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REPORT ON PROPOSED DEMONSTRATION SITES

SMALL FARM NATURAL RESOURCES MANAGEMENT PROJECT WITH
THE DIRECTORATE GENERAL OF RENEWABLE NATURAL RESOURCES
USAID/EL SALVADOR PROJECT 519-0217

PREPARED UNDER TECHNICAL ASSISTANCE CONTRACT 519-0217

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I N T R O D U C T I O N

Before we present site selection criteria and site recommendations we would like to mention and discuss certain realities which confront every technician when dealing with soil conservation projects in El Salvador. They are relevant to the work at hand and will provide a direction for the work ahead.

Looking at reports, analyzing some projects, and trying to define what has been done in the past, we see a lack of:

- A) Data that applies soil conservation aspects to the cropping system typical of the northern zone.
- B) Flexibility in the soil conservation practices proposed, promoted and executed at the farm level.
- C) Research and knowledge of the social and economic characteristics of the farmers in the northern zone.
- D) An Extension/Education methodology directed at training local technicians, and reaching farmers at their level of technology and farm size.

More recently, highly theoretical models have been proposed to deal with the countries' soil conservation problems on a watershed basis, but they still fail to deal with existing cropping systems, and social and economic conditions. Consequently they do not propose an extension/education component that reaches field technicians and farmers.

SITE SELECTION RATIONAL

Based on the above observations, "Small Farm Natural Resource Management Project" objectives, and time constraints, the sites we are proposing will attempt to facilitate:

- A) Data collection on agronomic and socio-economic conditions.
- B) On going Project evaluation and modification.
- C) A control cropping system, "the milpa", for analysis of the soil conservation practices under various cropping alternatives. This provides flexibility and continuity to the collection and analysis of data*
- D) A series of demonstration areas important in the training of farmers, technicians, and the professional staff of D.G.R.N.R.
- E) Future analysis of the methodology in respect to community/group structures, interest, development; and coordination, cooperation, and use of incentives amongst participants and agencies.

ASSUMPTIONS

- A) Technical and Agronomic Assumptions
 - 1) The subsistence level farmer in the northern zone is planting steep eroded slopes with basic grains within what we call the "milpa system".
 - 2) The "milpa" is a cropping system which integrates in a farming system such combinations as: small animals (pigs and chickens), livestock (2-5 head, mainly for dairy production or selling calves), fruit trees, henequen, vegetables, and more recently coffee. These variations are usually found when soils are better, irrigation is available, or when the farmer owns more than 5 manzanas (See Section IV).

This is of special importance in this project, due to the insecurity of the follow up project in 1981.

- 3) Under existing environmental constraints (varying precipitation patterns and marginal soils) the "milpa system" offers the most efficient cropping alternative to the small scale subsistence farmer, by 1) minimizing risks through reduction of investment (seed, fertilizer and insecticide), and 2) utilizing varieties (criollo and certain improved varieties) highly adapted to present site conditions.
- 4) Recommended soil improvement (ie. organic fertilizer, hand tilling), and water conservation (ie. hillside ditches, terraces, contour planting) practices provide the basis for increasing potential productivity by modifying existing environmental constraints through increased water holding capacities, decreased runoff, and controlled surface erosion.
- 5) An increased potential productivity makes it economically feasible to introduce internal (improved technology) and external (new components) variations to the "milpa system".

This cropping system provides a certain uniformity to the on-farm technology and/or changes in technology throughout the Northern Zone, and a basis for evaluating variations within the "milpa system". These variations represent changes in specific crops, varieties, soil erosion and those modifications due to changes in the soil management systems.

B) Extension/Education Methodology Assumptions

Given the countries needs for designing, implementing and testing an Extension/Education component in soil conservation, we have analyzed and identified sites where one or more of the following structure or groups are or will be developed with community participation:

- Cooperatives or pre-cooperatives
- Grupos Solidarios
- Community development projects
 - DIDECO
 - OPOR
 - Proyecto Integrado San Miguel/Morazán
- United Nations Projects (PNUD, UNICF)
- CATIE/CENTA Project (cropping systems)
- Other groups.

With each site representing at least one of these variables, measured in relation to project development, extension/education methodology, community interest, acceptance and incentives, then evaluation and future implementation should be easier and less costly.

1) Social and Economic Assumptions

Due to restrictions, principally time, extrapolations were made from actual field data from the Gotera and La Laguna projects to provide information, which will not be available until future in depth, site specific analysis can be made.

- 1) Family size: Based on several personal interviews and samples from Gotera and La Laguna, the average family unit will consist of 7-9 members, within the unit, we consider 3-4 member as economically active (working on the family plot; cortas; home industry; rural labor, etc.)
- 2) Land Ownership: A questionnaire was utilized which classed holdings in the following manner:

< - 1 manzana
 1 - 2 "
 2 - 5 "
 5 - 10 "
 10 -

- 3) Annual family income: This figure is based on four main aspects:
 - a) Annual production of 1 manzana of land under the "milpa system", defining two levels of technology, traditional and semi-technified.
 - b) Wages from "cortas" assuming:
 - a) participation of 2-3 members* (see next page).
 - b) A 6-8 weeks work period.
 - c) wages from jobs as labor during low times.
 - c) Additional wages at some sites from:
 - a) Vegetable production where irrigation is feasible.
 - b) Livestock component.

- c) Handicrafts (petates, jarcia, losa, etc.) usually produced by women at the house.
- 4) Within the communities we have proposed, there exist a variety of structure and/or group development efforts. These variations will be the variables utilized to evaluate project activities, achievement or failures in relation to:
 - Extension/Education methodology.
 - Adoption of soil management and conservation practices.
 - Awareness of soil and water in the cropping systems.
 - Rational use of incentives.

This information tends to be very group and/or site specific and should not be used to generalize on the Northern Zone.

II. SITE SELECTION CRITERIA

Based on this criteria the following parameters have been employed in site selection:

Technical - Agronomic

- A) The presence of the "milpa" cropping system with one or more internal variations, (ie. henequen, coffee, forestry, livestock, vegetables).
- B) Edaphic conditions (ie. soils, topography, physical characteristics, erosion).
- C) The role of water and its relationship to soil conditions and the cropping system.

Socio-Economic

- A) Crop production data and a cost/benefit analysis.
- B) Credit systems and/or incentives available.

The participation varies from 3-4 members working 6-8 weeks in San Miguel-Cabañas-Chalatenango area, and 1-2 members working 5-6 weeks in La Unión-Morazán area.

- C) Disposition of labor and migration patterns.
- D) Land tenure patterns.
- E) Infra-structure.
- F) Existing community social structures and attitudes.

III. SITE CHARACTERISTICS

In general, the soils of the Northern Zone are characterized climatologically as tropical savanna (800-1800 meter above sea level) according to the classification of Köppen; with average annual temperatures ranging from 20.4°C (La Palma) to 26.3°C (San Francisco Gotera), and annual average precipitations of 1533 mm. (Uluazapa) to 2166 (La Palma), according to the meteorological almanac of El Salvador.

The hydrological systems of the zones studied are formed by portions of the following rivers: Talquezalapa in La Palma, Jiotique in Sesori; El Sauce in Lislique; Corinto in Corinto; Grande de San Miguel in Uluazapa; San Francisco in Delicias de Concepción; Grande de Chapeltique in Guatajiagua; Soyate in Tejutla, Lempa in Villa Victoria. The zone is further dessected by many lesser streams which flow only in the rainy season.

The terrain is predominantly of broken relief, with slopes over 35%. Soils tend to be superficial, with an effective depth of about 30 cm., though there exist smaller areas, in depressions and terraces, of greater depth. Textures are characterized by gravelly clays and clays, over volcanic parent material (balsatic tuff), in an accelerated state of weathering, or in the form of a hardened layer. This layer is interspersed in general, with stones, though occassionally they occur in the entire profile. Additionally, there exist areas on the slopes, where because of heavy erosion, due to land use (basic grains and over grazing), the parent material is exposed superficially (See Appendix 1 & 2).

The actual land use often does not correspond to the land use capability due to localized social and economic conditions and restraints (See Appendix 3 & 4).

A superficial survey of actual production, under the "milpa system" in the study sites, supported by more complete data on

specific sites, and past experience, indicates considerable variation in production (Appendix 5). Despite a growing awareness of improved production technology and increasing availability and use of agricultural inputs, there has been a failure to deal with the more basic limiting factors of soil improvement and water conservation. As long as these limiting factors go unchanged, not even the "criollo" varieties will realize their inherent productive capacity. Under these conditions, it appears rather ineffective to promote increasingly sophisticated systems and more demanding varieties.

Current cropping systems are summarized by site in Appendix 5. The notable common factor about them is the presence, in some form, of the "milpa" system at each site.

Uniformity, not variation, is the common denominator in the Northern Zone, both in physiographic and socio-economic characteristics.

There exists in each community a basic group of subsistence farms utilizing the "milpa system" in areas of eroded hills and poor soils. Though, 40 to 60% of the farm workers own some land, the majority of farmers (60%) find it necessary to rent additional land to plant basic grains. Generally there exists a lack of economic incentives to allow or promote improvements within their agricultural systems (Appendix 6).

Despite the existence of an Extension/Education system there is a definite lack of 1) its availability in most small isolated communities, 2) follow up field assistance once technical recommendations are given, and 3) integration, in the majority of cases, of critical Soil/Water conservation practices with the farming system.

IV. "THE MILPA SYSTEM"

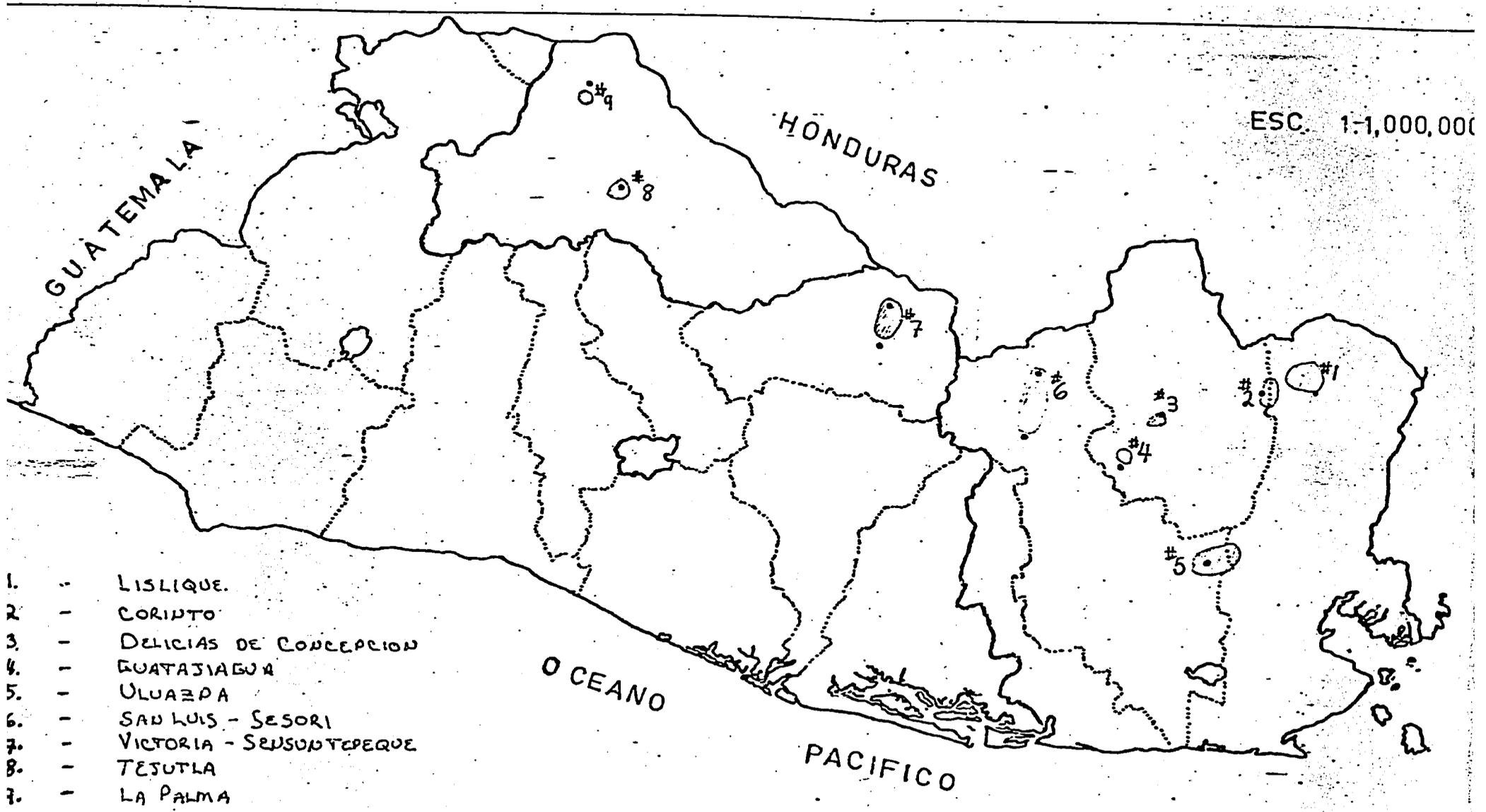
The "milpa system" as used here, is the traditional subsistence level basic grains cropping system. Its primary crop is corn, in combination with one or more other crops (beans, sorghum, rice). However, a crops priority within the system varies between sites depending on specific environmental and socio-economic restraints. In addition to the basic grains the systems implies a "solar"* with several criollo fruit trees (orange, mango, lemon, papaya, avocado, etc.), a few small animals (chickens, pigs, ducks, turkeys, etc.) again generally criollo, and occasionally a couple of cows and a calf (75%), production is basically for domestic use. The basic configuration of the system in the studied areas is:

Lislique	-	corn, beans, sorghum
Corinto	-	corn, beans, sorghum
Delicias de Concepción	-	corn, beans
Guatajiagua	-	corn, beans, sorghum
Uluazapa	-	corn, sorghum, rice
San Luis de la Reina	-	corn, beans, sorghum
Villa Victoria	-	corn, beans, sorghum
Tejutla	-	corn, beans, sorghum
La Palma	-	corn, beans

Depending on site conditions variations appear in the system. In areas of poorer mountainous sites the principle crop might be henequen in which the "milpa" is intercropped, in other areas where soils are deeper perhaps coffee or fruit trees assume a higher priority. In others, vegetables intercropped have the top ranking.

*Solar: Backyard - very small piece of land.

Proposed Project Demonstration sites



1. LISLIQUE (El Derrumbado)
LA UNION

Located in the extreme Northwestern corner of La Unión, at an altitude of 250 mts. Lislique has an average yearly temperature of approximately 26.3°C and an average yearly precipitation of 2077 mm., with a generally pronounced "Canícula".*

Physiographically the zone is characterized by steep broken slopes (> 35%) and depressions with smaller dispersed areas of gentle hills (< 15% slope). The soil has evolved from piroclastic rocks high in silicious materials and tends to be acidic. Erosion has reached an advanced stage in most areas due to the steep slopes and improper land use. The typical profile on the slopes has a surface horizon of clay, of up to 30 cm., of depth, over parent material (basaltic tuff) in an advanced state of weathering or as a hardened layer. In areas where utilization and erosion have been intensive the parent material is exposed on the surface. Surface stoniness tends to be moderate to heavy.

According to texture, structure and development these soils are classified as Entisols and fall into land use categories Class VI ES and V III with recommended uses being grazing land and protected areas respectively.

The predominant cropping system is basic grains (corn-beans-sorghum) under traditional management practices. A livestock component (5 head plus some chickens and pigs) is an integral part of this system. Additionally, a significant semi-technified tomato production exists, though access to markets is a problem. Recently, through the cooperative a major effort to integrate henequen has been mounted, incorporating contour planting.

It is the central point of agricultural and economical development for an extensive area. The area has been until recently, ignored by MAG Agencies due to inaccessibility. The community works together in the solution of common problems and recently a 300 member agricultural coop was formed in Cantón El Derrumbado. Coop members are basic grains producers, but they are planting henequen, using Soil Conservation practices with D.G.R.N.R. assistance. Land tenure in the area is typical of the pattern in the San Miguel-Morazán-La Unión zone where small scale farmers work marginal land in the hilly

A dry period of 2-3 weeks during the rainy season.

less accessible areas, on a subsistence basis. 50% of the farmers own some land, while 70% rent land to plant Basic Grains. 40% of the owners own < 2 mz., 35% own from 2 to 8 mz., 20% own 8 to 10 mz. and 5% own > 200 mz.

The average size of the family plot is < 1.5 mz. and the family unit is formed by 6-8 members. This unit has a yearly income of \$1500 under the "milpa system".

The area has been until recently, ignored by MAG agencies due to inaccessability.

LISLIQUE

The community has an strong desire to work as a group in the development of infrastructure (upgrading the road, providing facilities for a soil conservation extensionist, and coordinating meetings) and the organization of a coop in Cantón El Derrumbado.

Area provides, within our Site Selection Rationale, the opportunity to:

- 1) Analyze soil conservation practices in a cropping system dominated by henequen, and investigate variations of the system with the association of basic grains and/or vegetables.
- 2) Test and evaluate the employment of educational and, soil and water conservation practices within the group structure of a cooperative type of organization.

If the Extension/Education component of the project is to follow the guidelines and experiences of the Gotera and La Laguna projects; the coop will present an opportunity to develop a dynamic educational component. This will provide the group with tools to reinforce their own internal structure via classes, demonstrations, and experiences; and focusing the need for the integration of activities and cooperation. This will be a long term endeavor, with DGRNR to follow up if positive results are shown in 1980.

2. CORINTO (La Laguna, Corralito) MORAZAN

Located in the East Central portion of Morazán at an altitude of 820 mts., Corinto has an average yearly temperature of 22.6°C, and an average yearly precipitation of 2203 mm., with a usually pronounced "Canicula".

The zone is characterized by 2 principal physiographic conditions, wide depressions (slopes of 5-10%), and the surrounding low hills and steep ridges (slopes to 60%). Parent material is typically piroclastic, tending to be acidic and containing large amounts of silicious elements. Due to the steep slopes and cropping systems, and to a lesser degree the process of gleying, the soils tend to be deteriorated. Extreme slopes (>50%), shallow depth, and high water tables are limiting factors in some areas.

The steep ridges (slopes >25%) are Entisols of shallow depth (to 40 cm.) and clay textures. The low hills, though of lesser area present more developed soils, Alfisols, with effective depths of up to 100 cm., and textures of clays or fine clays. These soils belong to use Classes IV and VI, with their respective recommended uses being crops with intense soil conservation measures, and permanent pastures.

The depressions fall into two categories, those with drainage problems and those without. The poorly drained depressions are Entisols, heavy textured (clays) and superficial, of potential use Class V apt for pasture. While the soils of the well drained depressions, are more developed (>100 cm.), clay loams and clays, categorized as Inceptisols. Soils of this type are classified as Class IV with potential for cropping under intensive soil conservation practices.

Soil conservation is not a traditional practice though some classes have been given through the extension office and more are planned.

The predominant cropping system is Basic Grains (corn-bean-sorghum), in a semi-technified management scheme. A small live-stock component is integral. Additionally, there exists a traditional forestry (wood production) practice in the areas of pine forest, and a growing semi-technified commercial vegetable production (tomate, cabbage) established in the areas of deep irrigable soils. Rentable land is a limiting factor. The establishment of new coffee plantations (70 mz.), has received recent emphasis, but technical assistance has been lacking.

A small portion (<5%) of large scale ranchers own more than 4,000 mz. in the area.

Corinto is the center of a large agricultural community. Adoption of improved agronomic practices is fast but a void exists in Soil/Water conservation practices.

Basic Grains production is the main agricultural activity, but vegetables are produced on irrigable land, and coffee, fruit trees, wood production, and livestock are also of economic importance. Around 50% of the farmers own the land they plant, of this group 40% own 1 mz., 20% from 1-2 mz., 9% from 2-10 mz., and 30% 10 mz. About 60% of the farmers rent land.

The family unit is formed by 7-9 members, whom work a farm of no more than 1.5 mz., in Basic Grains. Total yearly income is approximately ¢ 1400 for Basic Grains production, under the "milpa system". The figure goes higher for livestock producers (>10 head), vegetable producers, technified bean producers, and small woodlot owners. The community is willing to learn and improve, and has an open attitude toward change. Peace Corps has worked in the area during the last 3 years and a good Extension Agent from CENTA has been in the area for 4 years and he has established very good credibility.

CORINTO

The site presents excellent characteristics :

- 1) Wide range of alternatives in soil/water and cropping systems such as forest, irrigated vegetables, bean production and natural pasture.
- 2) Rapid assimilation of improved technology. ^{1/}
- 3) Community interest in improving production and resource management.
- 4) The presence of a good extension Agent (CENTA) and preliminary work done by several volunteers in the promotion of soil and water conservation.

Even though Corinto is progressive in the adoption of improved Agricultural Technology, it does not, as of yet, have a viable group structure. This void provides an excellent opportunity for the project to promote a structure as part of the Extension/Education Methodology.

Last but not least, is the need to improve soil and water management practices to facilitate improved technologies being tested and adopted in the area.

1/ Improved techniques in relation to the "milpa system".

3. DELICIAS DE CONCEPCION (C/Comidera) MORAZAN

Located at 585 meters, Delicias de Concepción has an average annual temperature of approximately 24.0°C and an average yearly precipitation of 2396 mm., with a generally pronounced "Canícula".

Relief is typically one of steep broken slopes, ranging from 35-75%, which have evolved from piroclastic rocks (basaltic tuff) and other silicious materials. Soils are typically clay in early stages of development and classified taxonomically as Alfisols. The effective depth in the majority (60%) of the area cultivated in basic grains, is < 30 cm. and moderately to heavily stoned. Though in isolated areas, where the generally heavy erosion is more severe, the parent material is exposed. In the remainder of this area, due to the permanent cropping of henequen, the soils tend to be deeper (to 50 cm.) and less eroded, despite the presence of steeper slopes (> 40%).

Land capability classification rates the area as Class VI (40%) and Class VII ES (60%) with recommended utilization being permanent crops with intensive soil conservation and permanent pastures, respectively.

The principle cropping system is henequen intercropped with a traditional basic grains (corn-beans) component. Additionally, small coffee plantations have been planted in areas with deeper soils (25%), which are managed under traditional and more recently semi-technified practices.

Commercial vegetable production (tomato, cucumber, green beans) are produced in some of the valley areas.

This area is located on the San Miguel/Morazán Coordinated Project and it is considered a critical development area. It presents interesting alternatives in its socio-economic structure due to, 1) possibility of integrating soil-water conservation work with several agencies already working in the area, and 2) the presence of henequen as the main cash crop, even though Basic Grains are still an integral part of the farmers cropping system.

About 60% of the families own some land under henequen and/or henequen/Basic Grains cultivation. Additionally, owners of < 1 m²

lease land in less accessible areas, on a subsistence basis. 50% of the farmers own some land, while 70% rent land to plant Basic Grains. 40% of the owners own < 2 mz., 35% own from 2-8 mz., 20% own 8-10 mz. and 5% own > 200 mz.

The average size of the family unit is 6-8 members, whom work a plot of < 1.5 mz. This family unit has a yearly income of roughly ¢ 1500 under the "milpa system".

DELICIAS/MEANGUERA

This area presents:

An excellent opportunity for analysis of a cropping system which has henequen as the main component and, includes as variables such other components as corn-beans (milpa) and vegetables. Additional in depth research, on the systems influence on soil erosion and productivity is necessary. This will provide a setting to design field research to yield information on how soil-water management practices fit into the system and its variations, and increase potential production by reducing risk.

The area is part of the Proyecto de Desarrollo Integral de la Zona Norte (Proyecto Integrado San Miguel/Morazán) permitting analysis and evolution of Project Methodology and achievements in a different community development structure and a specific mandate that integrates several technical assistance, agencies and their resources.

4. GUATAJIAGUA (Meanguera) MORAZAN

Located in Southwest Morazán at an altitude of 240 mts., Guatajiagua has an average annual temperature of approximately 26.5°C and an average annual precipitation of approximately 2011 mm., with a usually pronounced "Canícula".¹

This area presents a broken topography of rolling hills and ridges with gradients of up to 60%, evolved from piroclastic rocks acidic in nature. The shallow upland soils of clay loams and clays are heavily eroded Entisols. The more well developed soils of the depressions are deeper of finer textured (clays) Alfisols, and generally less severely eroded. Soil conservation is not a traditional practice though a Peace Corps Volunteer has begun work with a group of 10 farmers making rock walls using an "A" level and contour lines.

The predominant cropping system is basic grains (corn-bean-sorghum), under the traditional management practices at a subsistence level, integrating a minor livestock component (chicken and pigs). The larger owners (5-10 mz.) have a few head of cattle (5-10). Most of the small land owners (< 1 manzana), rent land to supplement their productive base, but there are problems with credit availability. At higher altitudes (C/El Volcán), there are a large number of traditional coffee and fruit plantations, and a number of new plantations and expansions are going in.

Within the area we have localized the Mainguera area, a cantón where farmers are mainly Basic Grains producers. In this area around 70% of the farmers own some land, of them 55% own < 1 mz., 30% own from 1 to 5 mz., and 10% from 5 to 10 mz. (livestock owners). Farmers plant around 2 mz., in milpa (corn-sorghum-beans) and 20% rent land in order to plant. Despite the presence of a CENTA office in Guatajiagua, the area needs technical assistance in Resources Management and Forestry.

The family unit is formed by 7-9 members, they earn extra income by harvesting coffee (2-3 members) in the nearby coffee plantation, Finca San Carlos. Generally family members leave on a daily basis. Their yearly income is around \$1,400 and production in the area tends to be low.

GUATAJAGUA

The site in this area will be localized in Cantón Manguera. Farmers have been exposed to the Soil Conservation ideas of the San Francisco Gotera Project, and a PC Volunteer working in the Cantón has started a small soil conservation group.

There is no basic group structure in the area and technical assistance from Government Agencies is nil. This situation presents the project within the opportunity of having a "control" type of community good for comparison with more developed groups and communities.

Migration in the area is atypical, due to the proximity of several large Fincas, and is largely restricted to daily commuting.

Manguera is isolated from Gotera. Its socio-economical links are with Guatajiagua and Chapeltique, due to location. The Indian heritage present in the area makes it the most traditional site of the 9 proposed for the project. This will present a challenge to the Extension/Education Methodology component, but at the same time it will provide excellent information as to potential changes in traditional communities in the Northern Zone.

5. ULUAZAPA (RÍO VARRAS)
SAN MIGUEL

Located at an altitude of 300 m., Uluazapa has an average yearly temperature of approximately 26.5°C and an average yearly precipitation of 1533 mm., with a generally pronounced "Canícula".

This zone differs from the rest of the Northern Zone sites in presenting a less broken relief, of predominantly low hills and depressions, with gradients of < 35%.

Two basic soil conditions are prevalent in the area. Alfisols of moderate depth (> 100 cm.), clay loam to fine clay textures, occur on the heavily eroded slopes. While in the lower areas one finds Vertisols and Entisols of moderate development (< 30 cm.), fine clay textures, with drainage problems.

These soils are Class VI - VI H, recommended for permanent pasture. Soil conservation is not a traditional practice but a Peace Corps Volunteer has done some work with basic conservation practices.

The predominant cropping system is basic grains (corn-sorghum-rice) under a traditional management system and with a small integral livestock component.

Also, there exists a cattle-basic grains system, incorporating a semi-technified livestock component (5-50 head), utilizing natural pasture and silage, with a traditional semi-technified basic grains component.

Socio-Economic aspects in this area are affected by:

- 1) Proximity to the cotton production area of San Miguel, which has lessened dependence on subsistence crops and increased dependence on wages.
- 2) Understaffed CENIA Extension Agency in Uluazapa and/or lack of material support and transportation.
- 3) Limiting soil and climatic conditions in agricultural development

In spite of this the small farmers are interested in learning and modifying their agronomic practices. The response to outside help has been demonstrated by their cooperation with a Peace Corps Volunteer in the area.

An average of 60% of the farmers in the area rent land to plant Basic Grains, and of the 40% that own land the distribution is as follows:

30% owns < 1 mz.
15% " 1 to 5 mz
25% " 5 to 8 mz
30% " > 8 mz., mostly grazing land

The average Basic Grains plot, planted by a family unit of 6 to 8 members, is < 1.5 mz., and the yearly family income is \$1,300.

ULUAZAPA

The area presents a wide range of needs in Soil/water conservation practices in a different set of soil and topographical characteristics and under a cropping pattern more adapted to lack of water and higher risk conditions. The cropping system is characterized by the presence of sorghum as the main component of the "milpa" system on the small holdings, and by increased size of pastures needed to raise beef or dairy animals.

Socio -Economically the area presents :

- 1) Heavy migration toward urban areas (San Miguel)
- 2) Weak development efforts by agencies in the agricultural sector.
- 3) Lack of community structures, and economical alternatives for the farmers in the area.
- 4) Good opportunities to test and implement soil/water conservation practices on grazing land and in a sorghum dominated "milpa system".

Uluazapa is an area that represents a challenge to the development and implementation of a Soil/Water Conservation Project, but there is enough interest in the communities to merit inclusion. We consider this site as the lowest priority of the 9 presented.

9. SAN LUIS DE LA REINA, SESORI (C/San Antonio)
SAN MIGUEL

At an altitude of 545 meters, San Luis de la Reina has an average yearly temperature of approximately 26.4°C, and an annual average precipitation of approximately 1896 mm., with a usually pronounced "Canícula".

The area is characterized by steep, broken hills (70%) and depressions with isolated remnant terraces evolved from acidic piroclastic rocks. Soils are degraded Entisols, presenting lithic contacts at about 50 cm., of depth. Textures range from gravelly clay loams on the slopes to fine clays in the depressions, where frequently there are drainage problems.

Slopes are rated as Classes VII and VIII, due to strong limits of gradients and effective depth, apt for protected grazing land. The depressions fall into Class V H, apt for permanent use as forest or grazing land, due to constraints in effective depth and drainage.

The principle cropping system is the traditional "milpa" (corn-bean-sorghum), though there are a number of "grupos solidarios". There also exists a small scale livestock component, utilizing the traditional management practices. The seasonal migration of fural farmers is a problem in the zone as 80% leave for varying periods during the coffee harvests of November through January.

The area presents two interesting management systems, one of small to medium size livestock producers, and a second of "milpa" farmers, of which few are organized as Grupos Solidarios. Basic grains producers cultivate < 1 mz. plots, either rented (60%) or owned (40%). Ownership is categorized as follows: < 1 mz. (25%), 1 to 2 mz. (20%), 2 to 5 mz. (30%), 5 to 8 mz. (15%), and > 10 mz. (10%). This area has a conscientious D.G.G. extension agent, and interest amongst farmers is high for work in soil conservation on grazing lands.

Family size is from 5-7 members and annual income from basic grains is about \$ 1.200/year/family. While, for families with 10 or more animals the income increases to \$ 1.800 a year.

SAN LUIS DE LA REINA/SESORI

From the technical-agronomical view point, Sesori provides the best conditions of the sites studied to implement soil/water management practices on grazing land with small and medium size ranchers.

In San Luis de la Reina the conditions permit working with small Basic Grains producers at the subsistence level. Some of these farmers are organized as Grupos Solidarios in order to obtain credit from BFA.

Between these extremes are a wide range of variations in the cropping patterns, from a "rancher" raising more than 15 head of cattle and producing Basic Grains, to a small subsistence farmer who plants less than 1 mz., and owns 2-3 head of cattle.

Work in the area will be facilitated by coordinating with D.G.G., who have an excellent Extension Agent and are building a Posta Zootecnica as part of the livestock development project financed by B.I.D.

Additionally, a coordinated effort D.G.G.-UNICEF will finance a "small animal production project", that will integrate within the production activities of the cropping systems of the area.

7. VILLA VICTORIA (La Bermuda, Rojitas, Río Grande)
CABAÑAS

Located in Northeastern Cabañas at an altitude of 860 mts. Villa Victoria has an average annual temperature of about 22.1°C and a yearly average precipitation of 2019 mm. with a usually pronounced "Canícula".

Terrain is broken, characterized by slopes and depressions with gradients ranging from 15-70%. The piroclastic parent material tends to be acidic and highly silicious. Soils on the slopes are Entisols, characterized by moderate development to depths of up to 50 cm. though some areas are heavily eroded. Textures are clayey ranging from clay loam in the surface horizons to gravelly clays below. The moderate erosion of the slopes is principally due to the cropping system. Soils in the depressions (plains) are more developed clays, interspersed with rocks and classified taxonomically as Alfisols.

The U.S.D.A. potential use system places these soils in Class VI E, recommending utilization for basic grains production with intense soil conservation practices. Basic soil conservation practices have made significant headway in the area through a DGRNR directed conservation program.

The basic cropping system is basic grains (corn-beans-sorghum) in the traditional "milpa system". An integral small scale live-stock component in areas of lesser slopes and deeper soils.

This area, right now, is the main example of what DGRNR-CENTA-PMA-BFA can do on soil conservation if there is a good field coordinator, with a knowledge of extension/education methodology and soil conservation practices. The Soil Conservation campaign has reached 250 farmers and a lot of ground work and leader development is already underway.

In Villa Victoria: 50% of farmers own land, 60% own an average of 4 mz. and plant a plot of < 2 mz. with the corn-sorghum or corn-beans system. The family unit (6-7) has a yearly income of \$1.200 and there is a heavy migration to the coffee cortas from November to January.

The local Extension Agency, BFA and DGRNR has done excellent work with Grupos Solidarios and PMA food, and in some small cantons

will be ready and interested in soil conservation work. In Cantón La Bermuda a group of some 90 persons are associated in a pre-coop effort that will provide a dynamic work structure.

Sensuntepeque: main trust of the project will be in Cantón Río Grande where DGRNR and BFA-CENTA have been working with 80 farmers and 12 Grupos Solidarios. Soil Conservation interest is high in this area and conditions excellent to start a project that provides the right incentives and technical assistance.

Using the information from the Grupos Solidarios, land ownership pattern is 10% of farmers own up to 2 mz., 25% own more than 2 mz., and > 60% do not own any land. Their cropping system is mainly corn-sorghum and corn-beans-sorghum which provides the family unit (6-7 members) with around \$1.200 a year per family, some 60-70% of the families work at the cortas for 5 to 6 weeks.

VILLA VICTORIA/SENSUNTEPEQUE

Both sites will provide the project with groups, where Basic Soil Conservation practices have been taught on a coordinated basis by CENTA, DGRNR and BFA, through Grupos Solidarios.

At these sites the project Methodology in its technical and Extension/Education aspects, could be developed and evaluated as a typical GOES structure. Approaches and results of both the Extension/Education and technical components could be compared with those results at sites not so structured or where financing and/or other types of support come from other sources and/or organizations.

In the Agronomic/Technical aspects the area presents areas of coffee plantations and possibilities of working in Soil/Water management in grazed land.

Group interest and desire to work is excellent and the Agencies' Technicians are above average, and willing to integrate activities and projects.

8. TEJUTLA (Las Peñas, Salitre)
CHALATENANGO

Located at 350 meters, Tejutla has an average, annual temperature of approximately 25.1°C, and a yearly average precipitation of approximately 1805 mm., with a usually pronounced "Canícula".

The zone is characterized as gently sloping, and hilly with gradients ranging from 10-25%. Soils fall in two groups the first is superficial (< 15 cm.); gravelly clay loam, with a paralithic contact with the basaltic tuff parent material, and classed as Entisol. The land capability scale rates these soils as Class VI ES, apt for grazing. Within the general zone exist smaller, level areas differentiated for their drainage problems. These are classed as VI SH and also recommended for grazing.

The second group, Inceptisols, is typified by gentler, less eroded slopes (>20%), with deeper soils (>40 cm.) and finer textured gravelly clays, occurring over a paralithic contact with the basaltic tuff parent material. Classed as Class VI ES, they are apt for intensive agriculture with intense soil conservation measures.

Soil conservation is a traditional practice on a small scale, with farmers using pineapple barriers planted more or less on the contour to reduce erosion.

The predominant cropping system is the "milpa" (corn-beans-sorghum), with an emphasis on bean production, incorporating a small scale livestock component. Additionally, some fruit is produced (citrus, pineapples, papaya, avocado) for domestic consumption and local sales.

Las Peñas is located in the municipality of La Reina in the Department of Chalatenango.

Las Peñas is one of the sites where CATIE and CENTA have been involved in regional Cropping Systems research, financed by ROCAP. This is especially important in the development of the "Small Farm Natural Resources Management" AID/DGRNR Project since it provides a perfect setting to integrate Soil Conservation practices with Cropping Systems research at the farm level.

A great majority of farmers in the area own at least 2 mz., of land and the family unit plants an average of 1.5 mz. in Basic Grains.

Based on Grupos Solidarios data from BFA (56 persons), 60% of farmers own some land; of them 60% own < 5 mz., 34% own > 5 mz., and 5% own > 50 mz.

Economic activities in the area are very limited and migration to the cortas is high, mainly to the Santa Ana area.

Size of the family unit varies from 6 to 8 members and the yearly income per family is ¢ 1.400 though this figure needs further research.

TEJUTLA (Las Peñas)

This area will provide the project with a direct link with the CENTA/CATIE Cropping Systems project, and an opportunity to use CATIE's expertise on cropping systems research, both in its practical and theoretical aspects and its agronomical and socio-economical methodology. Besides this, the area presents site specific characteristics of soil, topography and migration patterns. Since some of the farmers who plant beans and corn in the area, actually live in the hills of Chalatenango.

Beans are an important component of the "milpa system", as they are often planted in the first (corn-beans) and second (beans-sorghum), cropping cycles.

Fruit trees are also planted and are a promising crop to increase production in the area, this will provide an opportunity to evaluate the incorporation of soil conservation practices, as individual terraces and water retention ditches.

Las Peñas and Salitre, with the exception of Grupos Solidarios, formed to obtain credit from BFA, have no developed community structure.

9. LA PALMA (Talchuluya)
CHALATENANGO

At an altitude of 1,000 meters, La Palma has an average annual temperature of 20.4°C and a yearly average precipitation of 2,166 mm., with a usually pronounced "Canícula".

The area presents a panorama of very broken hills with sloping and nearly level areas. Generally, the area is in the process of degradation, with moderate to heavy erosion. Parent material is an acidic, basaltic tuff with high quantities of silicious materials.

Soils are of two groups, Inceptisols and Entisols. The Inceptisols are deep soils (< 100 cm.), of clay loams over gravelly clays, under which occurs weathered parent material. These are classified as apt for permanent crops (Class VI E).

The Entisols occur in very degraded areas, with gradients of >40%. The profile presents a single horizon of 20 cm. of depth, with textures ranging from clay loam to gravelly clay loam, resting on weathered parent material. Within these slopes exist isolated areas of lesser slope (<15%) resting on unweathered parent material with drainage problems. Rated as Class VI ES; these soils are apt for grazing land.

The basic cropping systems is the traditional "milpa" (corn-bean), with a small scale livestock component in open unimproved natural pasture, and "leña" production in matorrales. Also, there is a recent emphasis on semi-technified coffee plantations, though technical assistance is lacking.

There is a high potential for commercial fruit/vegetable production, though accessibility is a critical limiting factor.

The proposed site is located in Cantón Talchuluya, Municipality of La Reina, though the main economical and social links for farmers are with La Palma. The area has an strong forestry tradition, wood products such as firewood and small logs are harvested during the dry season. Also, ISIC has recently promoted small coffee plantations which are growing well.

The area does not have technical assistance for basic grains production or Soil Conservation from Government agencies, mainly due to the lack of communication (poor access).

Basic Grains producers in the area plant Corn and Beans and have started some promising small coffee plantations. Besides the "milpa", they supplement their income by harvesting small logs, gathering firewood and raising small animals and livestock <10 head.

The target group, financed by a Coop. in the area, will be some 50 landless farmers who will be managing collectively about 100 mz., of land. The 50 families represent a total participation

LA PALMA

This site presents a set of unique characteristics for the development of the project, both in the socio-economical and in the technical - agronomical aspects.

- 1) The group of farmers involved in the project do not own any land.
- 2) Their land will be provided by an Artesanal-Agricultural Coop in La Palma.
- 3) Even though the land is owned by a coop each farmer will work his land individually.
- 4) In the agronomical aspects, the area has a forestry tradition, in which firewood gathering and small logging operations are present. Coffee and fruit trees are also being planted.

These characteristics, together with the traditional "milpa system" and the lack of technical assistance will provide the project with valuable data to evaluate project methodology and develop a more complete, and effective soil/consevation project.

SOIL CONSERVATION RECOMMENDATIONS

Because the majority of agricultural land is already under cultivation in the studied zones, soil conservation practices must fit into and become a dynamic part of existing cropping systems, if they are to have any impact. Therefore, it is necessary to use a series of conservation practices which are flexible and can be modified to the existing cropping system and technology level of the individual farmer. Potential land use schemes provide a direction for future planning, but do not take into account the existing social and economic conditions which so very often dictate actual land use at the farm level. Also, it is important to remember that the soil conservation effort is an on-going process in which the farmer may implement any given soil conservation structure or system in a series of steps depending on his needs and resources.

Listed below are a number of soil conservation measures, some mechanical others agronomic, which can be utilized either singly or in systems depending on the severity of the soil and/or water problem, tenure conditions, cropping system, resources and land available to the farmer. The soil conservation measures are recommended on their adaptability within specific cropping systems based on field experience. Obviously, the system is not rigid and modifications or substitutions can and should be made for special conditions in the field.

- | | |
|---------------------------------|--|
| Henequen | contour planting, continuous terraces |
| Basic Grains | contour planting, organic fertilizer, wind breaks, barriers of crop residue, live barriers rock walls, hillside ditches, hand tilling. |
| Livestock | rotation, pastures improvement, hillside ditches, tree planting, vegetable and rock barriers. |
| Vegetables | organic fertilizer, hand tilling, mulching, raised beds, continuous terraces, bench terraces, individual terraces. |
| Forestry, Fruit Trees or Coffee | individual terraces, continuous terraces, bench terraces. |

Additional measures are recommended for water conservation and gully control, these complement the previously mentioned measures for agricultural use.

Excess water (run-off) can be stored for future use in small tanks (holes in the ground), in retention ditches or in small check dams for use in irrigation, fish production or ground water recharge.

Gully control and stabilization are especially critical in areas of steep slopes and under conditions of intense, short duration thunderstorms as are typical of the studied areas. Revegetation, slope modification, rock retaining walls and check dams (preferably rock) are practical measures for stabilizing stream channels.

These soil conservation measures are feasible and have been proven in the field, but are of little value if not accompanied by an intensive education program at the field level. This education should include basic information on soil formation and characteristics, topography, hydrological cycle, erosion, and conservation systems and their implementation, and be presented at the field level with a careful balance maintained between the practical and theoretical components.

Farmers are generally receptive to the idea of a program with an emphasis on soil and water conservation. Awareness of the erosion problem is widespread, however little has been done due to the lack of qualified field technicians and a valid soil and water conservation technology at the field level.

As previously stated, it is strongly felt that a soil and water conservation component, when introduced into existing cropping system, will increase the potential productivity. This increase should allow the farmer to improve the productive components of his existing system and allow the introduction of new, more lucrative components (diversification) thus increasing stability and improving the "quality of life" at the small farm level.

APPENDIX 1Sites by Department

Lislique (#1)	-	La Unión
Corinto (#2)	-	Morazán
Delicias de Concepción (#3)	-	Morazán
Guatajiagua (#4)	-	Morazán
Uluazapa (#5)	-	San Miguel
San Luis de la Reina, Sessori (#6)	-	San Miguel
Villa Victoria, Sensuntepeque (#7)	-	Cabañas
Tejutla (#8)	-	Chalatenango
La Palma (#9)	-	Chalatenango

APPENDIX 2

Soil Groups (Brief Description)

Alfisols - Mineral soils lacking a mollic epipedon or condition that favor the formation of this or any other diagnostic horizon of priority in soil classification, and have an argillic illuvial horizon, with accumulation of silicate clays, have a medium to high base saturation of greater than 35%. These soils are more developed than the Inceptisols in that they possess an illuvial horizon such as the argillic.

Entisols - Mineral soils of recent deposition lacking a diagnostic horizon. Examples would be alluvial soils, regosols, or deposits of dry sand.

Inceptisols - Soils in early stages of development, without subsurface diagnostic horizons. Representative soils here in the country are those known as Brown Forest and some Brown Forest Latost

Vertisols - Mineral soils with the top 18 cm. mixed, from this limit to a depth of a meter they have a clay content of over 30%. When dry they exhibit a gilgai micro-relief. At depths of 23-100 cm., they possess slick faces (slikensides). In general when dry they present cracks of greater than 1 cm. of width and up to 50 cm. of depth.

Las Nuevas Clasificaciones y
Los Suelos de El Salvador
Ing. Ag. Miguel Angel Rico N
1974

APPENDIX 3

Land Capability Classification (U.S.D.A.)

Class I: Few limitations restrict use, and are safe for continuous cultivation without special run-off or conservation treatments. They are nearly level, deep, well drained and risk of water or wind erosion is low.

Class II: Some limitations restrict crop type and require moderate conservation practices. Limitations are few and practices easy to apply but present fewer alternatives than Class I.

Class III: Severe limitations restrict crop type and/or require special conservation practices. Present fewer practical alternatives and need extra investment in conservation.

Class IV: Very severe limitations restrict crop type, require very careful management and/or special conservation practices. But, under intense management is feasible to cultivate continuously.

Class V: Few or no erosion hazards, but present other limitations difficult to remove and preventing tillage by standard farm equipment (i.e. excessive wetness, stoniness, prone to inundation, or short growing season). Restricted the use as pasture, range, woodland, wildlife habitat, recreation or watershed protection.

Class VI: Severe limitations prohibit tillage and restrict use to trees, pastures, range, recreation, watershed protection and wildlife habitats.

Class VII: Very severe limitations prohibit cultivation and restrict use to well managed woodland, wildlife and grazing.

Class VIII: Limitations that preclude commercial production and restrict use to wildlife, recreation or water supply.

Limiting factors:

E = Erosion
S = Soil depth
H = Soil moisture

APPENDIX 4

PRINCIPAL CROPPING SYSTEMS BY SITES

Lislique:	Basic grains (corn-beans-sorghum), henequen, vegetables.
Corinto:	Basic Grains (corn-beans-sorghum), forestry, vegetables, coffee, livestock.
Delicias de Concepción:	Basic Grains (corn-beans), henequen, vegetables.
Guatajiagua:	Basic Grains (corn-beans-sorghum).
Uluazapa:	Basic Grains (corn-beans-rice), livestock.
San Luis de la Reina:	Basic Grains (corn-beans-sorghum), livestock (Sesori).
Villa Victoria:	Basic Grains (corn-beans-sorghum).
Tejutla:	Basic Grains (corn-beans-sorghum), livestock.
La Palma:	Basis Grains (corn-beans), livestock, firewood, coffee.

BASIC GRAINS PRODUCTION BY REGIONS (1975-79)

Region I:	Ahuachapán, Santa Ana, Sonsonate.
Región II:	Chalatenango, La Libertad, San Salvador, Cuscatlán.
Región III:	La Paz, Cabañas, San Vicente.
Región IV:	Usulután, San Miguel, Morazán, La Unión.

Corn - Criollo^{1/}

Year System	75-76		76-77		77-78		78-79		Average	
	M ^{2/}	I ^{3/}	M	I	M	I	M	I	M	I
Region I	25.9	20.5	20.6	16.3	14.6	13.2	18.1	16.2	20.8	16.6
Region II	18.6	15.6	17.0	12.7	15.7	10.2	15.9	14.4	16.8	13.2
Region III	18.0	16.2	15.5	12.9	14.8	16.2	18.1	19.9	16.6	16.3
Region IV	19.3	13.8	19.2	11.1	15.2	13.6	20.0	16.8	18.4	13.8

Sorghum

Year System	75-76		76-77		77-78		78-79		Average	
	M	I	M	I	M	I	M	I	M	I
Region I	23.7	21.1	21.7	18.9	12.8	17.6	13.5	18.5	17.9	19.0
Region II	21.0	18.0	22.6	21.4	27.3	16.0	28.1	16.4	24.8	18.0
Region III	23.9	23.0	21.9	20.7	17.5	17.0	17.4	16.9	20.2	19.4
Region IV	22.4	19.2	20.5	17.3	30.4	16.6	32.0	17.5	26.3	17.7

Bean

Year System	75-76		76-77		77-78		78-79		Average	
	M	I	M	I	M	I	M	I	M	I
Region I	11.1	9.4	11.9	10.1	10.3	5.9	14.1	11.0	11.9	9.1
Region II	11.9	10.4	12.6	10.7	11.1	8.2	11.9	12.1	11.9	10.3
Region III	11.3	10.3	12.0	10.7	10.6	10.2	13.4	10.2	11.8	10.3
Region IV	11.6	6.8	12.3	7.3	10.7	6.8	15.7	9.4	12.6	7.6

- 1/ Quintales/Manzana
 2/ Monocropping
 3/ Intercropping

Fuente: Anuario de Estadísticas Agropecuarias MAG. D.G. Economía Agropecuaria.

APPENDIX 6

PRINCIPAL COMMUNITY STRUCTURES BY SITES

- Lislique: Agricultural Cooperative in Cantón El Derrumbado promoted and receiving technical assistance from DGRNP
- Corinto: Weak community structures, but Grupos Solidarios and small Scale Conservation groups are forming.
- Delicias de Concepción: Area is located within the Proyecto Integrado San Miguel/Morazán boundaries, but influence of project is weak.
- Guatajiagua: Weak community structure, PCV has a small soil conservation group.
- Uluazapa: CENTA and DIDECO promoted groups. Sewing coop, clubes, etc.
- San Luis de la Reina: Grupos Solidarios.
- Villa Victoria: Pre-coop in Cantón La Bermuda, strong Grupos Solidarios and soil conservation effort with DGRNR, BFA and CENTA.
- Tejutla: CENTA/CATIE cropping system project.
- La Palma: Cooperative farming effort through handicrafts and agricultural coop in La Palma.