of nutrition among small farmers and their family members.

3) Promotion of a Sustainable Agriculture

Principal causes of the deterioration of land resources are the erosion and the degradation of soil fertilities. Soil erosion are caused by the inadequate land use, farming practice in sloped land, lack of adequate farming practice for the erosion control, resulting a lost of fertile soil. The degradation of soil fertilities is result of the lack of incorporation of organic materials, excessive use of fertilizer and agrochemistry, in existence of sustainable agriculture and inadequate land use.

To alleviate the deterioration of land resources, the implementation of comprehensive strategies, such as an introduction of erosion work, of sustainable agriculture, are required. Taking into consideration that the sustainable farming practice is not common in the Study Area, an introduction of practice in long term are necessary, installing the demonstration farm and strengthening the extension and research regarding to possibility of the introduction of sustainable farming. Furthermore, the incentives for the breeding of small cattle, objecting to produce the organic materials are required. This incentive for the small cattle breeding will contribute to the introduction of mixed farming and will stabilize the farmer's economy.

4) Promotion for utilization of natural resources

The agricultural activity must be in harmony with environmental resources. From this point of view, incentive for the utilization of fisheries resources and existing faunal resources will be planned and implemented. The promotion of small-scale forestation also will be utilized as a strategy to alleviate the woodcutting for the construction of housings. The Installation of environmental center to offer the space for the environmental education will be required to implemented adequate environmental education, showing the importance of environmental conservation.

5) Strengthening of extension services

Deficiency in quantity and quality of agricultural extension services constitutes one of the factors which reduces the productivity of crops and livestock farming. The low agricultural productivity and inferior quality of products in the region is closely related with an absence of appropriate technologies. So, transference of appropriate technologies from public institutions to farmers is highly necessary.

The said deficiency in technology, on the other hand, reduces the irrigation facilities utilization, because farmers can not have profits compatible with cost of irrigation system. Extension services related with management of irrigation water is anticipated in view of making intensive use of land resources as well as rational use of irrigation water.

Making an agricultural production sustainable depends heavily on maintaining land productivity. There are a number of measures to be proposed for sustainable agriculture and the most appropriate one shall be identified through testing at model farm(s), which, in turn, shall be transferred to farmers.

The subprogram for strengthening of extension services is composed of the following three projects:

1. Strengthening of extension services
2. Strengthening of extensionists

6) Strengthening of supporting services to livestock sector

Livestock production (cattle and small animals' breeding) in the region is in recession because of farmers' adherence to traditional breeding system which causes low productivity of milk, low reproduction rate, less fattening gains and inferior quality of meat. This situation is also related with low breeding base and inadequate veterinary and extension services. The latter services are undertaken by federal and state governments' agencies, universities, but not satisfactorily diffused to farmers.

Substantial expansion of livestock production can be made as follows: in case of cattle farming, provision of selective breeding of nationally available proven breed is essential and in this context, production of a large number of superior bulls produced at cattle breeding farms and identification for their production traits preferably through a system of progeny testing should be conducted; meanwhile in case of small and medium animals, artificial insemination technology should be developed and improvement of production abilities should be made by selection among native breeds or through cross breeding with exotic breeds suited to local environment.

Animal health support to livestock production system is the most vital segment of planning. Whereas farmers easily learn by experience the technique of breeding, feeding and management

in which they become self-sufficient, but they need expert's help in specialized health services. Disease investigation services must be improved and expanded. A system of animal disease surveillance incorporating disease-wise epidemiological analysis culminating into a disease forecasting system may be devised. Animal quarantine and transport certificate rules and regulations should be framed and constant exchange of information effected with neighboring districts. In order to supply hygienic and wholesome quality meat, it is necessary to establish proper inspection system of meat and modernization of slaughter houses.

Natural grazing lands have potentially high productivity and they may be intensified with introduction of legume fodder and improved fodder supported by proper management system. Remaining portion of grazing lands to be available by this intensification may be allocated to fodder crops feeding to animals. Small farmers are advised to use their residual plant of their crops for feeding their animals.

This sub-program is composed of the following two projects.

1. Strengthening of livestock technologies and supporting services to livestock farmers
2. Modernization of slaughter houses

7) Improvement of access to rural finance

Inadequate rural finance system constitutes one of the constraints to which stagnation of agricultural production activities in Soconusco is attributable and the most outstanding problem adhered to rural finance is that farmers faces difficulty in making an access to banking institutions; the rural sociological survey has revealed that only one for every ten farmers got credit from banking institutions. It is supposed that Mexican banks are reluctant to grant loans applying rigorous criteria for approval of loan application. The background of this banks' reluctance is that Mexican banks are required to attain more sound financial achievement with elimination of soar loans, which is one of the preconditions under the financial system restructuring program called FOBAPROA to have been disputed nationwide in Mexico.

In order to outstripping this difficult situation and, as a consequence, making farmers more accessible to rural finance system, farmers should undertake more profitable farm operation which would serve as basis for easier approval of banking loan. It is essential that farmers would be rendered more sophisticated technical assistance services accordingly. On the other hand, because banks' users are required to provide mortgage to get loan from banks, it is recommended that organization of farmers should be promoted and certificate of agrarian land ownership should be issued as early as possible. In sum, an improvement of rural finance system should be proposed in such manner as to integrate rural credit services with strengthening of supporting services relevant to technical assistance, farmers' organization and prompt certificate of agrarian land ownership.

An improvement in rural finance is expected with implementation of said package program, but because of with limited availability of resources banking institutions can not afford to satisfy all applicants for farm credit; in this case smaller and marginal farmers tend to be alienated from beneficiaries banking loan because they get less profit from farming business. In this connection, it is suggested that unconventional banking system aiming at providing loan to these alienated farmers should be established (At present, a similar program called "Crédito a la palabra" has come into effect, but sustainability of the program is in doubt because its beneficiaries are not obliged to repay their debt). The proposed new banking system is what is called "micro-credit system" which has been flourished in Bangladesh by operation of the Grammen Bank and has been replicated to other developing countries throughout the world. The similar micro-credit

system is pioneered in Mexico in 1996 by Santa Fe de Guanajuato A.C., the State of Guanajuato and is extended to other states (Nuevo León and Coahuila); the introduction of this micro-credit system is also being considered in such states as Baja California, Aguascalientes, Chihuahua. After making diagnosis and compiling constraints on actual operation of the micro-credit system in Guanajuato, proposal will be made to introduce this banking system in Soconusco. This micro-credit system is proposed to cover not only farming activities but also rural small business (commercial activities, small domestic industry, etc.) undertaken by rural inhabitants. Hence, this micro-credit system, if put into force, shall have a great impact on alleviation of rural poverty and invigoration of rural productive activities.

It is observed that very limited number of farmers in the area pay attention to sustainability of their land resources. It is thereby advisable to give local farmers some incentives to encourage them to undertake environment-oriented sustainable farm operation, in addition to enlightening them the advantage of sustainable farming. In this end, proposal will be made to establish a special credit fund to be operated for granting loans exclusively for environmental conservation purpose.

8) Improvement of information system

The main resource for the formulation of an optimal plan is the information which at present is being collected and analyzed by many institution independently one from another; if this information is made of public domain, it will be possible to efficiently use it. The present project promotes the creation of a public access GIS system by which basic GIS data will be obtained.

9) Agricultural infrastructure development

a. Irrigation system improvement

The area has an abundant annual rainfall and most of the main cultivation is done utilizing only the rainwater. On the other hand, the rainwater in dry season is limited, being necessary irrigation during the dry season to increase the agricultural productivity. The water resources development for large scale irrigation is difficult due to the topographic conditions and rain characteristics. There are about 9,900 ha (29 % of the total projected irrigation area) of irrigable farms not utilized in small scale irrigation farms, due to water shortage, bad maintenance or deterioration of irrigation facilities. So, it is recommended to improve or construct the irrigation facilities in small scale to utilize the total irrigable areas instead of the new irrigation development for the stable agricultural production in the dry season. It is expected to utilize 9,900 ha with these measures, reaching a complete use of the irrigable areas.

The coastal area has a not efficient land use, although it has a potential for agriculture. It will be able to develop irrigable areas that utilize shallow wells as water sources, for an efficient land use.

For the preparation of irrigation plans in the area, it is necessary to select a suitable crop with consideration of adequate balance of benefit and investment for the facility.

b. Drainage system improvement

The drainage improvement works are improving it in low land area, through the Chiapas Coast Hydraulic Project. As a result, the drainage conditions were improved making possible 2 cultivation per year, but due to the insufficient of drain network density, the drainage condition in some areas is still bad. So, an improvement of the drainage in those areas is necessary to increase the agricultural production.

The lateral drainage canals must be improved and it's density must be increased in the bad drained zone. It will improve the agricultural conditions in the bad drained zone, which realizes agricultural activities that are stagnated due to the drainage conditions in the rainy season.

The drainage project in the area must be executed in long term investigation. It must include the clarification of the causes of flux interruption at the estuaries and rivers, the river improvement at the upstream and the flood control.

10) Rural Infrastructure Development

The area's rural infrastructure is underdeveloped in relation to the urban one, and are constraint factor affecting the economic development and living condition improvement. The difference appears mainly in the road and water supply sectors. The road conditions in rural area are very poor, affecting the transportation of agricultural products and inputs materials. It is important to improve the road surface conditions by paved with asphalt or gravel for increasing the agricultural productions. It is also necessary to reinforce the road maintenance organization and machinery.

The water supply facilities must be increased in rural area for improvement of the sanitary conditions. The water supply facilities in urban area and its surrounded area have been installed, only small communities in rural area unequipped. It is required to install the water supply facilities for these communities.

The following projects are proposed to improve the rural infrastructure.

a. Road Improvement

In the rural area, the road network is not paved with asphalt or gravel and the maintenance is not sufficient, affecting the transportation of the agricultural and livestock products. So, the rural road network will improve for the adequate to accommodate future transportation system. The existing gravel roads must be covered with asphalt and, in parallel, the earth roads must be covered with gravel. It is also necessary to reinforce the maintenance machinery for the enhancement of road maintenance capacity. These works will contribute to facilitate the access for the rural communities, an agricultural product transportation not affected by the climate and activation of the socio-economic activities in the area.

b. Rural Water Supply

The water supply in the rural community is only about 10%. Due to the low water supply condition, local peoples are taken unsanitary water and it causes occasional symptoms of diarrhea, diseases caused by parasite and others, needing an urgent supply of hygienic water. So, a project of hygienic water supply will be presented to avoid the utilization of dirty water from rivers and dug wells. It will contribute to level up the living conditions by the improvement of the water supply conditions in the rural communities.

(3) Provision of Marketing System for Improving Farming by Small-scale Farmers

On of the factors that is stagnating the agricultural production is the inefficient marketing system. It is discouraging the farmers intention to increase production and it's investment. This condition makes the small farmers staying out of the business chances after the harvest. The reasons of the constraints (presented in item 3.12), must be reduced, making possible an effective utilization of the regional potential.

1. Promote the farmers organization to increase the selling price and annexed prices of the products;
2. Organize the present large scale farmers to survive in the NAFTA competition;
3. Installation of agricultural information centers and marketing centers;
4. Promote the introduction of processing sector and funds to increase the annexed value of the products;
5. Improve and enlarge the storage installation;
6. Improve the existing slaughter houses;
7. Facilitate the farmers participation in the market and install a wholesale market in Tapachula.

(4) Alleviation of Environmental Degradation

Enclosing coastal and mountainous area, the Study Area shows a very varied topographical variation and bio-diversity. Retaining abundant rainfall, coffee cultivation prevails in the mountainous area, covering the areas from the elevation of 400m to 1,200m. In some place of highland topographically steeply area, maize production are practiced, facing serious erosion problem and degradation of soil fertility.

In a Plain Area, because of the expansion of urban area, water contamination caused by the human waste and agro-industries are enlarging, giving a serious problems for the down stream communities. Also, there are two ecologically reserves in the Study Area, and adequate measures for preservation of those areas must be found. However, the preservation of the reserves will not be reached only taking measures of protection. To attain the preservation of ecological reserves, upgrading of environmental conditions in sounding area is an important argument.

To upgrade the environmental condition of Study Area, the implementation of improvement measure for agricultural infrastructure in the sounding area that influence the reserves is important. To attain the preservation of the ecological reserves, the introduction of strategies composed by protective measures in direct form and the introduction of sustainable agriculture as a indirect form, in order to upgrade the environmental condition in the Study Area, are required.

As a direct protective measure, the improvement of environmental institution, incentive for ecoturism activities, vitalization of fishing resources merges as important strategies. As an indirect measure of environmental condition upgrading, motivation of rural farmers for the implementation of erosion works, introduction of sustainable agriculture, incorporation of farmers for the forestation and water quality control are the main arguments.

In a practical form, the preservation of the Study area will be accomplished by the two basic strategies composed by the strengthening of environmental project for the public sector and the introduction of incentive strategies to promote the participation of communities for the environmental activities. In a following, the principal's problems and the strategies are shown.

1) Measure for the Degradation of Forest resources

As a measure for the deterioration of forest resources, incentives for the forestation and agro-forestry, increase of environmental coffee practice and the control of burning will be implemented. The forestation and the agro-forestry will be utilized as an alternative strategy to promote on where the coffee cultivation is not appropriate due to topographic and climatic conditions, objecting to promote the efficient utilization of land and increase of forested area. Measure for the burning control will be implemented in order to protect the reserved area from burning caused by the burnt of pasture and shift cultivation. The promotion of the environmental coffee practice is an important factor to increase floral and faunal bio-diversity of the Study Area,

and recuperating the surrounding original vegetation. Furthermore, through the introduction of environmental coffee practice, farmer's economic situation will be upgraded. Through the implementation of comprehensive strategies regarding to the forest resources preservation, the deterioration of forest resources will be alleviated.

2) Measure for the Water Contamination

As a measure for water contamination, improvement of drinking water's quality through installation of the rural sewage system, control of wastewater of human use and agro-industries will be implemented in a long term. In short term, improvement of the sewage system in an upper stream of the intake of water supply system for urban area will be a necessary measure. Furthermore, beyond the wastewater control of coffee processing facilities and of sugar factory, strengthening of monitoring system is an important strategy for the water contamination problem. Promotion of the minimum usage of agro-chemistry in farming also is applied in order to alleviate the contamination origins.

3) Measure for the Environmental Protection Areas

Two ecological reserved areas "El Triunfo" in an upper basin and "La Encrucijada" in a lowland swamp exist in the Study Area. However, because of the scarce fund assigned for the preservation activities, these ecological reserved areas are enfacing in a deterioration of the resources. In a future, if demographic population increasing or immigration from highland area looking for better living condition is occurred, the devastation of these reserved areas is in a high probability. Considering these previsions, is important to take adequate measure, possibiliting the adequate form of preservation. In this program, the following measures will be implemented.

1. Protection of the Reserved Area
2. Promotion of Preservation Activities
3. Strengthening of Monitoring

4) Strengthening of Environmental Institution

This program has an objective to implement sufficient environmental control, through the strengthening of related executing institution in the environmental reservation, IHN and INE. As a detailed measure, rehabilitation of existing inspection office, realization of studies for the preservation of natural resources will be implemented.

(5) Strengthening Project of the Disaster Monitoring

In spite of the necessity of sabo measurements in the study area, there are a lack of basic data in the area for the elaboration of a project. The study area has several collapses of slopes and debris flow due to the attenuated relief, weak soil and concentration of torrential rainfall in the upstream area, and river bed elevation due to the sedimentation. There are lack of data concerning to hourly rainfall data, hourly water level and discharge during floods, variation of sand/earth sedimentation volume and water level variation in La Encrucijada swamp. The disaster monitoring must be strengthen to collect those data.

(6) Project of Disaster Prevention and Environmental Conservation in the Novillero River

The flood of September 1998 caused collapses and earth/sand flow in the steep slopes of Novillero and Huixtla rivers in the Soconusco basin. The cities and agricultural lands situated in the downstream were

damaged by the resulting flood water and sand/earth flow. With the agricultural development in the Soconusco region, the urgency of the disaster prevention measurements due to flood and sand/earth flow is evident. But the data lack, as mentioned before, will spend a lot of time and budget for the elaboration of a master plan for all the Soconusco region. So, the Novillero river basin was selected as model area for it's urgency and priority. And, it is supposed that no difficulties will appear for the study and planning of the Novillero river downstream, the La Encrucijada swamp, that is narrow area. The following points must be considered in the study.

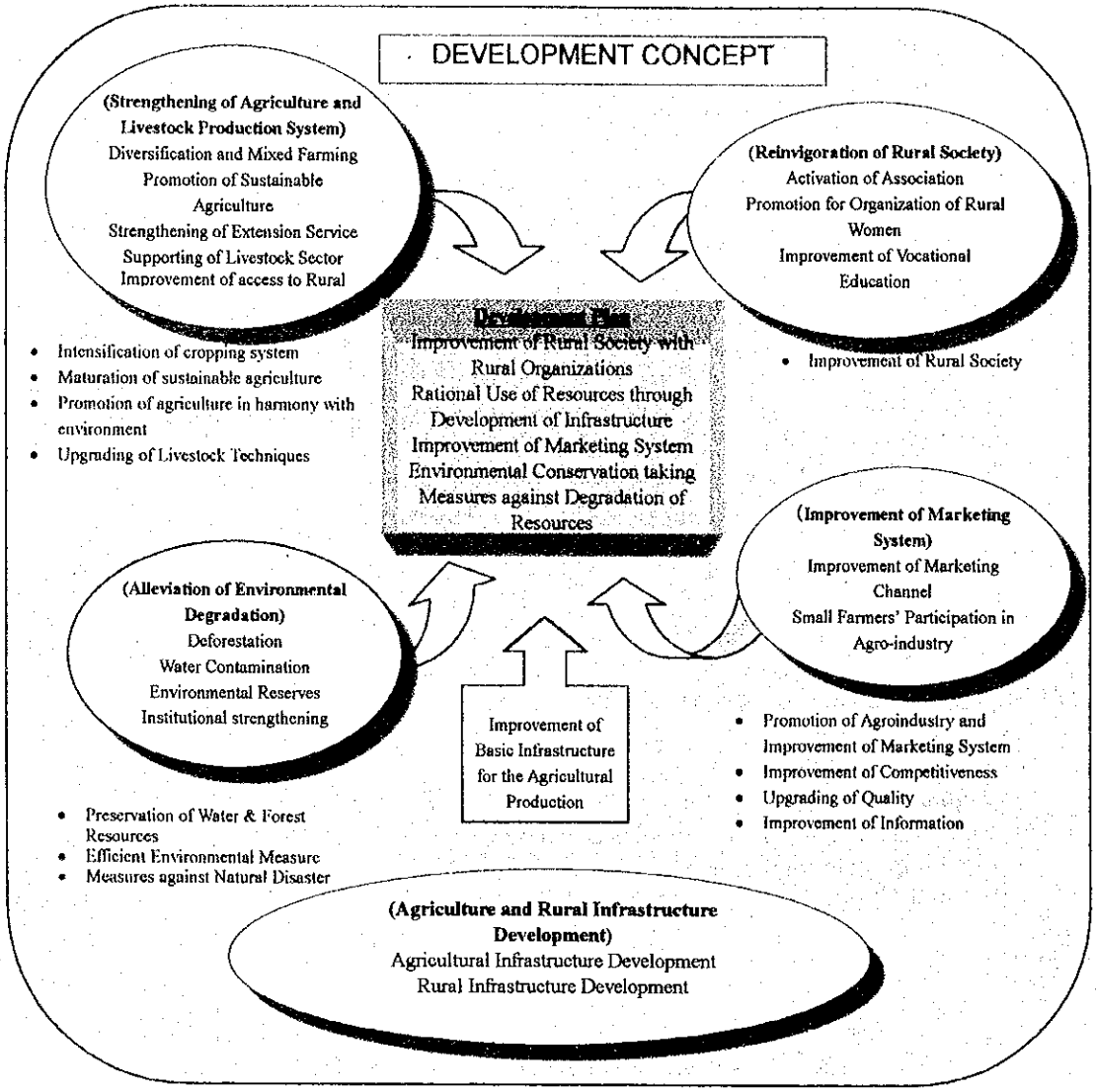
- the sabo measurement and flood control must be considered as a package, due to the relation of the sand/earth production in the upstream, transportation and sedimentation in the downstream.
- it must be observed the sand/earth transportation and sedimentation, due to the difficult access to the sand/earth production points.
- the environmental aspects must be considered for a realistic planning by making clear the merit and demerit of the disaster prevention works in La Encrucijada swamp.
- the development restriction of the environmental conservation area of La Encrucijada swamp affects the planning in San Nicolas, Cacaluta, Cintalapa and others beyond the Novillero river. So, alternative ideas must be elaborated for a harmonic planning, between the environmental and development point of view, for the other rivers.

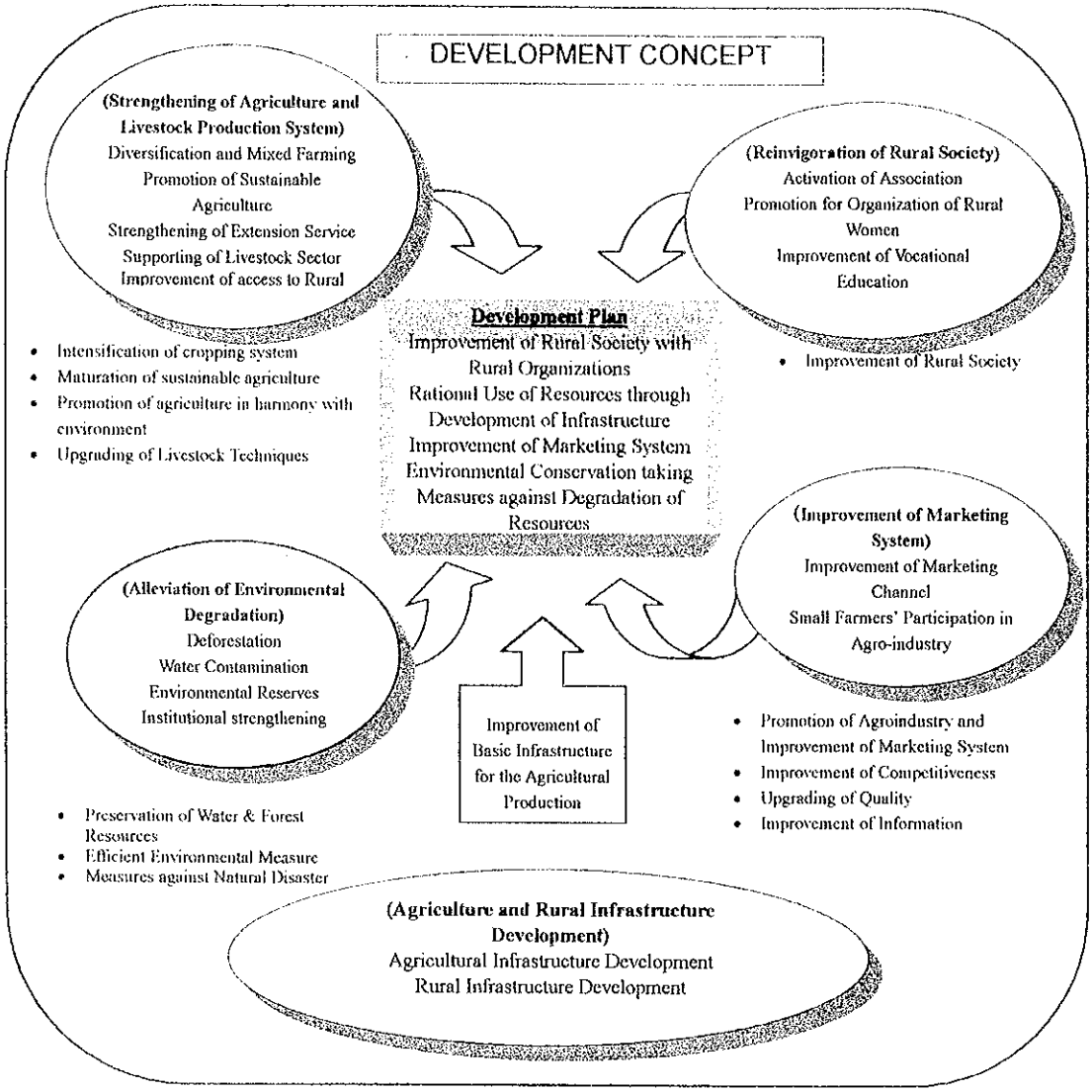
4.3 DEVELOPMENT PLAN

4.3.1 Overall Development Plan of the Master Plan

The Master Plan mainly consists of the following five sector plans:

- Rural Society Improvement
- Strengthening of Agriculture and Livestock Production System
- Agricultural and Rural Infrastructure Development
- Marketing System Improvement
- Alleviation of Environmental Degradation


DEVELOPMENT CONCEPT
(Strengthening of Agriculture and Livestock Production System)
Diversification and Mixed Farming
Promotion of Sustainable Agriculture
Strengthening of Extension Service
Supporting of Livestock Sector
Improvement of access to Rural
(Reinvigoration of Rural Society)
Activation of Association
Promotion for Organization of Rural Women
Improvement of Vocational Education
Development Plan
Improvement of Rural Society with Rural Organizations
Rational Use of Resources through Development of Infrastructure
Improvement of Marketing System
Environmental Conservation taking Measures against Degradation of Resources
Intensification of cropping system
Maturation of sustainable agriculture
Promotion of agriculture in harmony with environment
Upgrading of Livestock Techniques
Improvement of Rural Society
(Alleviation of Environmental Degradation)
Deforestation
Water Contamination
Environmental Reserves
Institutional strengthening
(Improvement of Marketing System)
Improvement of Marketing Channel
Small Farmers' Participation in Agro-industry
Improvement of Basic Infrastructure for the Agricultural Production
Preservation of Water & Forest Resources
Efficient Environmental Measure
Measures against Natural Disaster
Promotion of Agroindustry and Improvement of Marketing System
Improvement of Competitiveness
Upgrading of Quality
Improvement of Information
(Agriculture and Rural Infrastructure Development)
Agricultural Infrastructure Development
Rural Infrastructure Development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Promotion of Sustainable Agriculture
Strengthening of Extension Service
Supporting of Livestock Sector
Improvement of access to Rural
(Reinvigoration of Rural Society)
Activation of Association
Promotion for Organization of Rural Women
Improvement of Vocational Education
Development Plan
Improvement of Rural Society with Rural Organizations
Rational Use of Resources through Development of Infrastructure
Improvement of Marketing System
Environmental Conservation taking Measures against Degradation of Resources
• Intensification of cropping system
• Maturation of sustainable agriculture
• Promotion of agriculture in harmony with environment
• Upgrading of Livestock Techniques
• Improvement of Rural Society
(Improvement of Marketing System)
Improvement of Marketing Channel
Small Farmers' Participation in Agro-industry
(Alleviation of Environmental Degradation)
Deforestation
Water Contamination
Environmental Reserves
Institutional strengthening
Improvement of Basic Infrastructure for the Agricultural Production
• Promotion of Agroindustry and Improvement of Marketing System
• Improvement of Competitiveness
• Upgrading of Quality
• Improvement of Information
• Preservation of Water & Forest Resources
• Efficient Environmental Measure
• Measures against Natural Disaster
(Agriculture and Rural Infrastructure Development)
Agricultural Infrastructure Development
Rural Infrastructure Development

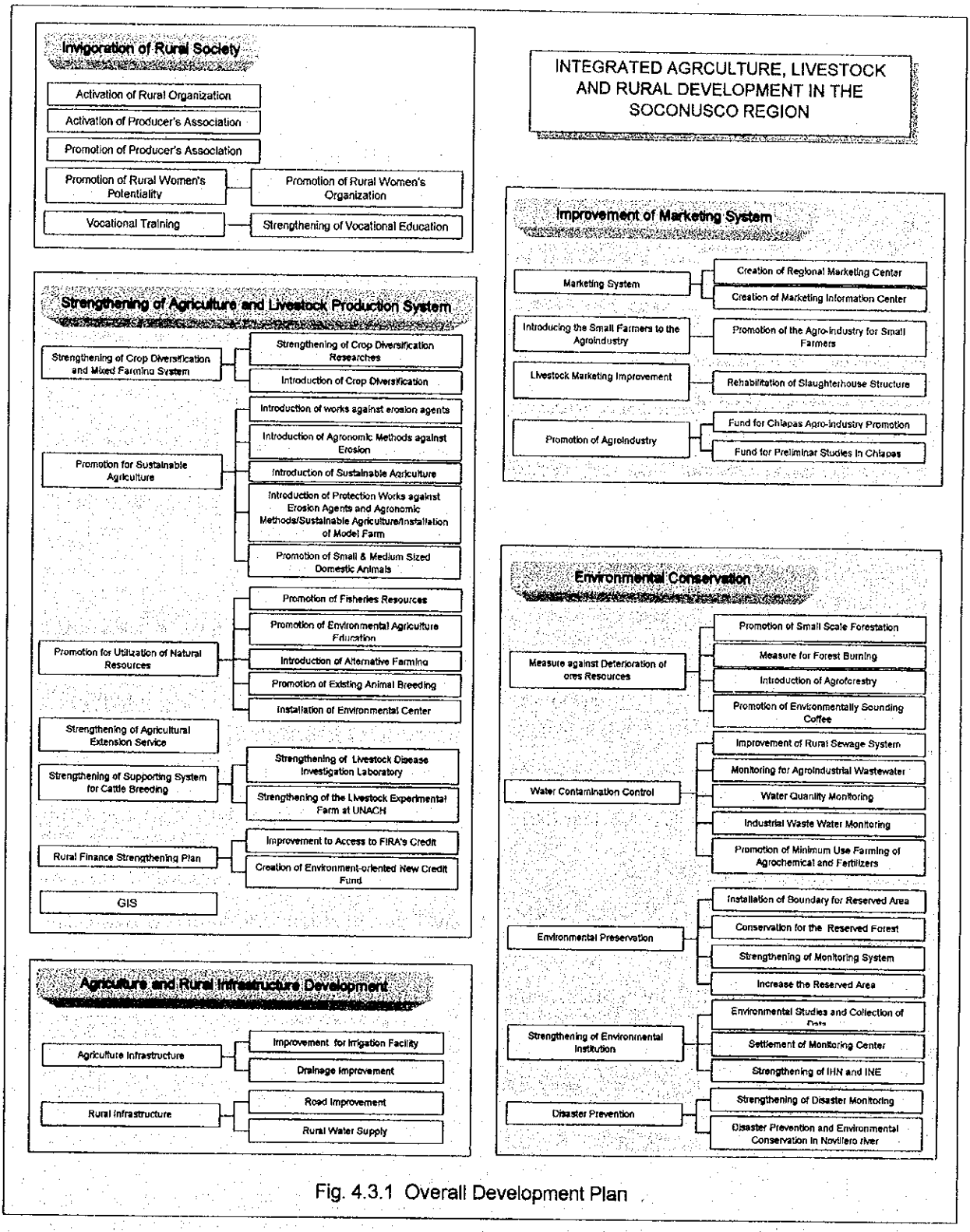


Fig. 4.3.1 Overall Development Plan

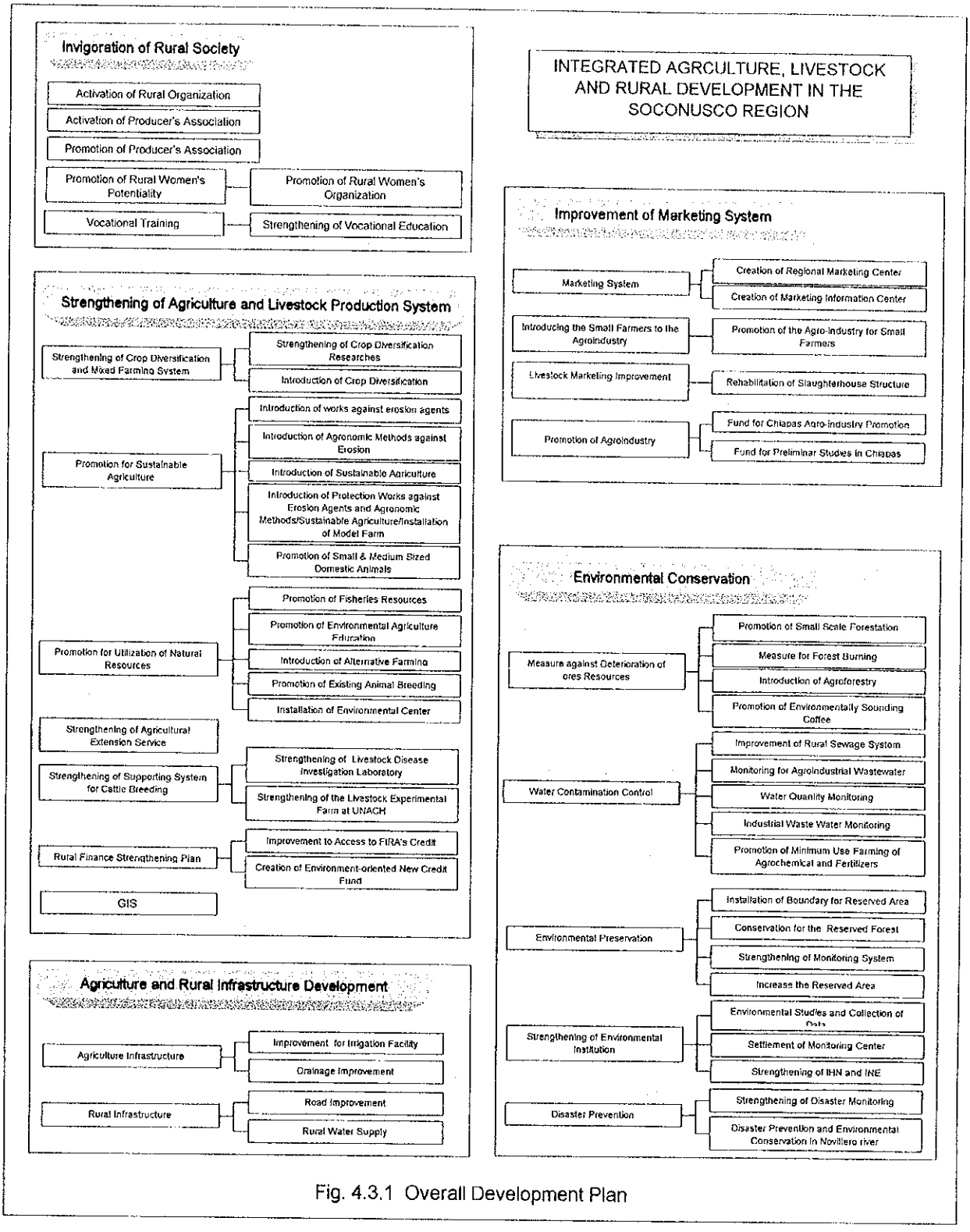


Fig. 4.3.1 Overall Development Plan

4.3.2 Rural Community Improvement Plan

(1) Rural Organization Activation Plan

1) Objectives

In order to function effectively the community organization at village level through activation of low community awareness of rural people, the leader training, formation of village development group and enlightening of community awareness will be carried out. The environmental conservation of rural community and improvement of rural life environment will be planned.

2) Contents

a. Training for DIF promoter on the scout of rural leaders

For the DIF promoters, the training which contains method of scouting of rural leaders and leader's role, will be carried out.

b. Training for rural leaders

In order to train rural leaders, the training on function of community and leaders' activity, solidarity awareness of rural people in order to discover rural life, rural community development, development and its problem of community activities, case and practical side of rural community development, and harmony of agricultural production and rural life, will be conducted.

c. Formation of group for village environment development

The group, which aims to solve the problems centering on community environment improvement, will be formed.

d. Establishment of spontaneously problem solution system within community through democratic management

Leading to change the consciousness of rural people (development of participating awareness to the community, development of harmony and formation of group leadership) through the group activities, the democratic problem solution system will be established.

3) Implementation Program

The state budget to rural and social development will be utilized for the leaders scout and formation.

a. Training for DIF promoters on the scout of rural leaders

For DIF promoter, the training by seminar and case study will be conducted. The training is carried out by mainly DIF, and in cooperation of SEDESOL, COPLADE SAG and SAGAR. The training course will be held in the DIF regional office.

b. Training for rural leaders

The training course for rural leaders will be conducted by municipal office. The training is carried out by seminar, case study and observation tour to advanced villages. The public institutions related to rural development and social assistance such as DIF, SEDESOL, COPLADE and SAGAR are cooperated to the training course. The course will hold four times in two years.

c. Formation of group for village environment improvement

At the first year of the leader training, leaders as center will plan the group formation in each village. DIF promoter support them indirectly. In the future, the groups by its function (health and nutrition, education, etc.) will be formed.

d. Establishment of spontaneously problem solution system within community

The system will establish by community leaders and villagers themselves. The DIF promoters will cooperate to this activity indirectly. However, it is a premise that the solidarity awareness prevailed among rural people.

(2) Producers' Organization Activation Plan

1) Objectives

In order to improve low farmer's consciousness for producers' organization and autonomous managerial awareness for its organization which bring about main cause of inactivity in agricultural production, development of leader's capabilities of the existing producers' organization and change of member's consciousness is performed. Also, the activation and reorganization of the existing organization will be planned. The existing organization will be reorganized by give the function of credit, technical support, supply of farm input and marketing of farm products, and perform the activation through effective management of the organization. The plan contributes to a profitable agricultural and livestock production.

2) Contents

Taking as a model for the existing advanced producers' organizations (founded by ejido farmers and small-scale farmers), reorganization of the existing producers' organization will be performed. Simultaneously, the new function as marketing and distribution will be added to the organization.

a. Training for the capabilities development of producer organization's leaders

For the leaders, the training courses, including the producers' organization and leader's role, practical side of the activities of the organization and the function of leaders, producers' activities and solidarity awareness, and problem-solving method of the organization, will be held.

b. Group formation aiming to the change of member's consciousness

After the leader training, the group will be formed having as center the trained leaders.

c. Reorganization of the existing organization

Out of the present activities of the organization, reorganization and strengthening of the organization power, extension of the services for members through the provision of marketing section, will be performed. In technical support section, a guidance agent for farming, who gives farming advice to members, will be provided in the organization.

3) Implementation Program

a. Leader training

The training courses, by seminar, case study, and combined with observation of advanced

organizations, will be carried out by SAGAR as center, cooperated to get the related authorities, UNACH and ECOSUR. The training will hold at the off-season of farmer within a year, after change of the directorate. It will be realized by the utilization of federal and state budget for rural development.

b. Group formation

The group formation will made by members and trained leaders as center, and cooperated in getting the well-trained staff of SAGAR. The group will lead the change of member's consciousness, showing definitely action on the change of farmer's consciousness and the creation of cooperative awareness.

c. Reorganization

Through a decision of the general assembly, reorganization of the existing organization will carry out independently by members and trained leaders as center. The guidance agent for farming will be nominated by the members (progressive farmers). The agricultural public organism will train regularly these agents. As to the reorganization of the existing organization, the staff of SAGAR, FIRA and municipal office will cooperate in consultation and guidance.

(3) Producers' Organization Promotion Plan

1) Objectives

The ejido and small-scale farmers who have unconcern and unenthusiastic for producers' organization and deficiency in cooperative awareness will be organized, and it makes possible in close connection with the outer system (administration and markets). In the course of this process, improvement of farming environment in the region through increase of agricultural and livestock production and its profitability, will be planned.

2) Contents

At the implementation stage of the producers' organization activation plan, participation to the organization will call out to unorganized farmers. On the other hand, for the farmers who make a stand against the participation to the existing organization, group organization of farmers at village level will be promoted in the following step.

a. Formation of production group

The production group as an unit is formed by several families, which are close friendship with each other. The group activities are technical and labor exchanges, purchasing of farm input and selling of farm products.

b. Support to change the farmer's consciousness

The place for communication with production group and public institutions will be arranged regularly.

c. Establishment of producers' organization from production group

From creation of the cooperative awareness of production group, producers' organization will be established through unification and expansion of neighboring groups.

3) Implementation Program

a. Group formation

Agricultural staff and DIF promoter of the municipality promote the formation of production group and conduct the consultation and guidance after organized.

b. Support to change the farmer's consciousness

Agricultural staff and DIF promoter of the municipality conduct the visiting to the group regularly.

c. Establishment of producers' organization

Agricultural staff of the municipality and SAGAR will conduct the consultation and guidance to establish the producers' organization.

(4) Rural Women Organization Promotion Plan

1) Objectives

Through organization of rural women, the women's empowerment for rural development and conservation of rural life environment as a foundation of rural society will be created. Furthermore, the elevation of education level of rural women in the traditional male-dominated society in the region and the generation of participating opportunity to rural society will be performed. Then improvement of the social status of rural women will be planned.

2) Contents

Group formation of rural women will be done at village level.

a. Organization of women – member's family of the existing producers' organization

Within the existing organization, as women's group will be organized. The group performs domestic animal raising, production control, processing, selling and profit sharing. Consequently, women's leader training and group training for handling and feeding technique and processing technique will be conducted.

b. Organization of women – family of unorganized farmers

Family women of unorganized farmers will be organized as a group. The group performs domestic animal raising and its selling. Accordingly, the training of handling and feeding technique will be conducted to the women's group.

c. Organization of women – family of the ejido farmers

Organization of UAIM will be promoted. Domestic animal raising, production control, processing and profit sharing system will be introduced in the group of UAIM. Therefore, the UAIM's leader training and the nurture of leaders for domestic animal raising and processing will be conducted. The strengthening of the existing women's SSS will be planned.

d. Activation of group activities of rural women

In order to improve rural life environment, group training such as health and hygiene, nutrition, childcare, family planning, vegetable garden, domestic animal raising and home economics will be

strengthened.

e. Training for organization of rural women

The leader training for active leaders in rural area will be carried out, and the training includes organization of rural women and methodology of rural women's activities.
As a result, promotion of organization will be planned.

3) Implementation Program

a. Organization of women – member's family of the existing producers' organization

Organization of women will be conducted under the leadership of agricultural staff and DIF promoter of the municipality, and to cooperate with SAGAR and FIRA indirectly. In the initial stage, the group prepares the domestic animal raising plan (pigs, sheep and local chicken), and the financing for the plan will be applied to FIRA. The production system, processing and selling are performed by joint work of the group. Each member operates the animal fattening.

b. Organization of women – family of unorganized farmers

Group formation of women will be carried out under leadership of agricultural staff and DIF promoter of the municipality, and to cooperate with SAGAR indirectly. In the initial stage, the plan for domestic animal raising (pigs and local chicken) and vegetable garden will prepares under the leadership of DIF promoter, then it starts the project. Handling and feeding of animals and cultivating of vegetable garden will practice by each member. The selling activity will be operated by group work.

c. Organization of women – family of the ejido farmers

Group formation of women will be carried out under leadership of DIF promoter of the municipality and women's leader of UAIM, and by cooperation of SAGAR indirectly. The domestic animal raising (pigs, sheep and local chicken) plan will be prepared by joint work of women's leaders of the ejido, women's leader of SSS and DIF promoter, then it starts the project. The production system, processing and selling are performed by joint work of the group. Each member operates the animal fattening.

d. Activation of group activities of rural women

The activation of women's group activities will be performed under the leadership of DIF promoter of the municipality, and with cooperation of the related public institutions – SSA, IMSS, SAGAR, SEDESOL, and COPLADEM. The introduction of domestic animal raising in rural area will be planned supported by existing active women's group, and it starts the project as same as women's group of the ejido. In addition, the group activities such as nutrition improvement by introduction of vegetable garden, basic health education, childcare and day care will be activated.

e. Training for organization of rural women

The training for rural women's leaders, women's leaders of UAIM, agricultural staff and DIF promoter of the municipality will be carried out. The contents of the training include women's role in rural society, definitely way of organization, and cooperation method to the activities. This training conducts at the initial stage of implementation of the plan. As a part of women's activities, the domestic animal raising plan is introduced. Therefore, the training of handling and feeding technique, production control, processing and selling will be carried out.

(5) Vocational Education Strengthening Plan of Agriculture and Livestock

1) Objectives

In order to nurture the human resources of agricultural and livestock development, basic educational facilities and equipment of technical secondary and high schools of agriculture and livestock, as the basic and secondary vocational educational institutions, are provided. By the increase of agricultural production in the practical farm, utilizing the facilities and equipment provided, these schools will plan to improve the educational level through rearrangement and expansion of educational facilities and equipment spending the proceeds of farm products efficiently. In addition, due to make substantial of the education, improvement of teacher's qualification will be planned.

2) Contents

a. Strengthening of the facilities and equipment for technical secondary school of agriculture and livestock

For the provision of educational facilities and equipment for 15 schools in the area, the following educational facilities and equipment will be provided.

- Construction of animal sheds (for cattle and for poultry)
- Provision of farm machinery for practical training: Tractor with attachment (1 unit)
- Provision of animals for practical training: donation

b. Strengthening of the facilities and equipment for technical high school of agriculture and livestock

In order to meet agricultural and livestock development, making the best use of characteristics of two zones, which are established technical high schools of agriculture and livestock, the educational facilities and equipment will be completed.

i. Technical high school of agriculture and livestock in Suchiate (C.B.T.A. No.60)
The school is given a place as a base of technical education for agricultural development in the Soconusco region. Though the educational facilities and equipment is arranged by the profits from the farm for practical training, the following equipment will be provided.
Provision of audio-visual equipment for education

ii. Technical high school of agriculture and livestock in Mapastepec (C.B.T.A. No.61).
The school is given a place as a base of technical education for livestock development in the Soconusco region. The facilities and equipment for practical training attain the level. Therefore, utilization of the unused equipment will be planned.

iii. Training for improvement of teacher's qualification
The training for qualification improvement to teachers of the technical secondary and high schools of agriculture and livestock will be carried out twice a year regularly.

3) Implementation Program

As special program of maintenance and provision program for schools prepared by the regional office of the science and technology, the Secretariat of Education, the federal government, will prepare the program in each school, which have given a consideration of the characteristics of the zone. Then the program will be conducted. In the program, the educational facilities and equipment spending the proceeds from the school farm for practical training are included.
The training for improvement of teacher's training will be carried out getting the cooperation of

UNACH, Huehuetán campus, and INIFAP.

4.3.3 Strengthening of Agriculture and Livestock Production System

(1) Project for Strengthening of Crops Diversification and Diversified Farming System

1) Objectives

Agricultural conditions in the Study Area have potential to introduce new profitable crops based on the various agro-environmental condition. Therefor the right crop for right land system based on the diversity of landform and climate will bring about the strengthening of farming basis, farmer's income increase and the agricultural development in the Study Area.
Several new crops, judging from the landform condition, can be expected to be introduced into the Study Area. Temperate fruit tree cultivation can be introduced into the mountainous area where altitude is more than 1,000 m. above sea level. Double cropping, i.e. rice cultivation by using of sufficient water at rainy season and watermelon and melon cultivation by using of residual soil water at dry season can be introduced into the poor drainage area distributed on the plain at low altitude area

However, as temperate fruit trees and rice plant have never been planted in the Study Area, the studies on the selection of suitable crops and varieties for the Study Area, and the development of cultivation techniques should be carried out before introducing new crops. Fortunately, as agricultural research institutes in the Study Area actively engage in the research and development of technique on agriculture, some facilities and equipment will be supplied to those institute to support their research activities to introduce new crops.

2) Contents of Program

The program consists of two. One is the studies on the introduction of temperate fruit trees into the high land area. The other is the studies on rice cultivation at the poor drainage area.

a. The studies on the introduction of temperate fruit trees into the mountainous area

Studies on the introduction of temperate fruit trees such as citrus fruits (mandarin orange), apples, pears, grapes and vegetables for self-consumption into the maize cultivation area at high altitude (more than 2000m above sea level) and into the coffee cultivation area (more than 800 m above sea level) are carried out.

i. Establishment of experimental and demonstration field
   - Construction of sub-experimental station and demonstration field at from 800 m to 1000 m above sea level
   - Supply of some facilities and equipment to sub-experimental station

ii. Settlement of research stuffs and assistants

iii. Activities
   - References, introduction, adaptation of temperate fruit trees with economical potential in the Area.
   - Development of cultivation technique
   - Technical guidance to Extension workers and farmers

b. Studies on rice cultivation at the poor drainage soil area

The poor drainage area is distributed on the plain at low altitude area less than 20 m above sea

level. This area has a potential for paddy field from the viewpoint of hydrological and geographical conditions.

As to avoid causing excess oxidation of the soil, drainage facilities, which can control water depth, are installed at the beginning of the project. Then, selection of suitable paddy field based on the soil chemical property, research, development and transference of rice cultivation technique based on the soil conditions will be carried out.

i. Establishment of sub-experimental station and demonstration field
   - Construction of sub-experimental and demonstration field at the poor drainage area
   - Supply of some facilities and equipment to the sub-experimental station
ii. Settlement of research stuffs and assistants
iii. Activities
   - Research and development of rice cultivation technique based on the soil condition
   - Technical guidance to extension workers and farmers.

3) Execution Method

As INIFAP (Rosario Izap experimental unit) has many achievements to breed new coffee, cacao, and frijol beans varieties, and to develop new cultivation technique, INIFAP will carry out the research and development mentioned above in this project. Also, SAGAR and SAG will realize indirect cooperation.

(2) Project for the Crop Diversification and Mixed Farming System

1) Objective

This project aims to strengthen the small-scale farmer's farming in the Study Area by the crop diversification and mixed farming system, which are based on the various agro-environmental condition in the Study Area, instead of single and unstable mono-cropping system.

2) Contents of Plan

Farmers group (producers' association), which consists of about 10 - 30 farmers, will be organized to attain the following objects.

- To get fixed amount of the agricultural products
- To ship agricultural products jointly through the fixed commercial channel without brokers
- To reduce cost of production by buying agricultural materials cooperatively and group farm practices

This system also brings the following benefit to the small-scale farmers, i.e. each small scale-farmer plants new crop at small-scale area with small amount of farming funds, without risk of heavy fall of farm price and/or lean crop
As type of crop diversification and mixed farming system to be introduced into the Study Area depends on the condition of agricultural zone. Mixed farming system models for each agricultural zone are shown bellows.

a. Renovation of cacao tree by mixed farming system with useful trees and tropical flowers

Target area: Fruit production area from 20 m to 400 m above sea level

Seventy per cent of cacao trees in the Study Area are more than 40 years old with low productivity. Primavera (*Cybistax donell Smith*), which is one of useful trees, and Hawaiana (*Alpinia purpurata*), which is one of tropical flowers, Arachis (*Arachis pintoy*), which is a kind of leguminous cover crop to prevent from soil erosion at planting, will be introduced as diversified farming system to renovate old cacao tree and to increase farmer's income.
As average cultivation area of cacao tree in the Study Area is about 2.3 ha, every cacao trees at 0.5 ha will be renovated every year and the renovation of cacao tree will accomplish in about five years. Plant density per hectare is 1,000 trees for cacao, 70 trees for Primavera, 2,000 plants for Hawaiana.

One ton per hectare of cacao can be harvested from 4 years after planting, primavera can be deforested in ten years. Hawaiana can be harvested 2 years after planting and are thinned out according to the cacao growth.

b. Renovation of coffee trees by mixed farming system with useful trees

Target area: Coffee production area from 400 m to 900 m above sea level

Cedro rojo (*Cedrela odorata*), which is one of useful trees, will be introduced into the gentle slop land at coffee production area as mixed farming system. And furthermore, the improved varieties such as Caturra, Catuaí, Oro Azteca, which have low tree height and suitable for high crop density introduced to renovate the coffee trees such as Bourbon and Mundo Novo, which are high tree height and suitable extensive cultivation.
As average coffee tree cultivation area by small-scale farmers in the Study Area is about 3.5 ha, every coffee tree at 1.0 ha will be renovated every year and the renovation of coffee tree will accomplish in four years.

Renovation of coffee is not carried out all at once, but carried out every other row. The improved variety will be introduced as 2m in row x 1m in hill. The rest of coffee trees are treated by the Recepa treatment, which is cutting main trunk to introduce branches, to be rejuvenated and to increase productivity. The coffee tree treated by Recepa treatment will be replaced with the improved variety after 5 – 6 years. Plant densities per hectare are 3,333 trees for the improved varieties, 100 trees for Cedro rojo.

After the first renovation accomplishment, renovation of coffee tree will be carried out every 15 years; all Cedro rojo will be sold at the same time as coffee tree renovation to get the expense of coffee renovation continuously.

c. Mixed farming system by introducing cashew nut

Target area: Grains production area from 20 m to 200 m above sea level

As harvesting period of cashew nut, which starts from March to July, does not overlap with harvesting period of maize and soybean, the introduction of cashew nut into the Study Area is convenient for the distribution of farmer's manpower.
Cashew nut will be introduced to get high yield and high quality into the fertile soil area with good water permeability and without waterlogging where maize, soybean and sesame are planted at present.

As average of cultivation area of cashew nut is about 3.0 ha, cashew nut will be introduced 0.2 ha at first year, then increase the cultivation area in order by 1.0 ha. Cashew nut production farmers should contract with the cashew nut processing factory (PROMASOSA at Tapachula) to sell nut. They can get loan and technical supports from the factory.

Plant density is are 180 plants per hectare. Cashew nut can be harvested 2 years (Variety Enano Precoz) and 3 years (Variety Jamaiquino) after planting for 25 to 30 years. As distance between trees is 8 m, soybean and/or maize will be planted in among plants will be planted during two years before the harvesting of Cashew nuts. Cashew apple can be processed as juice and jam, also used as feed of pig.

d) Mixed farming system with small and medium size cattle

Target area: Grains production area from 20 m to 200 m above sea level
Fruit producing area from 20 m to 400 m above sea level

As a strengthening measure for grain farmers, part of the grain area will be replaced by grain for small and medium cattle feeding. It can be utilized, as feeding items out of grains, low quality corn, soybean and harvest rests of banana, cashew nut apple, etc. and surrounding grass. The fecal matter from the cattle can be utilized as fertilizer.

The animal must be selected according to the farmer condition, but farm will have the following items.

i. Local chicken
Two cocks and 20 hens will be breed by each farmer. That chicken will be breed in open-cage on the ground for egg and meet.
Feeds of chicken: waste maize, waste soybean, and weed

ii. Pig
Two pigs of F1 generation of modern specimen will be breed and young animals will be sold twice a year. It is estimated to sell 25 to 30 animals per year. The insemination will be done in combined with the neighbors animals. Corn cultivated specially for feeding (productivity of 4 ton/ha) cashew nut apple and low quality banana will be the main feed.

iii. Sheep
Each farmer can always breed five parents. Lamb will be sold for fattening by other farmers
Feed of sheep: weed surrounding their field. Many weeds can be grown on the land with enough residual soil water.

e) Mixed farming system with tropical ornament plants

Target area: Fruit producing area from 20 m to 400 m above sea level
Grains production area from 20 m to 200 m above sea level

As domestic and foreign countries demand for tropical ornament plants become great, ornament plants will be introduced into the area where irrigation water is available at dry season. These ornament plants, which are cultivated under intensive quality control, will be intend to ship to Mexico City and/or export to USA and Canada

Tropical ornament plants shown in the next table will be planted at 0.5 ha of the field. Farmer's groups will carry out joint selection and joint shipment of flowers.

Tropical ornament plants which can be grown in the Study Area

Spanish name	Scientific name	Remarks
Hawaiana	Alpinia purpurata	*Red ginger (English name), Ginger Family*
Heliconias varias	*Heliconia spp*	Banana Family
Antorchas	*Etlingera elatior*	Torch ginger (English name)、Ginger Family
Palma kamedor	*Chamaedorea metallica*	Kamedor palm、Leaf will be shipped.
Tree-fern	Dicksonia antarctica	*A kind of fern grown on the tree*

Source：CEIDEPACHI、

f. Crop diversification with tropical fruit

Target area: Fruit producing area from 20 m to 400 m above sea level
Grains production area at less than 600 m above sea level
Coffee production area at less than 600 m above sea level

Join planting and joint shipping by farmers group will be carried out for rambutan.
Optimum plant density: 250 trees/ha
Price of grafting nursery plant: 25 Peso/plant
Yield: Fruit can be harvested at 18 months after transplanting. Yield from 10 years old tree is about 150 to 300 kg/tree/year.

As irrigation water is necessary for rambután at dry season, 10 to 20 plants per each farmer will be planted at first for manual irrigation. As the price of rambután is enough expensive to get large amount of profit by farmers, even if its cultivation area is small. It is possible to make bottled or caned rambután with syrup other than table fruit after the cultivation area increase.

g. Mixed farming system with pineapple

Target area: Grains production area from 20 m to 200 m above sea level
Grains production area at less than 1,000 m above sea level
Fruit producing area from 20 m to 400 m above sea level
Coffee production area at less than 1,000 m above sea level

As far as Pineapple production in Soconusco Region is concerned, the production does not meet the demand. Pineapple can be grown in any kind of soil with well drainage, with no waterlogging and are adapted to elevation from 0 m to 1,000 m above sea level. Pineapple also can be planted on slope land to prevent from soil erosion. Although pineapple has a drought resistance compared with other crops, irrigation is necessary to get high yield. It is desirable for pineapple to plant near road, because is a heavy fruit. As pineapple cannot be planted in wide area in the Study Area at present, pineapple will be planted in accordance with land condition of each farmer for table fruit. But if a certain amount of pineapple can be collected, these pineapple can be sold to the plant which produce fruit syrup in bottle.

3) Execution method

Crops such as mentioned above would be planted at each farmer's field and small or medium animals will be bred in each farmer's garden. But collection and shipment will be carried out by group work to get market for their produce. As farming fund and agricultural technical assistance are needed to introduce new crops and livestock, municipality will give indirect aid to the farmers.

(3) Promotion of Sustainable Agriculture

1) Objective

The soils of the study are susceptible to the erosion caused by the characteristics and type of rainfalls and the form of maize cultivation developed in high slope hills increasing the erosion risk. This type of erosion originated in the high parts is also a problem for the low areas due sedimentation and damage caused to the coastal vegetation. Besides, the development of modern farming using agriculture fertilizer and chemical products, the use of farming systems inadequate to the soil and climate capability are also causes for the deterioration of the soil quality. Then, reduction of productivity and increase of the production cost emerge as a consequence of those techniques.

Introduction of protection works against erosion agents and also development of agronomical practices as well as the introduction of sustainable agriculture are required to prevent erosion damages. However, at the moment a suitable place for the development of demonstrative fields in the study area was not found yet. It is necessary to extend training of farmers by the extension system utilized in the demonstrative fields. Taking into account the necessity of addition of organic matter to the soils is very important, husbandry of domestic animals shall be necessary to achieve positive results when introducing sustainable agriculture. This program has the following objective;

1. Against Erosion
2. Keeping of the soils fertility
3. Promotion of Sustainable Agriculture

The following impacts shall be obtained as indirect effect:
(Against Erosion)

1. Stability of the Agriculture Economy in the long term
2. Conservation of soil resources at upstream
3. Mitigation of Natural Disasters in downstream areas
4. Mitigation of sediments in lagoons and preservation of mangrove reserves.

(Maintenance of Soil Fertility)

1. Stability of the Agriculture Economy in the long term
2. Improvement of the Productivity by the maintenance of the fertility

2) Contents of the Program

Details of each project are as follows;

a. Introduction of works against erosion agents (Terrace and Stopping of erosion)

Theses actions shall be stimulated giving credit lines for farmers in the following works. The risk area shall be priority when implementation of project.

1. Elaboration of the Action Plans
2. Purchase of Equipment and Materials for the implementation of the works against erosion agents.
3. Credit for the Works

b. Introduction of Agronomic Methods against Erosion (Introduction of Vegetal Covers, Minimum Farming, etc.)

Agriculture credit shall be created for farmers who introduce agronomic methodologies against erosion agents in the following eligibility.

1. Preparing of Action Plans
2. Purchase of Equipment and Materials for the introduction of sustainable agriculture.
3. Annual Cost until stabilization of the productive activities

c. Introduction of Sustainable Agriculture (Organic Matter, Milpa, etc.)

1. Preparing of Action Plans
2. Purchase of Equipment and Materials for the introduction of agronomic methodology against erosion agents.
3. Annual Cost until stabilization of the productive activities

d. Demonstrative Fields for the Introduction of Works against erosion agents, Agronomical Methods and Sustainable Agriculture

Demonstrative fields shall be implemented in places easy to access in order to demonstrate the works against erosion, agronomic methodology against erosion agents and sustainable agriculture. Certain quantity of demonstrative field shall be established in erosion risk areas considering that these fields shall demonstrate the experiences in farmer's place. Taking into account the type of works, they shall be implemented as a part of public works without cost for farmers.

e. Introduction of Domestic Animal Husbandry for the production of organic matter

Credit lines for farmers shall be created in order to produce organic matter to promote the sustainable agriculture. The credit shall include the following eligibility.

1. Preparing of Action Plans
2. Construction of Establishments for breeding of Domestic Animals.
3. Purchase of Matrix
4. Construction of Warehouses for the production of organic matter.
5. Purchase of Organic Matter transporter

3) Implementation Method

The present implementation will be realized by supplying agricultural credit for each farmer, except the model farm settlement. The last one has strong dependence to the public sector, reason that must be developed by the strengthening of the agricultural extension. The government budget will be utilized for the implementation and the operation/maintenance will be realized with participation of the farmers. The government will assist the technical part.

(4) Promotion for Utilization of Natural Resources

1) Objective

The conscience of the inhabitants for the environment is essential for the continuation of the agricultural production in conservation areas. The production in harmony with the environment will contribute for a sustainable elevation of the production and living condition. So, the combination of an efficient resources utilization and environmental education must be done.

The objectives of the programs are as follows:

Project	Objective
Stimulation for the use of fishery resources at blackish water	• Prevent extinction of fishery resources at blackish water • Take advantage of the large lagoon areas • Increase the resources of fishery by establishment of breeding and • Stimulate the fishery activities
Stimulation for the introduction of alternatives crops for traditional ones	• Improve the farmers conditions through the introduction of profitable activities that may replace maize, coffee plantations, etc. • Promote forestry reserves
Stimulation for breeding of native animals	• Preserve the extinction risk species • Preserve the native animals, maintaining the existing ecological condition
Stimulation of Education on Environment-oriented Agriculture	• Increase the knowledge regarding the environmental preservation activities • Connect population to the environment issues • Improve technologies applied in the environmental buffer regions
Creation of the Environmental Education Center	• To be used for the environmental education activities • Propose places to be connected to the natural environment • Supply information regarding fauna an flora to the communities

2) Content of the Project

a. Promotion of the use of Fishery Resources at blackish water

The Ecological protected area of La Encrucijada is located in the Study area where there are large lagoon areas and where fishing activities is developed in large scale, however, in the last years the fishery resources have reduced after increasing of fishers and due the lack of control. It is necessary to find an ecological point between fishery activities and the available resources. Then, breeded fishes shall be added to the lagoon population in order to balance fishery and resources according to the following methodology.

1. Identification of Fishery resources, especially species in extinction
2. Alternative Studies to increase fishery resources
3. Definition of discharge quantity of fishes
4. Habilitation of Fishery Nursery Resources to be discharged in the lagoons
5. Discharge of fishes
6. Monitory Study to control Fishery Resources

b. Promotion of alternative crops introduction for traditional ones

The coffee plantation activities are being carried out in the hills even considering the unsuitable conditions of topography, climate and soil which cause low productivity. Alternative crops for coffee and corn must be defined to make capable enough profits even in small farms. Holericulture, tropical and temperate flowers, mushrooms, etc shall be considered as alternative of coffee. Suitable infrastructure for each region shall be habilitated in order to promote these crops. The cultivation alternatives are as follows;

1. Habilitation of Small scale irrigation infrastructures for cultivation of vegetables
2. Installation of nurseries for the introduction of ornamental flowers
3. Installation to promote cultivation of tropical flowers

c. Promotion of Native Animals Breeding

Number of animal shall be increased by this project, especially the animals under extinction risk through the installation of wild animal breeder and a distribution of animal center. The government shall implant the breeding and incubation points and the interested shall collect them for breeding. This project shall be carried out as follows;

1. Installation of breeding centers
2. Incubation, Breeding and discharge
3. Distribution to the interested people

The objective animals shall be the Iguana, Casquito, etc., considered under extinction risk.

d. Promotion of Education on Environment-oriented Agriculture

It is necessary to carried out educational activities for each region taking into account that the environmental problems such as erosions, deforestation, forest fire, uncontrolled wastes and contamination of water appear in each region with different origins and causes. The following programs shall be programmed:

1. Preservation of the Flora (Signaling and planting of trees)
2. Introduction Methodology of practices for control of erosion and agronomic practices against erosion
3. Preservation of Fauna (Birds and Animals, etc.)
4. Control of fire
5. Use of Agriculture Chemicals
6. Wastes control
7. Processing Residues control

Especial educational activities shall be given to those population living inside the buffer area of the ecological protected areas in order to balance the productive activities with the ecology.

e. Creation of Environmental Education Center

An environmental education center shall be constructed in order to demonstrate and indicate information regarding flora and fauna. The following facilities shall installed in those centers;

1. Buildings (Meeting Rooms, Show room, Dormitories, Library, Audio room, etc.)
2. Environmental Issues Analysis room
3. Botanic

3) Implementation Method

The government budget will be utilized to implement the present plan, but the management will be done by the farmer.

(5) Project for Strengthening Agricultural Extension Service

1) Object of the Program

The improvement of each small-scale farmer's agricultural technique is indispensable to promote crop diversification in the Study Area. For that purpose, following countermeasures are aimed at in this program. First of all, a) establishment of the system to communicate well between the small-scale farmers and the institutions on agricultural research and extension services. b) Improvement of agricultural technology of each extension worker. c) Arrangement of necessary extension members, maintenance of the vehicle and the office machine for extension services.

2) Contents of the Program

Some new duties are given to the organizations, which are existing, to guide adequate agricultural technology to the small-scale farmer who has the desire to improve the agricultural production and the farming.

Municipalities arrange the persons in charge of the promotion of agriculture and animal husbandry, who contract of two or more years and not controlled by head's tenure of office, to intermediate between the small-scale farmers and the institutions on agricultural research and agricultural extension services.

On the other hand, the institutions on agricultural research and agricultural extension services, such as INIFAP, SEIDEPACHI, SEMARNAP, UNACHI (Huehuetan), SAG, SAGAR, FIRCO, FIRA, and CIICA, arrange managers as the window for agricultural technology transfer.

Moreover, a technological transfer through organizing according to the fact in the region is carried out by the extension service workers employed by PEAT (SAG), which are reallocate to CADER as a coordinator in charge of the rural society improvement to organize the small-scale farmers.

Two new CADER office (Tapachula and Huixtla) among CADER offices, which are located in the building hired from private, will be constructed. Indispensable equipment for strengthening extension services such as cars, audio-visual education materials, personal computers, and copy machines will be supplied. Demonstration fields, which are hired from private, at the area in charge of each extension worker, will be established.

3) Execution Method

Municipalities arrange the persons in charge of the promotion of agriculture and animal husbandry by their original budget, to intermediate between the small-scale farmers and the institutions on agricultural research and agricultural extension services.
SAGAR and SAG reinforce CADER and PEAT with increasing extension services workers and supplying office machine for extension services.
As decentralization of power from CADER to SAG is transition period, agricultural technology transference program should be carried out with close cooperation between farmers and the institutions on agricultural research and extension services.

(6) Strengthening of the Livestock Technology

1) Objective

To promote the livestock in the region, it is necessary protections against diseases to make

capable the creation of health animals. So, it is important to consider the complexity of the recent disease control. The Mapastec diagnosis center must be strengthen and a system between farmers and the center must be consolidated. It will make possible to strengthen the diagnosis system and the realization of precise diagnosis.

Also, the introduction of specimens apt with the region's condition and the related techniques extension must be realized to elevate the cattle breeding technology of the farmers. The UNACH in Huehuetán deals with the Central Americano specimen and small and medium animals that are apt for the region's conditions. The improvement of this Agricultural Faculty will make available the research of breeding systems and modernization of the farmer's technology.

2) Contents

a. Strengthening of Animal Disease Diagnosis Center

The renovation and modernization of the diagnosis center equipment will contribute to develop the diagnosis method, human resources and the diagnosis system, disease information system and other activities to control diseases.

b. Strengthening of the Annexed Veterinary Experimental Farm of the Chiapas State Faculty (Huehuetan)

The modernization of the experimental farm can be achieved by introducing basic equipment and artificial insemination facilities. It will contribute to introduce modern technologies making possible new researches and formation of new technicians. The researches will be mainly on the most apt bovine, the Central Americano, and small and medium animals breeding. The technology achieved in this farm will be extended to the region's farmers.

3) Implementation Plan

The present program will be developed by the SAGAR utilizing federal budget. On the other hand, the UNACH will utilize it's own budget to realize the researches.

(7) Strengthening of the Rural Finance System

1) Objective

This plan, by means of improvement in access to existing credit programs together with establishment of non-traditional credit funds, aims to contribute to elevating productivity of farmlands, realization of farm diversification and mixing activity of agriculture-livestock as well as promotion for sustainable agriculture.

2) Contents

The present program consists of proposal for improvement of access to existing credit programs and establishment of non-traditional credit funds.

a. Improvement of access to the existing programs

At present, various credit programs aimed to save farmers who are alienated from normal credit line of FIRA have been forged or put into implementation by FIRA and federal and state governments. Of these programs, the following three may be emphasized:

- PROCREA: The present program, conceived by the FIRA, is directed to the small farmers. This program intends small farmers to be more accessible to FIRA's credit lines by establishing agents between banks and beneficiaries. Elevated cost due to establishment of agents shall be born by FIRA, so no disadvantage (higher interest rate, etc.) is foreseen for beneficiaries. Target beneficiaries at initial stage of the program shall be coffee farmers and credit services shall be expanded to producers of other crops gradually.

- Special credit for the beneficiaries of PROCAMPO: Eligible beneficiaries of this program are those who get financial assistance related with PROCAMPO. Because payment relevant to PROCAMPO is made after harvest season, credit under this program is rendered for farmers who lack resources for land preparation and sowing. This program has been already underway with initiative of SAG, Government of Chiapas and Banrural is also ready to participate in this program starting early in 1999.

- Special Credit for Beneficiaries of the Alianza para el Campo: This program is formulated by Banrural and the credit is to be provided to the beneficiaries of Alianza para el Campo with regard to the proportion of investment born by them. This program is not applicable to all subprograms of Alianza para el Campo but limited to four subprograms: Renovation of coffee trees, maize cultivation, farm mechanization and dual-purpose cattle breeding.

Because farmers are not familiar with these programs, it is prerequisite that public entities take necessary measures to diffuse them among farmers. It is also proposed that the fruits of rural organization (this is indispensable to be beneficiaries of PROCREA) and strengthening of technical assistance and extension services (to fulfill repayment of loan) shall be replicated as far as possible.

b. Establishment of Credit Fund for Agricultural and Environmental Improvement

Small farmers may become more accessible to official credit services, if the proposal cited in item a above should be realized. Nevertheless, available resources are limited under the said proposal and it is not viable to satisfy completely the pressing demand for credit by farmers and other rural population. Under the circumstances, it is necessary to establish non-traditional credit funds under the initiative of the state government of Chiapas which are deemed to take charge in providing loan for agricultural and rural development. These funds may include: rural development fund, micro-credit system and special fund for sustainable agriculture and proposed sources of finance for them shall be FIRA and other public development banks. The credit conditions shall coincide with the most favorable condition of FIRA and the state government shall bear cost to be incurred for depressing interest rate and be responsible for guarantee of credit.

Rural Development Fund: Eligible beneficiaries shall be farmer who are alienated from FIRA's normal credit line. Due to the fact that FIRA's PROCREA mentioned before is exclusively for short-term credit uses for sowing of crops, this fund sets as its target users those who need credit for capital goods such as purchase of farm machinery, installation of irrigation system, small-scale agroindustrial plants.

Micro-credit System: This credit system, which has been successful in the state of Guanajuato and its adjacent states, has a central purpose to encourage rural women, landless farmers and other handicapped rural population. Credits are mainly provided to cultivation and vegetables and fruits at gardens, breeding of minor animals, as well as to rural commercial and small industrial activities. It is worth while to indicate that credits under this system is provided not to individuals but to groups in view of realization of social reform at rural societies by making aware for mutual responsibility, promotion for saving and educational improvement, etc.

Special Fund for Sustainable Agriculture: Provision of credit under this fund shall be limited to limited to farming activities closely related with conservation and adequate management of natural resources and undertaking of sustainable agriculture. It is supposed that farmers are reluctant to undertake these activities because of their negative economic benefits in the short run. In this connection, it is advised that special measures in terms of interest rate, loan period including longer grace period and so forth should e taken by the state government.

c. Implementation plan

The improvement of access to existing programs will be proceeded by FIRA, Banrural, SAGAR, SAG and other concerned public entities. On the other hand, for establishment of non-traditional funds it is prerequisite to create within the state government an "Office for development finance", which shall take charge in arrangement of environment for establishment of said funds. The office's scope of responsibility shall include, but not limited to, preparation for establishment of funds, provision of technical and administrative advisory services for operation of funds, giving guarantee to credits whenever it is required, and public diffusion for use of these funds at rural communities. Provision of credits shall be made in the following manner:

- Micro-credit system: directly to beneficiaries
- Rural development fund and special fund for sustainable agriculture: through Banrural, commercial banks and agents to take part between funds and beneficiaries.

(8) GIS Improvement Plan

1) Objecitve

The region has many public and private organisms collecting their own information. But those informations are not compiled or the collection is interrupted due to several factors as government changes and not sufficient supports. Most of the available data is individual with low applicability. So, the unification of those individual information is necessary to elevate the potential of utilization.

The GIS system is essential for the compilation of the existing information. The exchange of information inter organisms is important and they know it, but difficulties are find to do that in the present situation. So, GIS information compilation is stagnated in the present moment.

Many regional studies have being developed in the region, but the information has not being effectively utilized due to the following reasons:

- Undeveloped information storage system;
- Not improved information publishing system.

As the storage system is not complete, individual information has being individually published, not making it directly usable. So, the storage system must be developed. After the completion of the storage system, the publishing system must be improved. The not improvement of the last system is carrying to the following facts:

- Double collection of information
- Low resolution of the data
- Difficult acquisition of the data
- Difficulties in the research and planning activities

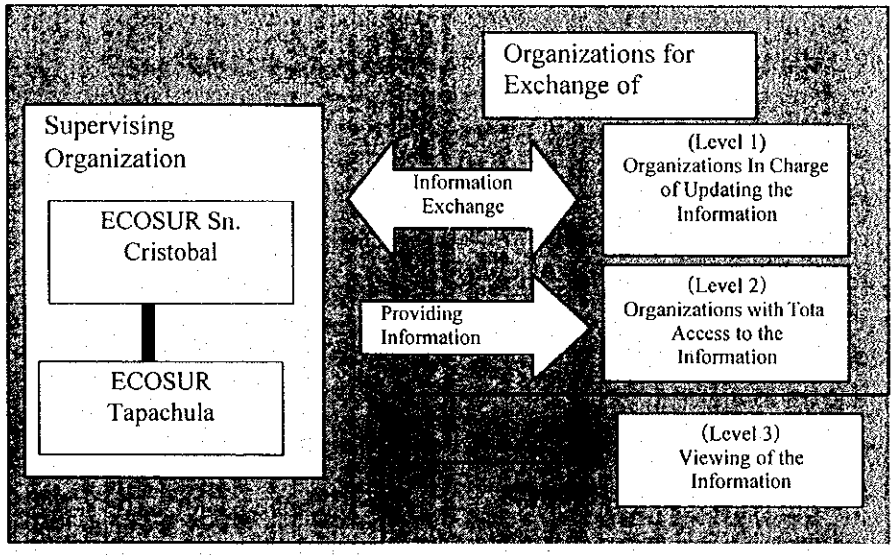
- Not efficient planning
- Not efficient researches

The present program will improve the information exchange system by a model for information publishing and exchange.

GIS information will be compiled for the Soconusco region to make easier the common utilization of it.

2) Contents

The Soconusco region GIS system will have the ECOSUR faculty as center as follow:



The basic information of GIS will be compiled in the present study. But, information renovation must be carried by each organism in the future. The information management organism, according to the level and know-how, can be the ECOSUR university.

3) Implementation Plan

The information management center will check the compatibility of the information from the organism of level 1, and will renovate the information according to the necessity. The renaveted information will be stored in the computer in the ECOSUR GIS center. The ECOSUR GIS center in Tapachula is linked with the San Cristoval del las Casas, having a constant back-up structure. The GIS center has the responsibility of technical transfer, and will assist input of difficult information not able to be realized by the other organisms capacity.

The level 1 organism will renovate it's own information and has access to all existing information. Each organism in the system will be responsible for their information and has the right to renovate it. The renovated information from each organism will be evaluated by the information management center to renovate the last information in the center. The other organisms have the right to access the information, but the information renovation right is only owed by the information management center. The other organisms only will suggest the renovation.

The level 2 organisms are those that have only the access right. They can be elevated to the level 1 according to the process of capacity improvement in the future.

The level 3 is for the common users. For example, it can be accessed by the internet for the compiled information.

4.3.4 Agricultural and Rural Infrastructure Improvement

(1) Irrigation Project

1) Objective of the Project

The study area has an abundant annual rainfall, but it is concentrated in the rainy season, having a shortage of rain during the dry season. So, the irrigation is necessary for the agricultural production increase during the dry season. There are irrigable farms not utilized in small scale irrigation units, due to bad maintenance or deterioration of irrigation facilities. So, it is planed to improve or construct the irrigation facilities for the efficient farm usage by increasing the actual irrigation area in small scale irrigation units. It will be developed by shallow wells for an effective land use in the coastal area and will be constructed small reservoirs in the suitable area for small reservoirs construction.

2) Contents of the Project

a. Improvement Project for Small Scale Irrigation Farms

The target facilities of the project are the one in 49 irrigation units that have farms not completely utilized in the existing individual 139 irrigation units. It is planed to improve or construct irrigation diversion weirs, pumping stations and deep wells. The projected area by irrigation types is shown in below table, and the project area's location is shown in Fig.4.3.2.

Irrigation Type	Number of Irrigation Unit	Irrigated Area (ha)	
		Projected	Present
Diversion weir	20	10,181	6,101
Pumping station	6	957	586
Deep well	23	6,926	2,023
Total	49	18,064	8,710

i. Improvement of Irrigation Systems with Diversion Weirs

The irrigation systems with diversion weirs exits 20 irrigation units with no total utilization, due to the inefficiency water use by the obsolete canals, not completion of the projected installations and the flood damages in 1998. The objective is to improve the irrigation facilities in these areas for a total utilization. The diversion weir will be installed in points with possibility to take water directly from gates, and the structure will be simple constructed with the river bed stones. The existing canals are mainly earth one, with great losses by infiltration, and several canals are damaged by scours and collapses. So, lining works must be carried. The furrow irrigation will be selected due to it's economical adequacy. The 20 selected areas, with a projected total area of 10,181 ha (presently 6,101 ha), will have as main improvement the construction/ rehabilitation of diversion weirs in 7 areas, construction of 22.1 km and lining of 32.9 km of main canal, construction of 87.7 km and lining of 110.9 km of branch canal.

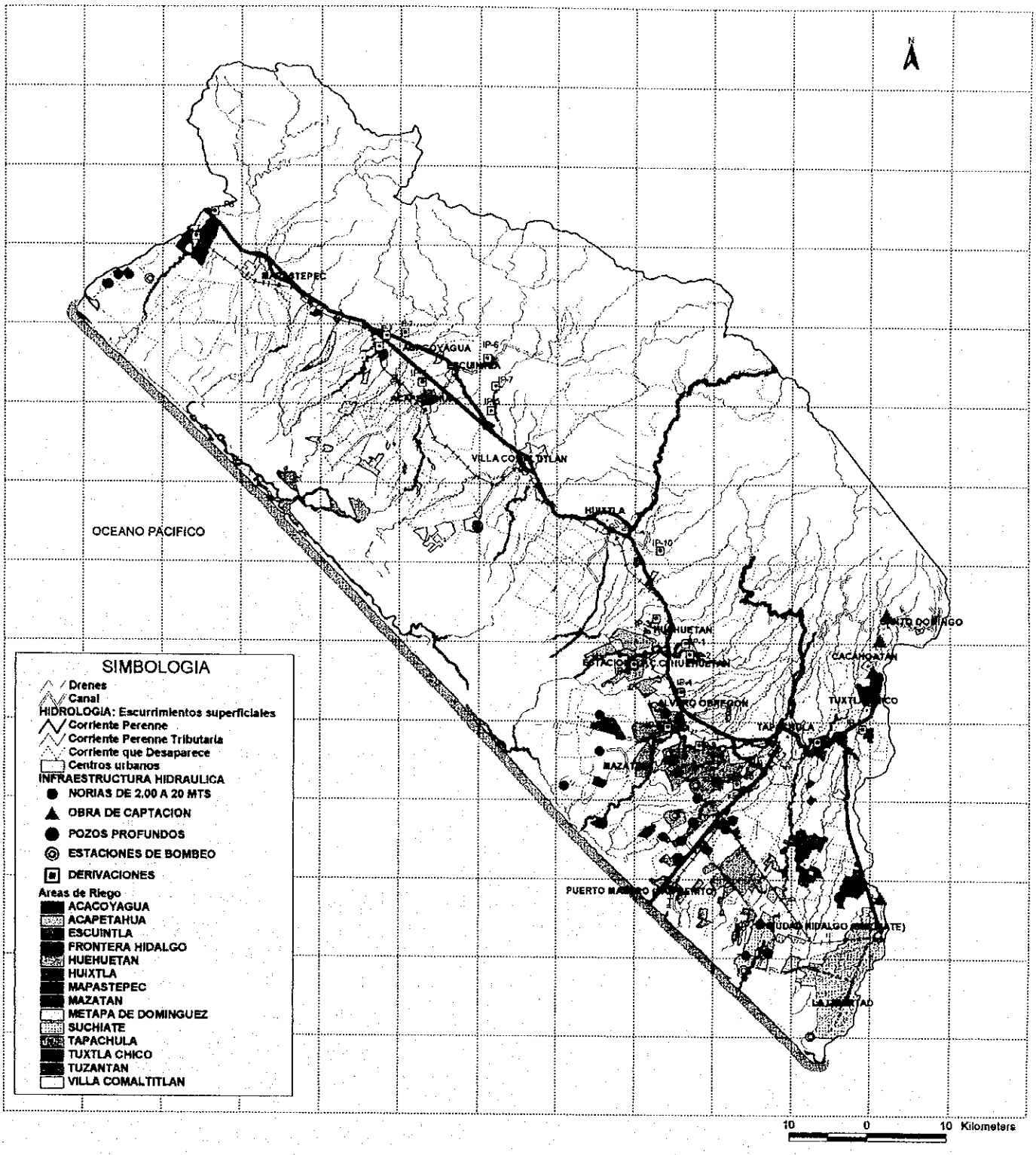


Fig. 4.3.2 Proposed Area for Small Irrigation System

ii. Improvement of Irrigation System with Pumping Stations

The irrigation efficiency is declining due to damages of pump/engine in the pumping station, installed in rivers and canals, and not improvement of canals. So, there are 6 irrigation units where the irrigated area is very small when compared with the projected one. With the improvement of the pumping stations, it will be possible to take the necessary water, proportioning a total utilization of the irrigable projected area. The main improvement will be the renovation of 8 sets of pumps, construction of 2.2 km and lining of 4.5 km of irrigation canals for an area of 957 ha (presently 586 ha).

iii. Improvement of Deep Well Irrigation System

The project will be constituted by the renovation and rehabilitation of deep wells / pumps / irrigation equipment in 23 irrigation units that are not totally utilized due to the obsolete and lack of pumping equipment and low discharge capacity of the pumps and wells. The existing deep wells with no possibility of utilization will be replaced by another one. The depth of the wells has great variation according to the location, but the average depth will be 60 m. There will be installed bore hole pumps in the deep wells, with sprinkler irrigation systems of movable aluminum pipes. The improvement will cover 23 units in a total of 6,926 ha (presently 2,023 ha), with projected 132 wells (construction of new 63 wells) and 95 pumps (new/rehabilitated pumps).

b. Small Scale Irrigation Project in Coastal Area

The coastal area has a concentration of plain lands, but the agriculture potentiality has not being utilized totally due to the lack of irrigation installations. The installation of shallow wells for small farm areas will develop and utilize efficiently the limited irrigable area in this area. It is selected the Emiliano Zapata – Barra de San Jose district (800 ha) for the project due to the concentration of agricultural lands and the production desire of the inhabitants. There will be installed 160 wells of 15 m of depth, with bore hole pumps of 125 mm of diameter, irrigating watermelon and melon with micro irrigation. Each well will irrigate 5 ha and the operation / maintenance will be responsibility of the benefited farmers.

c. Small Reservoir Irrigation Project

For the supplementation of the water lack during the dry season, the small scale reservoirs will be possible way by the storage of water excess during the rainy season to be utilized during the dry season. It will be reached by the construction of small scale reservoirs at the river upstream. The selection of irrigable areas around the possible points for small reservoirs construction resulted the following for the Cosalapa, Huehuecho and Cacao rivers.
The reservoir dimension is planned to be as follow:

Item	Unit	Rio Cosalapa	Rio Huehuecho	Rio Cacao
Dam Type	Homogeneous Type Dam			
Reservoir Area	ha	33	35	41
Weir Height	m	4	4	7
Weir Width	m	180	120	90
Water Depth	m	3	3	6
Storage Volume	m3	420,000	550,000	1,200,000
Irrigable Area	ha	60	15	10

The sprinkler irrigation will be utilized for the banana and palma africana. The operation and maintenance will be done by the beneficiaries by the establish of new water use cooperatives.

3) Implementation Plan

For the planning and implementation of the project, water users associations or individual farmers will work as executing body under the support and inspection of State Government and use the local consultant and contractor in the State. The implementation period will be determined by the scale and items of project because it is necessary to get the management and technology for each association or farmer to cultivate profitable crops that corresponds with the investment. The period depends to each unit content and size, but basically, each unit will be completed in one year, needing 20 years for the project completion.

For the coastal area project and the small reservoir project, the SAG will be the execution agency and will provide the design and implementation program. But, as it doesn't have much experience in irrigation projects, it will receive collaboration for planning and implementation from the Tapachula No 8 Agriculture Development Department of the SAGAR.

(2) Drainage Improvement Project

1) Objective of the Project

The present area's drainage improvement has the bank construction in the main rivers and improvement of main drains by the Chiapas Coastal Area Water Management Works. It resulted in the decrease of flood and inundation damages, becoming possible 2 crops annually in some areas, increasing the agricultural production. But, the not improvement of secondary and smaller drains makes the drainage of inner water insufficient, resulting in inundation damages during the rainy season damaging the agricultural production. So, the drainage improvement will eliminate the inundation damages, increasing the germination, rood putrefaction and the vegetable renovation capacity developing the agricultural sector.

2) Contents of the Project

The present area has drainage deficiency at the west part of the Cahoacan river with altitude less 20 m. The construction of secondary and smaller drains will be carried in this part in an area of 1,051 km^2, that exclude the environmental protection area. The planned drains will be connected to the existing main drain not occurring changes in the basin. The drain density will be based on the Suchiate No 46 irrigation Area's one. It will be composed by secondary to quaternary drains. The length will be 597 km for the existing main drain and construction of another 987 km of secondary, 2,103 km of tertiary and 4,319 km of quaternary drains, in a total of 8,006 km.

3) Implementation Plan

The present project has being implemented by the Chiapas Coastal Area Water Management Works, but it will be desirable to be continued by the CNA. Essentially the works will be responsibility of the CNA being executed by local consultants and constructors. The construction cost will be charged to the beneficiaries, that will be responsible for the labor cost, and the CAN, that will be responsible for the material and equipment costs.

(3) Road Improvement Project

1) Objective of the Project

The main roads are very well maintained, but the most of rural roads are gravel or earth roads and the maintenance are insufficient. Due to this, the road surface conditions are very poor, affecting the transportation of agricultural and livestock products and inputs materials. The improvement of

rural roads and reinforcement of the road maintenance machinery will contribute to increase the agricultural production and improve the living conditions of the inhabitants.

2) Contents of the Project

a. Improvement of Rural Road

The project has the objective of road surface improvement with asphalt or gravel pavement for the existing rural roads. Also the rural road network will be improved by the construction of new roads. The roads to be paved with asphalt are those principal rural roads that are parallel and perpendicular to the route 200, and the total length will be 271 km. The gravel pavement will be realized in those branch from the above mentioned principal ones, having as total length 417 km. The implementation will be divided in 3 phases: 1st phase for the asphalt pavement; 2nd and 3rd phase for the gravel pavement. The roads to be improved by the project are shown in the Fig. 4.3.3.

b. Reinforcement of Road Maintenance Machinery

It takes a time for the completion of all the improvement works. So, the road maintenance machinery must be reinforced for the increasing of periodic maintenance capacity until the completion of improvement works. Especially in the rainy season, when the roads used to be closed, an urgent repair service must be done by reinforcement of the maintenance machinery. Judging from the road density in the area and the experience of the repair and maintenance of the rural roads, 2 sets of maintenance machinery groups must be reinforced. Each set will be equipped with heavy machinery as bulldozer, vibrating roller, macadam roller, motor grader, back hoe, damp truck, etc. and with a management vehicle and necessary equipment.

3) Implementation Plan

The road improvement will be realized by the present responsible organization without substantial changes, but increasing the efficiency of their activities. The roads will be improved independently, and in case of different involved organizations, a combined work will not create any problem for the works realization. So, it is reasonable that the CEC being responsible for the improvement of the asphalt roads, and the SCT and CNA for the remaining one.

(4) Improvement Project of Rural Water Supply

1) Objective of the Project

The water supply facility is covered for 53% of the population and 10% of the communities, a very low water supply conditions in the rural area. Due to this, in the rural area without water supply facility, inhabitants are taken an unsanitary water from rivers and dug wells. So, it is required to be installed the water supply facilities for improvement of the water supply conditions to level up the living conditions.

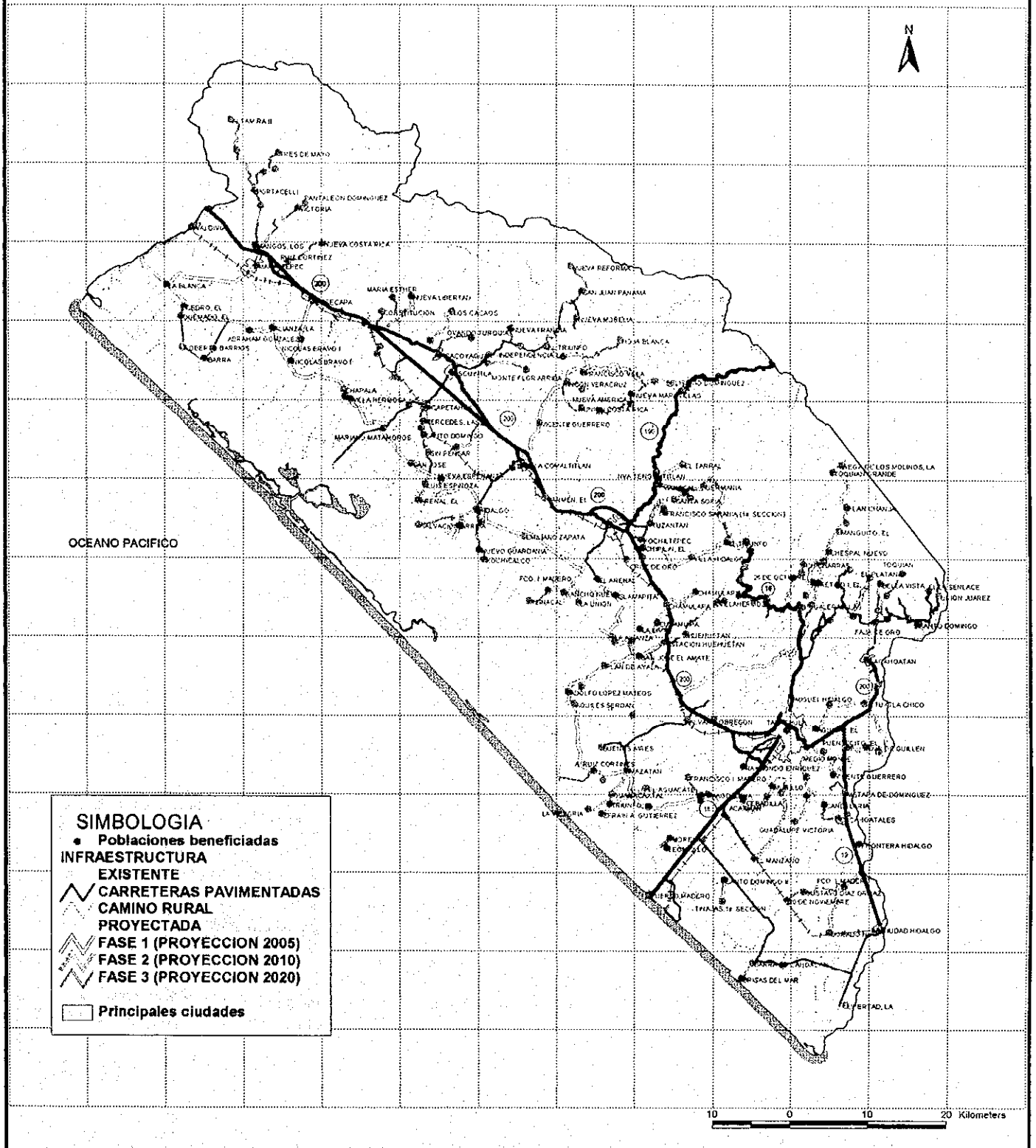


Fig. 4.3.3 Proposed Route for Road Improvement Project

2) Contents of the Project

The target communities for this project will be the one without water supply and more than 100 inhabitants. Among the about 2,330 communities in the area, the project will be selected 379 communities. The house connection system utilized deep well is proposed for those communities. In this system, the groundwater is pumped up from deep well by submersible pump. The water is then stored in elevated tank and distributed through pipelines to individual houses. The inhabitants of 379 target communities differ from each one. So, considering the standardization of design, installation and maintenance, the water supply system is classified into 4 classes : 100 to 300 inhabitants, 300 to 500 inhabitants, 500 to 1,000 inhabitants and more than 1,000 inhabitants. Each classes has 237, 79, 54 and 9 communities respectively.

This water supply system is an independent water supply system to be operated and maintained by each community. So, new organizations for operation and maintenance will be established for each system. Those new organization will be under responsibility of each municipality.

3) Implementation Plan

Rural water supply is largely related with supply of safe water as Basic Human Needs (BHN) and it is an important sector in the rural development. So, it is desirable that sufficient support by government organization is provided until financial and technical conditions of inhabitants are stabilized. For the planning and implementation, respective municipality will work as the executing organization under the support and inspection of State Government and use the local consultant and contractor in the State.

4.3.5 Marketing System Improvement and Processing Sector Promotion

(1) Objective

It is necessary to know the problems concerned to the agricultural products marketing system in Soconusco to develop measures of attenuation.

(2) Contents

1) Improvement of the Marketing Route

a. Outline of the Plan

There is no way to small farmers sell their products for a suitable price in Soconusco. There are many cases of losses in profits due to the short information that the farmers have. The master plan implementation will increase their production, making capable the establishment of wholesale markets for them to have direct access to the market. Lack in information in the present makes the small farmers not apt to realize alternative measures as introduction of new crops, etc. So, a marketing center will be planed here to solve these problems.

b. Contents

Establishment of Wholesale Market

Mixing and diversifying, the agricultural production will increase between the small farmers. The marketing of those products will need a marketing center to assist in the negotiation through a direct participation in the market. The wholesale market can be settled in the Tapachula city that can be considered as center of the region.

Formation of a Market Information Center

This center will be created to facilitate the acquisition of information of the region and out of it. Also, it will be created a system to maintain a close relation with the oversea department of Chiapas government. This information system will allow to know the market variation and sell the products for the best price.

c. Implementation Method

The establishment of whole sale market will be performed by the Municipality of Tapachula which will be in charge of planning, finance, execution, administration and operation. The finance will be depended on the development banks. The resources of the finance of the project will be recovered by the selling of lots to whole sellers and merchants.

The Market information center, the other hand, will be implemented by participating with SAGAR, SAG and Secretariat of Economic Development of Chiapas state.

2) Participation of Small Farmers in the Market

a. Outline of the Plan

The monoculture is common between the small farmers, and the productivity is very low. Also, they don't have suitable transportation ways, reason that the products are sold to brokers that buys for lower prices. To avoid these problems, associations of small farmers must be settled to joint the productions. Processing installation also can be installed to elevate the value of the products. With the mixed and diversified production, the small farmers will facilitate the direct participation in the market increasing their profits.

b. Contents

Installation of Agricultural Products Processing Facilities

- **Improvement of Coffee Process Installation**

Most of the small farmers in Soconusco don't utilize the humid coffee processing method, that elevate it's quality and so, the selling price. On the other hand, most of the facilities that utilized this method are becoming obsolete needing renovation. So, the following measures are proposed:

- Construction of small scale humid coffee processing units for small farmers
- Renovation of the existing obsolete humid coffee processing units
- Installation of coffee bean drying unit

c. Implementation Method

In principal, the installation of the plants will be executed by the beneficiaries. However, it is anticipated to obtain the fund by the program of Alianza para el Campo. In addition, the expense of the beneficiaries will be financed by FIRA.

3) Improvement of the Existing Slaughterhouses

a. Outline of the Plan

For a secure and hygienic distribution of meat, the inspection structure before slaughter, improvement of the existing slaughter houses, construction of new slaughter houses and suine and sheep processing units must be strengthen. Also, the management improvement at the

slaughterhouses must be carried to secure hygienic meet. It will promote the consume increasing the farmers profit.

b. Contents

New or rehabilitation slaughterhouses must be settled to meet the national standards for meat processing. It must be equipped with depilatory machine, blood treatment facilities, derivates and waste treatment facilities, incinerators, scales, simple disease diagnosis equipment, etc. to secure hygienic meat. Also, proper disposal of waste must be carried.

It will be improved the existing slaughterhouses in 10 communities, except Acacoyagua, Frontera Hidalgo, Mazatán Metapa, Tuzantán and Union Juares, and suine process units will be constructed. Frontera Hidalgo will have a promotional project for suines and a slaughterhouse specialized in it.

c. Implementation Plan

The program will be implemented having as main organism the responsible community. There is no suine slaughterhouses except in Huixtla and Suchiate. But, suine processing units will be settled according to the possibility and inspection structures will be created. Sheeps don't need special facilities, but the rehabilitation of the slaughterhouses expenses will be re-evaluated.

4) Promotion of Agricultural Processing Sector

a. Outline of the Plan

There are many projects concerning to agricultural development in Soconusco that were not put into execution. The main reasons for the not execution are the not sufficient study and lack in budgets. The present plan will contribute to avoid such condition by the efficient utilization of the regional resources. The potential for the processing sector in the region is very high. But it will need a careful study of the market, necessary measures to decrease the investments and formation of human resources. So, before the investment, budgets must be secured for the study.

b. Contents

Fund for the Chiapas Agro-products Processing Units
The activities to be carried under the fund are:

- Promotion of the agro-product processing sector in the region. Participation as stockholder in firms at the beginning.
- Acquisition of equipment for small and medium firms, and credits with low interests;
- Assistance for human resources formation to improve and modernize the existing firms.

Budget for Preliminary Studies for the Investment in Chiapas
The activities to be carried under the fund are:

- Studies on economical, financial and technical aspects to enable the development of the agro-products processing sector utilizing in a wide range the regional natural resources;
- Credit to the elaboration of F/S by the association of farmers.

c. Implementation Method

The Secretariat of Economic Development of Chiapas state in cooperation with SAGAR, SAG, FIRA and other public organization will be responsibility for promote this fund.

4.3.6 Alleviation of Environmental Degradation

The following programs shall be implemented in order to preserve the existing natural resources in the Study area by the introduction of the maps referred to water, flora, etc.

1. Measures against deterioration of forest resources
2. Water pollution control
3. Management of environmental reserves
4. Strengthening of environmental institutions
5. Project of Disaster Prevention Monitoring Strengthen

In regards to measures against the deterioration of forestry resources, besides the preservation of the existing resources by the promotion to increase the natural resources, the forestry resources in terms of areas and diversity shall be also increased. Introduction of measures against forest burning and the introduction of environmentally sound coffee production system shall be promoted as an strategy for preservation of the existing forest areas. However, the environmental preservation parts in the protected areas shall be carried out through the actions to be implemented by the measures program for Environmental Preservation conserving the forest and diversities. Introduction of agro-forestry and forest in areas where unsuitable agriculture in terms of quality of soils and climate are being carried out,.shall be promoted in order to increase forestry resources

Regarding the measures against pollution of water resources, quality of water shall be improved by the introduction and promotion of measures for the improvement of waters contaminated by agriculture industries, waste of rivers and sewerage from the village. Monitoring area shall be also strengthened in order to identify causes of contamination. Works shall be implemented given priority to the areas where there is high contamination problem for the extraction of drinking water considering the size of the plans.

Necessary measures to preserve and strengthen the necessary monitory actions in the ecologically protected areas existing in the Study area shall be developed. Besides de execution of the necessary studies to preserve the natural resources, strengthening of the supervision shelters and related office shall be carried out in order to strength the institutions related to the environmental areas. Implementation of monitoring system shall be carried out in order to mitigate natural disaster by the fiscal actions.

The actions to be carried out within the environmental preservation sector shall be implemented in order to create a balanced region between the human activities and environmental preservation actions by the introduction of sustainable agriculture considered more resistance to natural disaster and suitable for the long term environmental preservations.

The environmental degradation alleviation must consider a long term protection of the environment. The human activities must be in harmony with the environment.

(1) Measures against Deforestation

1) Objectives

The study area has privileged rainfall and soil condition, but the deforestation has being realized to cultivate the coffee and cattle breading. Moreover, some lands not apt for agriculture had being deforested despite of it's low productivity. The remaining forest is reduced, but the fauna and flora diversity is big, being necessary to be protected. The fire control in essential for the forest

protection, and the increase in the area must have the promotion of reforestation and agro-forestry.

The following project shall be implemented in this project:

1. Conservation of Forestry Reserves
2. Increasing of the Forestry Areas
3. Conservation of the existing flora and Biodiversity
4. Production of Wood by forestry activities

The following indirect impacts are expected as sub-products of the Implementation Program.

1. Against Erosion due the Forestry actions
2. Conservation of Natural Resources
3. Raising of Soil Fertility
4. Transformation of non-economical activities in soils unsuitable for agriculture production
5. Increase of regional economies due the production of forest products.

2) Content of the Program

Details of each project are demonstrate as follows

a. Stimulation of Small scale Forestry

This project is carried out in order to stimulate the forestry actions in small scales by following the next items

1. Distribution and Production of Seeds
2. Forestation in small scale

This project is developed as public action by the establishment of a production and distribution center for each municipality. The seeds will be distributed to the inhabitants without expenses The establishment shall be managed by the municipalities and include the following facilities.

1. Nursery with irrigation Equipment
2. Transport means
3. Administrative Center

b. Measures against fire

Taking into account that the main causes of forest fire are burning of pastures and traditional practices of burning of deforested areas, the following items shall be implemented by the supply of credits to carry out those prevention actions;

1. Establishment of fire break belt
2. Purchase of equipment and machinery for fire prevention

c. Agro-forestry activities and forestry

The following items shall be financed to farmers interested in the implementation of agro-forestry and forestry activities

1. Elaboration of Action Plans

2. Supply of seeds and plantation costs
3. Supply of Equipment and Agriculture Machinery for planting activities
4. Planting and maintenance Cost until the stabilization of the agriculture activities

d. Stimulation for the Introduction of the Environmental Coffee (Stimulation for the utilization of native trees for shadows)

The coffee plantation is one of the main economical activity in the region and covers most of the hill areas and is also considered as base activity. However these flower diversity are being reduced by the introduction of the modern agriculture practices by introduction of other trees. Besides, small scale farmers are abandoning coffee plantation activities due the low productivity leaving large areas. The following actions shall be promoted in order to recover the flora resources and coffee plantations.

1. Stimulation for recovering of tree flora resources and coffee shadows with native trees
2. Coordination with the authorized agencies
3. Implementation of necessary studies in order to certify farmers of Coffee-amigo.
4. Establishment of Commercialization ways

3) Implementation Program

The present program has profitable and conservation characteristics. The profitability will be achieved by agricultural credits for the farmers, and the conservation by the assistance of the government.

(2) Water Pollution Control

1) Objective of the Program

The El Encrujilada conservation unit has being damaged by the water coming from the upstream. Measures against sewerage and industrial water in the upstream, measures agaist contamination sources from agricultural activities in the middle stream must be developed to avoid the damage increase in the conservation unit. Also, the communities in the middle stream utilizes low quality water for drink, that comes from the upstream. The inhabitants health has being damaged. So a immediate measures agaist contamination of water shall be implemented. The following result shall be obtained by the implementation of this program;

1. Improvement of the canalized water quality
2. Improvement of the water quality in low water

2) Contents of the Program

a. Improvement of waste water in Rural Zones

This project is guided to improve the quality of drinking water by the improvement of the wastewater in the rural zones. This project shall be implemented gradually. This project shall be considered as public work and following actions shall be carried out for its implementation;

1. Elaboration of the studies necessary for the implementation of the works
2. Installation of septic tanks
3. Execution of collective works in the rural zone for treatment of wastewater

b. Measures against Contamination of Water caused by Industrial Water

This project aims to improve the quality of industrial wastewater by the credit lines that may supply stimulation for the implantation of contamination control systems. The following investments shall be allocated:

1. Elaboration of Action Plans
2. Modernization of facilities costs
3. Installation cost of the Water Treatment System

c. Monitoring of the Water contamination sources coming from Agriculture Activities

The following actions shall be carried out in the main rivers in order to monitory the quality of water in the region.

1. Elaboration of the Monitoring Action Plans (Methodology and use of human resources)
2. Establishment of the control shelter
3. Habilitation of Water Analysis Laboratory
4. Supply of Monitory Equipment
5. Implementation of Monitoring

d. Monitoring of the Water contamination sources coming from Agriculture Industry activities

This project shall establish the water monitoring systems. The monitoring system shall be established in the following places.

1. Coffee benefited factories
2. Sugar industries
3. Slaughterhouses
4. Exit of wastewater

e. Stimulation for the Minimum Use of Agriculture Inputs

The following activities shall be financed in order to stimulate the agriculture practices with a minimum use of fertilizer and toxic products;

1. Practices for the use of organic matter
2. Practices for control of grass
3. Practices for control of plagues
4. Practices of rotating crops with leguminous plants

3) Implementation Program

The present program will be realized as a public enterprise.

(3) Measures for the Environmental Reserves

1) Objective

There are two ecological protected areas within the study area, however there are not sufficient

measures that may protect those resources. The following measures shall be implemented in this program.

1. Enlargement of the environmental protected areas
2. Signaling of ways in the Environmental protected Areas
3. Monitoring strengthening
4. Promotion of forest conservation

Objective of each projects area as follows;

Project	Objective
Enlargement of the Environmental Preservation area	• Enlargement of the Ecological Reserve Areas • Improvement of inter-relationship among reserves • Conservation of natural resources
Signaling of Way in Environmental protected areas	• Signaling of ways
Stimulation for the preservation of protected areas	• Environmental Education by Environmental Signaling for ecoturism • Indication to population regarding natural resources
Monitoring	• Protection and Conservation of the Environment

2) Content of the Project

a. Enlargement of the Preserved Area (Protection of the Cordón Paxtal and Pico de Loro)

This project aims to include the following areas, not included as conservation areas yet, within the protected areas due the ecological resources developed in these areas;

1. Cordón Paxtal
2. Pico de Loro

b. Signaling Limits in Environmental Preserved Areas

Borders shall be implemented in order to clarify boundary among reserves. The places where the division shall be placed are the Biosfer el Triunfo, and the la Biosfer Reserve of la Encrucijada. When installing the signaling topographic studies shall be carried out to line the boundary of the nucle and buffer area and also the access area.

c. Stimulation for the Preservation of Environmental Areas

A command against fire shall be formed considering that forest fire is one of the main problems .

d. Strengthening of Monitoring

The following monitoring shall be implemented in order to improve conservation condition of the environment.

1. Monitoring in the Reserve Areas
2. Monitoring of fire control
3. Monitoring of Land and Water use
4. Formulation of the Integral Control System of the protected areas

5. Sedimentation study in swampy areas
6. Monitoring of works

Equipment, transport and necessary human resources shall be distributed for each control office. The proposed places for installations shall be the monitoring center of each organism. Those places are proposed in the monitoring strengthening program. The equipment will be defined according to each monitoring contents.

3) Implementation of the Program

The program will be executed as public works.

(4) Strengthening of Environmental Institutions

1) Objective

This program is composed of the following items guided to promote the environmental preservation actions.

1. Opening of Offices and Control Posts of IHA and INE
2. Environmental studies and data arranging
3. Establishment of trust

The environmental control post shall be installed in order to supply information for tourists and conserve the environment. The studies shall be carried out in order to collect the necessary data for the environmental preservation. The trust shall be installed in order to supply necessary resources for the environmental actions.

Specific objective of each project is as follows:

Project	Objective
Opening of Office and Control post of the IHN and INE	• Strengthening of the environmental control activities
Environmental Studies and Arranging of data	• Identification of Natural Resources
Establishment of Trust	• Arrangement of financial resources

2) Content of the Program

a. Opening of Offices and Control Post of the las IHN and the INE

The following facilities shall be rehabilitated;

1. Regional Offices (Acacoyahua, Mapastepec, Angel Albino Corzo)
2. Triunfo Control Post
3. Biological Station of El Triunfo
4. Integral Environmental Station of Paval
5. Ovando Guardening Camp
6. Londores lagoon Camp
7. Integral Camp of Concepción
8. Camp of Las Garzass
9. Camp of turtles in Barra Zacapulco

The facilities must have necessary space for the moninory actions. Service to be rendered are the following.

1. Daily report of activities
2. Control of invasions and transference of technology of ecological agriculture
3. Control of fire and deforestation
4. Support of the Environmental Studies Activities
5. Support of the Eco-tourism
6. Environmental Education

b. Environmental Studies and Arranging of Data

The following studies shall be carried out within this program

1. Environmental Information Collection and Studies
2. Studies of Fauna and Flora in the different regions
3. Flower resources in the high areas
4. Forest resources in the low lands
5. Fauna in the lagoon areas
6. Flora in the Coast Region

c. Establishment of Trust

The trust shall be established in order to guarantee the preservation activities. The trust will be achieved by the environmental fund.

(5) Project of Disaster Prevention Monitoring Strengthen

1) Objective

The master plan for the river sabo planning is urgent due to the high occurrence of sand/earth disasters and flood in the study area. But basic data are not available due to the lack in the monitoring system as rainfall, river water level, sedimentation volume, etc. The present plan has the objective of strengthen the disaster prevention monitoring system in the Soconusco region and collect the necessary data for the river sabo measurements.

2) Contents

The following disaster prevention monitoring system must be settled in the study area. Moreover, a disaster prevention center must be created to realize the management, data collection and periodic measurements, as to create a database.

Monitoring Item	Resume	Location (River)
Rainfall	Automatic pluviometer capable to measure short term rainfalls in the upstream of the main rivers.	Novillero, San Nicolas, Cacaluta, Cintalapa, Vado Ancho, Comaltitlan, Huixtla, Huehuetan,Coatán Caoacan, Suchiate
River Discharge	Automatic water gauge capable to measure short term floods in the main rivers.	Novillero, San Nicolas, Cacaluta, Cintalapa, Vado Ancho, Comaltitlan, Huixtla, Huehuetán Coatán Caoacan, Suchiate
Sea and Lake Water Level	Automatic water gauge to measure the water level of the La Encrucijada swamp and sea water level.	El Manguito, Juan Escutia, Las Garsas, La Palma, Embarcadero, San Jose
Sand/Earth Sedimentation Volume	Ruler for sediment volume measurement in the main rivers.	Novillero (3), Cacaluta (2), Cintalapa (2), Vado Ancho (2), Huixtla (3)
Disaster Prevention Center	Computer for the database, vehicle for the transportation and management of the measurement equipment.	CNA/Tapachula Office

3) Execution Method

The present plan is to strengthen the CNA hydrological measurement structure. So, the responsible organism must be the CNA and a CNA disaster prevention center must be settled in Tapachula. The disaster prevention center director will be the Tapachula (CNA) director, and the staff will be filled by transference of the existing personnel. The installation and management of the automatic pluviometer and water gauges will be realized by the disaster prevention center. The water gauges for the La Encrucijada swamp and sea will be managed by the SEMARNAP/INE, but the data will be managed by the disaster prevention center after the collection. The execution will be as follow.

a) Elaboration of a Manual of Disaster Prevention Monitoring System (settlement location, personnel, costs)
b) Settlement of the measurement stations and equipment acquisition
c) Monitoring

(6) Project of Disaster Prevention and Environmental Conservation in Novillero River

1) Objective

The flood of September 1998 resulted in several collapses of slopes and debris flow in the Novillero river. It buried the Valdivia city causing damages. The rehabilitation of residences, federal roads bridge, etc. are under realization , but an effective river sabo measurement was not executed, remaining a great quantity of sediments in the medium and downstream of the river, that makes the condition very weak in case of floods. The present project will elaborate the feasibility study for flood and sabo measures in the Novillero basin, to prepare an effective and urgent river sabo measures.

2) Contents

The present project can be divided in sand/earth disaster survey in the upstream and flood control survey in downstream. The study area is the 409 km2 of the Novillero river basin. The study contents are as follow.

a) Collection of the Federal Development Plan, Regional Development Plan, Related Plan of CNA
b) Collection and analysis of meteorological and hydrological data
c) Topographic survey (cross and longitudinal) of the Novillero river and of the relief of the federal road downstream.
d) Geological survey and mountain collapse/debris flow survey.
e) River mouth survey, social survey of the environmental protection area, ecosystem/environmental survey.
f) Flood analysis, sand/earth production and transportation survey, flow capacity survey of the existing rivers, flood damages survey.
g) Sabo dam planning survey, river works survey, flood control survey
h) Hazard map, collapse/debris flow hazard map elaboration.
i) Flood measurement for medium and log terms, alternative plan for sabo measurements
j) Emergency works for short term flood and sabo plan.
k) Environmental evaluation for emergency works.
l) Execution plan and project evaluation for emergency works.
m) flood and earth/sand disaster forecast, alarm, definite plan of evacuation system.
n) Advises on river management and basin conservation for the natural disaster prevention.

3) Execution Method

The study must be realized by a international organism or other developed country with the counterpart of the Mexican concerned organism. The study team member must be constituted by (1) team leader, (2) river improvement, (3) sabo plan, (4) hydrology, (5) geology, (6) flood/debris flow analysis, (7) river structures, (8) sabo structures, (9) construction plan/cost estimation, (10) topography, (11) environment, (12) organization/legislation, (13) socio-economy/project evaluation. The study period will be 24 months.