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ASSESSMENT OF AGRICULTURAL
RESEARCH RESOURCES
IN THE SAHEL

VOLUME III
NATIONAL REPORT: CAPE VERDE

by

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PREFACE

ASSESSMENT OF AGRICULTURAL RESEARCH RESOURCES IN THE SAHEL

This document has been prepared by DEVRES, Inc. and the Sahel Institute (INSAH) in accordance with the terms of a contract with the U.S. Agency for International Development.

The national agricultural research resources assessments which provide the necessary background information for this document were conducted by national agricultural research scientists from Sahelian countries under the guidance of DEVRES and INSAH with financial support from the U.S. Agency for International Development (under Contract No. AFR-0435-C-00-2084-00 and Project No. 698-0435 entitled Strengthening African Agricultural Research) on behalf of the member countries of the Cooperation for Development in Africa (CDA).

The results of the assessment are contained in the following reports:

Volume I - Regional Analysis and Strategy

Volume II - Summaries of National Reports

Volume III - National Reports:¹

Cape Verde
Chad
The Gambia
Mali
Mauritania
Niger
Senegal
Upper Volta²

These reports are available in microfiche or printed form in French and in English at a cost determined by document size at the following address:

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¹Each national report is printed separately.

²As this report was going to the printers in August 1984, the change of name of "Upper Volta" to "Burkina Faso" was announced. While Upper Volta was the correct name of the country as of the date of the inventory (December 1983), readers should take note of this recent change.

LIST OF ACRONYMS AND ABBREVIATIONS

ACP/EEC	Groupment of states located in Africa, the Carribbean and Pacific Ocean, and European Economic Community
AFDB	African Development Bank
BCV	Bank of Cape Verde
CDP	Center for Livestock Development
CEA	Center for Agrarian Studies
CIF	Cost, Insurance and Freight
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
CPFCDR	Training Center
CRAT	African Regional Center for Technology
CRES	Regional Center for Solar Energy
ECA	Economic Commission for Africa
EEC	European Economic Community
EMPA	Public Supplying Company
ENAVI	National Poultry Breeding Company
FAD	
FAO	Food and Agriculture Organization
FAP	Agricultural and Livestock Development
FDN	National Development Fund
FIT	Intertropical Front
FOB	Free on Board
FRG	Federal Republic of Germany
GIR	Rural Survey Service
GTZ	West Germany Agency for Technical Cooperation and Assistance
IBRD	International Bank for Reconstruction and Development
ICAO	International Curl Aviation Organization
ICTCA	International Commission for Tuna Conservation in the Atlantic Ocean
IFAD	International Fund for Agricultural Development
ILO	International Labor Organization
IMO	International Maritime Organization
INIAAC	Amilcar Cabral National Agrarian Research Institute
INIT	National Research and Technology Institute
IUT	International Union for Telecommunications
MDR	Ministry for Rural Development
OAU	Organization for African Unity
PAICV	African Party of Cape Verdian Independence

PAIGCV	African Party of Guinean and Cape Verdian Independence
PANA	Pan-African Information Agency
PRODESA	Assomada Integrated Development Project
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPU	Universal Postal Union
USAID	United States Agency for International Development
WASEO	West African States Economic Organization
WHO	World Health Organization
WMO	World Meteorological Organization
Z-CIT	Intertropical Convergence Zone

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INTRODUCTION

A. Background

The Agricultural Research Resources inventory and assessment for Cape Verde was also conducted in the remaining seven countries of the Sahel (Chad, Mali, Mauritania, Niger, Senegal, The Gambia and Upper Volta), all of which are member countries of the CILSS, the Permanent Interstate Committee for Drought Control in the Sahel. The eight national reports taken together comprise Volume III of this report. They are bound separately and are available from the United States Agency for International Development in Washington.¹

The inventory and assesement was carried out within the framework of the high priority accorded by the member countries of the CDA (Cooperation for Development in Africa) and the CILSS to the need to develop and strengthen agricultural research capability in the region. As the World Bank noted in its September 1983 report entitled "Sub-Saharan Africa: Progress Report on Development Prospects and Programs"²:

"Even within the present state of technical knowledge, improved incentives and marketing arrangements would permit very large increases in agricultural output [in Africa]. However, for the longer term, increased output will depend on the development of effective technical packages, pest and disease control and developments in animal husbandry... In a situation of budgetary stringency and of immediate crises, expenditure on research having a possible, but uncertain payoff, ten years or more in the future is frequently seen as dispensable. This danger is increased when research programs are manifestly weak and unfocused. It is, therefore, essential that these programs be formulated and implemented in ways which will enable them to contribute more effectively to the process of development..."

The CDA is an informal association of donors including Belgium, Canada, France, Italy, West Germany, the United Kingdom and the United States. The United States, assisted by other CDA donors, was assigned

¹Volume II, Summary of Agricultural Research in the Sahel, contains summaries of each of the eight countries' national reports. Volume I is a "Regional Analysis of Agricultural Research Resources in the Sahel". Both may be obtained from AID as well.

²World Bank, Sub-Saharan Africa: Progress Report on Development Prospects and Programs, Washington, D.C., World Bank, (September 1983, pp. 30-31.

the specific responsibility for coordinating the development of CDA-supported agricultural research programs in the Sahelian and Southern African regions.

This CDA initiative responds to initiatives already undertaken by many national governments and regional entities (such as the OAU, and CILSS) to emphasize the development of a strong capability in the Sahel to increase agricultural productivity. The donors, therefore, joined with African regional agencies such as INSAH in the Sahel and the Southern Africa Development Coordination Conference (SADCC) in Southern Africa to develop country-specific, regionally-sensitive analyses of existing resources and to identify medium- to long-term needs and opportunities in support of agricultural research that will lead to increased agricultural productivity.

The assessment and preparation of this report were financed by the U.S. Agency for International Development (AID) and carried out by DEVRES, Inc., a U.S.-based private contractor located in Washington, D.C. engaged by AID. DEVRES was assisted by two sub-contractors, the Institut du Sahel (INSAH) and the Midwest Universities Consortium for International Activities (MUCIA). INSAH was established in 1976 and given prime responsibility by CILSS for the collection, analysis and dissemination of research results; for the promotion and coordination of research; for the training of researchers and technicians; and for the adaptation and transfer of technology. The MUCIA consists of seven universities, with administrative headquarters at Ohio State University. Michigan State University was identified by MUCIA as its lead institution for this assessment due to its experience in Africa.

The CDA mandate for the assessment and this report preparation was to consider programs up to 20 years in duration. Few specific project ideas were developed with this timeframe in mind. However, in developing proposals for future programs, this long term emphasis maximized flexibility to focus on the needs of agricultural research regardless of the timeframe involved. Ultimately, the research priorities and activities were set out as needed, while remaining sensitive and responsive to the severe budgetary constraints in the Sahelian countries.

B. Methodology

Sahelian participation in the process of carrying out the inventory and assessment--the collection of data, the preparation of national reports, and the subsequent regional assessment--has been a central aspect of the design and implementation of this study. In May 1983, INSAH, cooperating with DEVRES, invited agricultural researchers from Cape Verde and other Sahelian countries to INSAH headquarters in Bamako, Mali to discuss the study and examine the first draft of a series of questionnaires intended to inventory the resources (both

physical and human) available for agricultural research in the region. The questionnaires were then revised in light of the researchers' knowledge of the technical areas and local conditions.

Senior researchers from each of the Sahelian countries were hired by INSAH as National Coordinators and placed in charge of obtaining the answers to the questionnaires and preparing the national reports for their respective countries. National Coordinators in turn hired experienced researchers for short periods of time in their respective countries to help with the completion of the questionnaires in specific subject matter areas such as export and food crops, livestock, agro-forestry, fisheries, and farming systems. The questionnaires included not just the research institutions in these fields, but also the training institutions, and the extension institutions which provide the link between the research and the farmers who utilize the research results.

DEVRES fielded a team of experienced agricultural researchers and development specialists to assist the National Coordinators and their staffs, help with the establishment of a data bank at INSAH on research resources, and develop the regional program. The DEVRES staff consisted of a team leader, a regional coordinator, a technical consultant, one sub-regional coordinator for Cape Verde, The Gambia, Mauritania and Senegal, and another for Chad, Niger, and Upper Volta. Mali was assisted by the technical consultant stationed in Bamako. In addition, INSAH made available two of its senior staff--the Director of its Research Department and the Coordinator of the Research and Documentation network (RESADOC)--who were responsible for coordination between the DEVRES staff and the National Coordinators. MUCIA participated in the design of the questionnaire, furnished country background data for the survey and the sub-regional coordinator for the Eastern Sahel.

INSAH, because of its regional responsibilities for coordination of agricultural research and dissemination of the results, became the repository of the results of the questionnaires in the form of a data bank located at INSAH headquarters. The data collected from the study has been organized using a standard software package--"dBase II"--and can be accessed on the microcomputers available at INSAH headquarters.

More information on potential uses of the data bank can be found in Volume 1. The survey has been an important first step in creating a data bank which (when combined with other information available at INSAH) will provide a foundation of practical, useful data that can be updated and refined. It will be a valuable tool for those designing programs and projects in agricultural research in the Sahel and it will also be a source of providing information for researchers in the Sahel and in other neighboring countries.

The inventory and assessment were carried out from May 1983 to April 1984. The bulk of the data collection and the writing of the national reports were carried out from September to December 1983 by the National Coordinators and their consultants in cooperation with the DEVRES/INSAH staff. The national reports are essentially the product of the work of the National Coordinators, assisted by their consultants, based on the responses to the questionnaires. The regional analysis and research strategy were developed by the DEVRES staff in consultation with INSAH in light of the national reports, the questionnaire, and contacts with international research organizations, bilateral and multilateral donors and development organizations (such as the Club du Sahel, the various UN agencies, and the World Bank) and other written information available to the team. The DEVRES/INSAH staff collaboratively designed the proposed regional projects and activities to carry out the strategy elements.

In carrying out the inventory and analysis and in preparing recommendations for programs and projects in this report, the national Coordinators team made special efforts to take into account research work already carried out, underway or proposed. This is consonant with one of the principal objectives of the assessment--to seek ways to strengthen existing national and regional research activities. Further, specific recommendations are placed in a wide context, involving not only the research institutions, but also the training of researchers and the dissemination of research results to the farmers.

II. GENERAL INFORMATION ON CAPE VERDE

A. Geographical and Ecological Data

1. Geography

The Cape Verde archipelago is composed of ten islands and eight islets in the Atlantic Ocean. It is located between latitudes 17°12' and 14°48' north and between longitudes 22°44' and 25°23' west. (See Figure 1.)

The islands, covering a total area of 4,033 km², are separated into two regions. The windward region includes the Sao Vicente, Santo Antao, S. Nicolau, Sau, Santa Luzia and Boavista islands. The leeward region consists of the Maio, Santiago, Fogo and Brava islands.

2. Geology and relief

All islands in the archipelago are of a volcanic nature. The major rock types are basalts, which constitute more than 80 percent of the total area, and phonolitic rocks, which represent 9 percent of the area. The main sedimentary rocks are dolomitic and marl limestones. Some of the sedimentary formations are covered with lava or basalt.

All islands, except for the most eastern ones, are relatively hilly. The highest point is the Pico on Fogo island at an altitude of 2,829 m. The Coroa summit (on Santo Antao) is 1,979 m above sea level, the Pico de Antonia (on Santiago) 1,395 m, and the Monte Gordo (on S. Nicolau) 1,304 m.

Fogo Island has the largest and most perfectly shaped volcanic formation. It is a huge, asymmetric, truncated cone emerging from the ocean, with an almost circular circumference.

3. Vegetation

In the SCETAGRI report the following elements have been mapped on the basis of a photographic interpretation.

a. Vegetation at elevations of more than 900 m

(1) Sub-humid zones with gramineae

These zones consist of gramineae steppes and are found on the northern slopes of Fogo island, between 900 and 1,800 m in elevation, and on Santiago in the Curralinho region. These are the best pastures in the country.

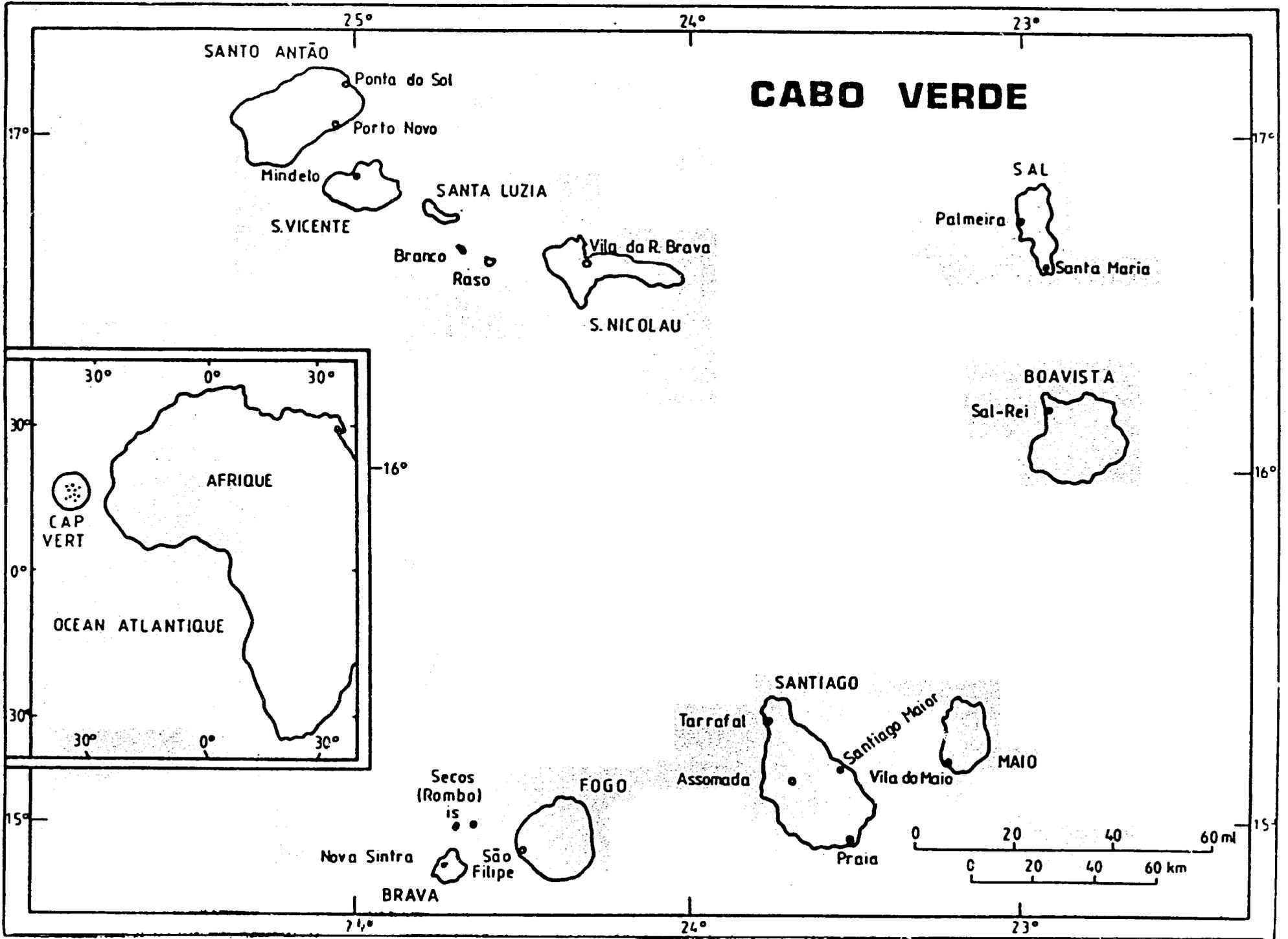


Figure 1: Map of Cape Verde

(2) Semi-arid and arid zones

These are covered with a two-strata vegetation formation, one at 29 cm from the ground and covering 5 to 20 percent of it, and the other at 30 cm with mainly shortcycled species and some perennial species. These zones are located on Fogo island between elevations of 900 and 1,200 m, on S. Nicolau in the northern part of the Monto Gordo and on Santo Antao island.

b. Vegetation in humid zones

(1) Cultivated areas

Gramineae and various dicotyledons are found in the areas where beans and maize are grown. The cultivated zones are found at elevations of between 600 and 1,200 m on Fogo, Brava, Santiago, S. Nicolau and Santo Antao islands. Trees and various types of bushes are also found in these areas.

(2) Non-cultivated areas

Some vegetation is also found in very stony and steep areas which are not suitable for growing crops.

c. Vegetation in sub-humid zones

There are two sub-humid zones, one in the cultivated areas and the other in the non-cultivated areas. They are found on Fogo, Brava, Santiago, S. Nicolau, Santo Antao and S. Vicente islands at elevations between 100 and 200 m.

d. Vegetation in semi-arid zones

(1) Cultivated areas

These areas, which are very sensitive to the decreasing rainfall, are located on the southern side of Fogo island, and on the coasts of Santiago, Santo Antao and S. Nicolau.

(2) Non-cultivated areas

Due to their soil characteristics (coarse-textured soil on a pyroclastic base) and the climatic conditions, these areas are not suitable for growing crops. They are located on the southern sides of Fogo, Santiago and Santo Antao islands.

e. Vegetation in arid and desert zones

(1) Areas with sediment accumulation

These are found in all arid areas. The flora is very diverse and includes perennial and gramineous species, as well as some tree species.

(2) Barren zones

These zones are located on basaltic plateaus and hills, where the number of plants is less than 100 per ha during the dry season.

(3) Sandy zones

Only sparse vegetation grows on these more less stable dunes. This type of soil is found on the Maio, Boavista and Sal islands.

(4) Salty zones

Most species are halophilous in these areas, which are found on Boavista, Sal and Maio islands as well as on some parts of the coasts on Santiago, S. Nicolau and Fogo.

f. Vegetation in rocky and volcanic zones

(1) Ravines and cliffs in the humid and sub-humid zones

This type of vegetation is found on the Fogo, Brava, Santo Antao and S. Nicolau islands.

(2) Pioneer species growing on recent lava

This vegetation is located in the humid and sub-humid zones of Fogo island.

g. Vegetation in reforested zones

(1) Humid and sub-humid reforested areas

The species growing in these areas include Eucalyptus, Cyprinus, Pinus, and Accacia molissima, found on Fogo, Santiago, Santo Antao and S. Nicolau.

(2) Semiarid and arid reforested areas

Prosopis and Parkinsonia species grow in the tree strata; the tree sub-stratum is scarce and underdeveloped. These zones are found on the islands of Santiago, S. Nicolau, Fogo and Maio.

(3) Purgueira (Jatropha) plantations

These plantations are located on Fogo, Santiago and S. Nicolau islands.

4. Erosion

The characteristics of rainfall (especially its scarcity) the type of relief, and the disappearance of natural vegetation are all critical contributions to the erosion, soil degradation and spreading desertification now occurring in Cape Verde.

The following types of erosion can be found in Cape Verde:

a. Erosion by water

(1) Stratum erosion

This is the major type of erosion in cultivated areas. This process was accelerated at the inception of colonization, not only because of the destruction of vegetation, but also because of the introduction of farming practices unsuited to the environment. A major part of the sediment is drained toward the ocean by surface waters. This makes arable soils progressively thinner and infiltrating water scarcer, which in turn affects the flow from water sources.

(2) Erosion in furrows

On steep slopes, surface rainwater first flows in numerous small ramifications, which then merge and form progressively wider natural drainage lines.

(3) Ravine erosion

The merging of drainage furrows creates deep gashes in the ground, reaching down to the rocky strata. These ravines grow simultaneously deeper and wider.

b. Erosion by wind

The average speed of the wind is high, with predictable direction and regularity throughout the year. The wind blows away fine particles from the soil surface, especially on the plateaus near the coasts where there is no natural obstacle.

5. Ecological zones

The islands can be divided into two major ecological areas:

- o The low islands where elevation is not a factor, specifically Sal, Boavista, Maio and Santa Luzia; and
- o The hilly islands where elevation plays a major role: S. Vicente, Santo Antao, S. Nicolau, Santiago, Fogo and Brava.

A breakdown of these principal areas into specific ecological zones is presented below:

- o Zones located at elevations of between 500 and 1,000 m: These zones face north or northeast. These are humid areas, almost always cloudy, with an average rainfall of over 1,000 mm per year. Agriculture is intensive, and the coffee tree grows well. This type of ecological zone can be found on Fogo, Santiago, S. Nicolau, Santo Antao and S. Vicente islands;
- o Humid zones located above 1,000 m: These are similar to the previous type, but with less humidity and rainfall, since they lie above the clouds. The average temperature is lower, and nights are cold. There are pastoral areas with scattered trees. This type of zone is found on Santiago and Santo Antao;
- o Arid zones at high altitude, with low humidity and rainfall: Such zones are only found on Santo Antao. Pasture land is scarce, as on the coast;
- o Coasts and slopes exposed to wind: Slopes exposed to the wind, along with coasts, are characterized by low rainfall, varying through the year by as much as 40 percent, low humidity, high temperature and evaporation;
- o Riverbeds: These are the main irrigated or irrigable alluvial areas. They are found on Santiago and Santo Antao;
- o Zones with shallow underground water: The islands of Maio and Boavista include areas where the underground water is not deep, and where, therefore, the refill of subterranean water pools is relatively easy;
- o Zones of variable rainfall: These areas with considerable rainfall variations are often subjected to intense erosion by water and wind;
- o Transition zones: These zones extend from the arid coastal areas to the humid mountain areas; rainfall varies considerably, and erosion by water is extensive; and
- o Dunes: Zones containing both fossilized and new dunes are prevalent on Maio, Boavista, Sal and S. Vicente islands.

B. Demographic and Employment Characteristics

The total population of the islands is approximately 296,000. Table 1 indicates the population and area of each island.

As shown in Table 1, nearly 50 percent of the population is concentrated on Santiago, and nearly 90 percent live on Santiago, Santo Antao, S. Vicente and Fogo. Table 2 indicates the relative populations of urban and rural areas.

Table 1: Population and Area of Each Island

<u>Island</u>	<u>Population</u>	<u>Percentage</u>	<u>Area</u> (km ²)
Windward Region			
Sao Vicente	41,792	14.1	227.00
Santo Antao	43,198	14.6	779.00
Sao Nicolau	13,575	4.6	330.00
Sal	6,006	2.0	216.00
Santa Luzia	-	0.0	50.30
Boavista	3,397	1.1	620.00
Total, Windward Region	<u>107,968</u>		<u>2,230.30</u>
Leeward Region			
Maio	4,103	1.4	269.00
Santiago	145,923	49.3	990.90
Fogo	31,115	10.5	476.00
Brava	6,984	2.4	67.40
Total, Leeward Region	<u>188,125</u>		<u>1,803.30</u>
Overall Total	<u>296,093</u> =====		<u>4,033.60</u> =====

Table 2: Population by Residential Zones

<u>Zone</u>	<u>Residential Population</u>	<u>Percentage in Relation to Total Population</u>
Praia and Mindelo	80,000	26.7
Secondary Center	30,000	11.7
Rural Zones	185,000	61.6
Total	<u>300,000</u> =====	<u>100.0</u> =====

The total number of emigrants since 1900 is estimated to be approximately 300,000. Their major destinations are the United States (11 percent), Portugal (12 percent), Angola (11 percent) and Senegal (8 percent). This strong flow of emigration, especially in the last decade, has almost counterbalanced the natural population growth between 1970 and 1980. With an annual growth rate estimated at 2 percent, the population could grow to 420,000 inhabitants by the end of the century. (See Table 3.)

Emigration has long played a major part in the history of the Cape Verde archipelago. It began in the 18th century, due to hard living conditions and drought, and has not stopped since. In 1963, 4,089 individuals emigrated; in subsequent years, emigration averaged 6,000 per year. Table 4 shows the breakdown of emigrants by country of destination.

There is also an internal, inter-island emigration flow toward urban centers and jobs. Praia, Mindelo and Sal were the primary destinations between 1960 and 1980 (Sal: 130 percent; Santiago: 64 percent and S. Vicente: 102 percent).

1. Age structure

The age structure of the Cape Verdian population is shown in Figure 5. As seen in the figure, there is a notable preponderance of women over men in Cape Verde, probably due to the high emigration rate. Table 5 indicates the percentage change in age groups from 1970 to 1979, with the most significant change occurring in the five-nine age group and the 15-64 age group.

2. Population of working-age

Preliminary data from the 1980 census show that among the total population of 296,000, the working-age (15-64) group contains 169,865 people, and the working population is 101,400.

3. Rate of employment

Although the potential working population numbers 101,400, the Cape Verdian economic structure only offers 28,700 permanent jobs. The employment rate is 61.7 percent among the working-age group and 34.5 percent among the total population.

4. Employment

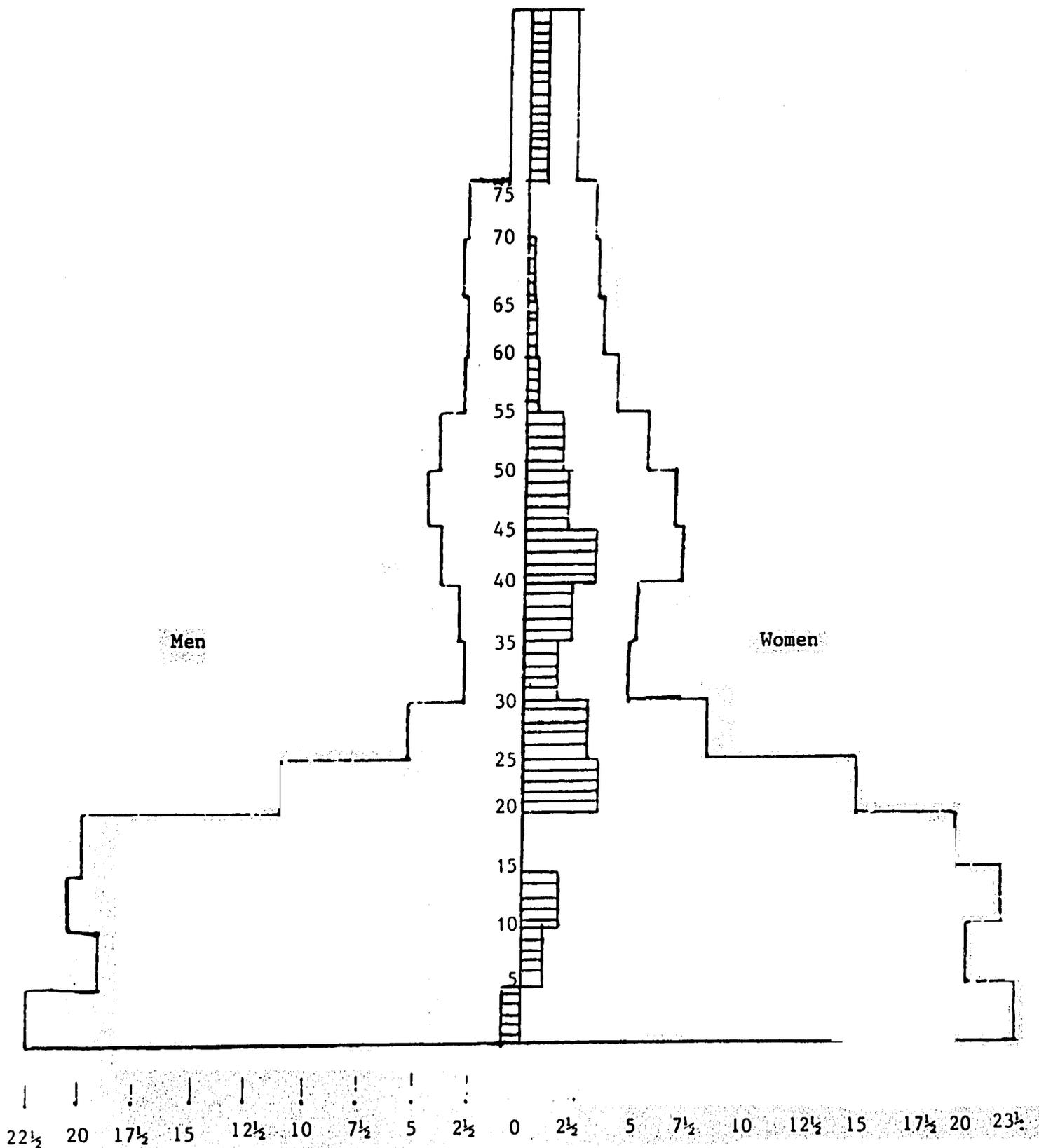
The underemployment rate of the work force is very high (63 percent) in both urban and rural areas. Some unemployed find work on farms during the rainy season, and 16,000 to 17,000 are employed in special public works projects. There are, nonetheless, 35,000 potential rural workers engaged in no significant activity. Of the 40 percent underemployment in urban areas, 28 percent is complete unemployment, while 12 percent is marginal employment. The situation is especially acute in Mindelo.

Table 3: Residential Population Growth from 1960-1980

<u>Islands/"Concelhos"</u>	<u>1960</u>	<u>1970</u>	<u>1980</u>	<u>Percentage Growth Rate</u>
Boa Vista	3,263	3,463	3,397	4
Brava	8,625	7,858	6,984	-19
Fogo	25,615	29,692	31,115	21
Maio	2,680	3,451	4,103	53
Sal	2,608	5,642	6,008	130
Santiago	88,587	129,508	145,923	64
Praia	(23,194)	(40,099)	(57,196)	
Santa Catarina	(31,885)	(41,970)	(41,201)	
Santa Cruz	(14,368)	(21,150)	(23,067)	
Tarrafal	(19,140)	(26,289)	(24,453)	
Santo Antao	33,953	45,051	45,198	33
Paul	(6,024)	(8,050)	(7,991)	
Porto Novo	(10,683)	(13,734)	(13,335)	
Ribeira Grande	(17,246)	(23,267)	(21,872)	
Sao Nicolau	13,866	16,320	13,575	-2
Sao Vicente	20,705	31,586	41,792	102
Total	199,902	272,571	296,093	48
Total Males	92,691	131,785	137,154	
	=====	=====	=====	

Table 4: Emigrant Assessment by Country

Destinations	1900 1920	1927 1945	1946 1952	1953 1973	Total	Percentage
U.S.A.	18,629	1,408	538	-	20,575	46.1
Brazil, Argentina, Uruguay, Chile	1,968	1,203	86	-	3,257	7.3
Guinea	2,247	1,197	901	-	4,345	9.7
Angola-Mozambique	366	352	6	-	724	1.6
Senegal-Gambia	1,428	1,772	251	-	3,451	7.2
Portugal	1,232	3,336	3,933	-	8,501	19.0
Other Countries	363	719	1,087	-	2,169	4.9
Without Indicating Destination	-	-	-	135,289	135,289	-
Total	27,765	10,120	6,804	135,289	197,978	



Unit: 1,000 inhabitants.

Note: The striped areas correspond to the excess rate of women over men.

Figure 2: Age Distribution Pyramid, 1980

Table 5: Age Structure of the Population

<u>Age Groups</u>	<u>1970</u>	<u>1975</u>	<u>1979</u>
	(percentage.)		
0 - 4 years	15.4	13.3	13.1
5 - 9 years	16.9	14.2	12.0
10 - 14 years	14.6	16.2	13.5
15 - 64 years	48.1	53.5	55.9
65 years and over	5.0	2.8	5.5
Total	100.0	100.0	100.0

5. Education

a. Organization of the education system

The national education system is divided into the levels described below.

(1) Basic education

Basic education lasts six years consisting of four years of elementary education followed by two years of complementary education.

(2) Secondary education

Secondary education offers a choice between academic and technical training.

The academic track lasts five years (three years of general education followed by two years of specialization).

The technical track is the responsibility of the Technical and Business School of Mindelo, which offers classes in mechanics, electricity, civil engineering, administration, business and women's education. This training lasts three years.

b. Education level and literacy

According to the preliminary results of the 1980 census, the illiteracy rate among the adult population is about 52 percent. This rate varies from 33 percent to 65 percent according to the concelho (administrative division). It amounts to 31 percent for the 15 to 19 age group and to 67 percent for the 30 and older age group.

c. Enrollment in primary and secondary education

The average enrollment rate in the elementary education system is more than 80 percent of the appropriate age group, but is only 13 percent at the complementary education level.

Enrollment in academic secondary schools represents only 3.8 percent of total school enrollment; technical schools have only 1.2 percent of total enrollment.

d. Intermediate and higher education

Until 1979 all intermediate and higher education took place abroad. Since then, the secondary education system has granted the Bachelor's degree. There are currently 561 students being trained abroad, of which 28 percent are in intermediate level training and 72 percent in higher education.

The training problem is more serious for rural development officers than for other sectors of development. Consequently, the government decided to create a Polytechnic Training Center for Rural Development Officers, run by the Center for Agrarian Studies. The training center commenced its activities in January 1983, with two different types of training (described below).

C. Brief Description of the Government Framework

1. History

The Cape Verdian people, led by the African Party for the Independence of Guinea and Cape Verde (PAIGC), gained independence on July 5, 1975. Both Cape Verde and Guinea were under the rule of PAIGC until November 1980. On November 14, 1980, a coup was organized by the Prime Minister of Guinea-Bissau. A revolution council was appointed which replaced the President of the Republic, Mr. Luis Cabral, who was also Deputy Secretary-General of PAIGC. The former prime minister of Guinea-Bissau was appointed president of the revolution council. Under these circumstances, the Standing Committee of the Cape Verdian National Council within PAIGC called the militants to a national conference on January 16-20, 1981, in Praia, in order to analyze the situation brought about by the coup. The conference eventually proclaimed itself a Congress and decided on the creation of the African Party for the Independence of Cape Verde (PAICV).

PAICV preserved the historic, political and ideological legacy of PAIGC as well as Amilcar Cabral's philosophy as guidelines for action. The party also adopted the platform and policies of PAIGC, at least the aspects that were compatible with the new situation. PAICV has the following principal organs:

- o The Congress is the major body within PAICV;
- o The National Council assumes leadership during the period between sessions of Congress;
- o The Political Commission is in charge of the party in the interim between two meetings of the National Council;
- o The Secretariat, under the authority of the Political Commission, manages the day-to-day running of PAICV; and
- o The National Control and Review Commission is in charge of discipline in the party and the State.

The Congress elected Mr. Aristides Maria Pereira, the Secretary-General, and Mr. Pedro Verona Rodrigues Pires, Deputy Secretary-General of PAICV.

2. Structure of the Cape Verdian State

The bodies having power under article 49 of the constitution are the National People's Assembly, the President of the Republic, the Government, the Courts, and the local authorities. The National People's Assembly, which is the supreme authority in the state, holds both legislative and constitutional powers, elects the president and appoints the prime minister. The prime minister is nominated by the president.

The president is the head of state and the supreme commander of the Revolutionary People's Armed Forces. The government is the executive and administrative body, and its policies are in keeping with the guidelines established by the National People's Assembly. Justice is exercised solely by the courts defined by law. Local authority is held by local administrative units.

The national administration is structured on the basis of general directorates. The windward islands have a regional representative to the Government. On the local level, the country is divided in districts (conselhos) composed of communes (freguesias). Economic and financial management is basically the responsibility of the Ministry of Economy and Finance. The Ministry of Planning is in charge of planning and cooperation tasks.

The Bank of Cape Verde is the central bank of issue, responsible for the implementation of monetary and credit policies.

a. The Government

The Government is headed by the prime minister, who is assisted by the cabinet, the State Secretariat for the Prime Minister, and the State Secretariat for Cooperation and Planning.

There are also a number of ministries, in each of the following domains: national defense, rural development, economy and finance, education and culture, housing and public works, interior, justice, foreign affairs, public health and social affairs, and transportation and communication. The Ministry of Economy and Finance includes the state secretariats of commerce and tourism, of finance, of fishing and of industry.

b. Economic and social organization

According to article ten of the constitution, the Republic of Cape Verde has the following economic and social objectives:

- o To achieve an independent national economy as well as social and cultural advancement;
- o To develop a technical and material infrastructure for the country, and to control the major sectors of the economy as a basis for social progress;

- o To implement a rural land reform with a view to enhancing agricultural production, essential for a strong society; and
- o To organize cooperatives and people's production.

Under article 11 of the constitution, three systems of property ownership are recognized. State property is the common patrimony of the whole people and is the predominant system in the economy. Cooperative property is that used in agricultural production, consumer goods production, craftsmanship and other activities defined by the law. Private property is that which does not belong to the state.

State property consists of the ground, the water, mining resources, main energy sources, basic means of industrial production, information and communications systems, banks, insurance companies, infrastructure and basic transportation systems. The state controls foreign trade.

The national economy is primarily controlled through economic and social planning.

c. National budget

The budget is presented in Tables 6 and 7.

d. Major policies related to agriculture and agricultural research

(1) Main objectives for long-term development

The objectives outlined under article ten of the constitution include: continuous promotion of the people's welfare; end of the exploitation of man by man; and elimination of all forms of human enslavement to degrading interests for the profit of individuals, groups or classes.

In terms of economic activity, reaching the above-mentioned goals will require a 7 or 8 percent annual GNP growth rate. This will also require the full use of human resources in the country, which implies the creation of at least 120,000 jobs by the year 2000, and a balanced foreign trade budget, which means that by the end of the period about 60 percent of national production must be exported.

(2) Establishment of an efficient production apparatus

The production system to be implemented will be based on agriculture, forestry and livestock, whose functions are to accommodate the rural work force, to reverse ecological and land deterioration, and to satisfy the food needs of the country (in other words, "the agricultural revolution"); industry, energy and fishing, which are means of supporting the internal and external economy of Cape Verde as a whole (the "industrial challenge"); and activities

Table 6: National Budget

	1976	1977	1978	1979	1980	1981
Direct Taxes	73	79	117	124	209	309
Indirect Taxes	200	247	299	349	485	564
Property Income	-	9	40	85	110	114
Other Receipts	43	62	53	60	70	91
Total Receipts (A)	316	397	509	618	874	1078
Expenses (B)	391	516	575	657	847	1053
(A) - (B)	-75	-119	-66	-39	27	25

Table 7: Operating Budget, 1981-1983
(in 000 escudos)

	<u>1981</u>	<u>1982</u>	<u>1983</u>
National People's Assembly	6,596	7,197	7,900
Precedency of the Republic	68,136	53,711	64,782
Cabinet of the Prime Minister	73,618	103,426	96,968
Ministry of Housing and Public Works	35,447	40,689	44,420
Ministry of Foreign Affairs	93,919	132,065	173,659
Ministry of Economics and Finances	221,970	302,491	407,480
Ministry of the Interior	76,081	102,614	125,116
Ministry of Education and Culture	185,887	238,965	257,503
Ministry of Transportation & Communications	207,005	319,106	277,437
Ministry of Rural Development	69,293	78,764	88,498
Ministry of Justice	33,661	42,575	48,373
Ministry of Public Health and Social Affairs	104,185	129,400	140,500
Total	<u>1,266,735</u>	<u>1,678,950</u>	<u>1,878,280</u>

related to the geo-economic situation of Cape Verde, which should better integrate the economy into regional and international networks, in so doing inducing development in other sectors as well (the "geo-economic vocation").

These three fundamental lines of development, which will shape the Cape Verdian production apparatus, will be supported by the sectors of construction and public works, transportation and business. The efficiency of the production system will also depend on the reform achieved in the administration.

(3) Objectives and policies under the First National Development Plan (1982-85)

The National Development Plan for 1982-85 is currently under way. Within the framework of the objectives defined for the 80's, the First Plan proposes to achieve the following by 1985:

- o Satisfying the basic needs of the population as regards nutrition, drinking water, health, education, culture, housing and sanitation;
- o Achieving an independent national economy, by increasing the participation of external funding in the gross formation of permanent capital, by increasing exports, and by reducing the deficit in goods and services; and
- o Increasing employment.

The major policies of the government can be summarized as follows:

- o Slowing down and reversing the processes of desertification and soil degradation;
- o Establishing infrastructure for long-term development;
- o Guaranteeing employment and income to the unemployed and the underemployed, especially those having to support a family;
- o Satisfying the basic needs of the population, especially for nutrition, health and drinking water supply;
- o Unifying the national territory; and
- o Preventing possible shortages in the economy, especially food supply shortages.

D. Economic Situation

1. General indicators

a. Gross domestic product

The GDP (in million escudos C.V.) is characterized by a weak productive sector and a strong services sector, especially commerce, public services and transportation. The services sector accounts for 56 percent of GDP and increased by an average of 15 percent between 1977 and 1980. (See Table 8.)

b. Public investment

A breakdown of public investment is shown in Table 9.

The average annual growth rate is higher than 17 percent. Rural development, which shortly after independence received 50 percent of investment, represented 30 percent of investment in 1978-80, and only 20 percent in 1981. This was a result of the growth of the industrial, energy and hotel sectors, which had an 8 percent rate in 1978-80 and increased to 30 percent in 1981. Internal funding only accounts for 7 percent of the total.

c. Revenue breakdown

About 42 percent of the total population lives below the poverty line (disposable income of US\$ 170). This constitutes 60 percent of farmers and rural workers and 80 percent of urban unemployed and underemployed. About 30 percent of the population owns 60 percent of disposable income. (See Table 10.)

d. GDP trends (forecasts for 1985)

These trends are shown in Tables 11 and 12.

2. Foreign trade

The foreign trade situation reflects the difficult economic situation of the country. Almost all imports are consumer goods (approximately 68 percent) and intermediate goods (11 percent).

Cape Verde's main trade partner is still Portugal. As a result of food assistance, the EEC countries and the US have increased their participation. The balance of payments from 1976 to 1981 is indicated in Table 13.

3. Financial and monetary situation

a. Public finance

Table 6 summarized government receipts for the period from 1976 to 1981. There was a 22 percent annual increase in operating expenses, which represents a 12 percent increase when inflation is taken into account. Receipts have grown at a rate of 28

Table 8: Structure and Breakdown of the GDP in Current Market Prices
(million escudos C.V.)

	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>
Agriculture, Livestock and Forestry	260	390	531	570
Fishing	82	82	123	180
Industry	110	126	126	120
Building Industry	261	317	390	590
Services	870	985	1081	1890
Trade and Transportation	580	692	710	1360
Public Services	290	293	371	530
	<hr/>	<hr/>	<hr/>	<hr/>
Total	2453	2885	3332	5240
	=====	=====	=====	=====

Table 9: Public Investment
(million escudos C.V.)

	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>	<u>Total</u>	<u>Percentage</u>
Rural Development	15	320	480	465	1,680	27
Fishing	65	50	175	15	305	5
Industry	30	5	35	420	490	8
Energy, Desalting	5	20	155	205	385	6
Building Industry	64	48	75	84	271	4
Transportation and Communications	140	395	235	615	1,485	24
Distribution	20	25	25	45	115	2
Tourism and Hotels	-	5	45	100	150	2
Education	15	40	70	115	240	4
Health	35	40	35	70	180	3
Housing - Urban Planning	90	90	95	120	395	6
Public Administration	85	80	155	210	530	9
Total	<u>1,060</u>	<u>1,115</u>	<u>1,580</u>	<u>2,440</u>	<u>6,195</u>	<u>100</u>

Table 10: Income Breakdown

	<u>Percentage of Population</u>	<u>Percentage of Available Income</u>
Agriculture and Under- Employed of Rural Zones	54.8	32.4
Unemployed or Under-Employed Urban Population	8.8	4.5
Small-Scale Fishermen	7.1	5.2
Non-Agricultural Permanent Employees	18.7	31.2
Merchants and Landowners	10.6	26.7
	<hr/>	<hr/>
Total	100	100
	=====	=====

Table 11: GDP Growth
(1985 Forecasts)

	<u>1980</u>		<u>1985</u>		<u>Average Annual</u>
	(Value)	(Percent)	(Value)	(Percent)	<u>Growth Rate</u>
					(Percent)
Agriculture and Fishing	940	22	1,180	16	4.7
Energy and Industry	150	4	810	11	40.1
Consulting and Public Works	740	18	1,680	23	17.8
Transport and Trade	1,700	41	2,600	35	8.9
Other Services	<u>670</u>	<u>15</u>	<u>1,130</u>	<u>15</u>	<u>11.0</u>
Total	4,200	100	7,400	100	

Table 12: Overall Balance
(in million escudos C.V. in 1982 prices)

		1980		1985		Growth
		(Value)	(Percent of GDP)	(Value)	(Percent of GDP)	1980/1985
Internal Utilization and Con- sumption	Final Consumption	4,690	112	6,500	88	1,810
	Investments	2,940	70	6,850	93	3,910
	Stock Growth	-	-	150	2	150
	Internal Utilization	7,630	182	13,500	183	5,870
	Internal Production	4,200	100	7,400	100	3,200
	Deficit	3,430	82	6,100	83	2,670
Balance of Goods and Services	Imports	4,400	105	8,200	111	3,800
	Exports	970	23	2,100	28	1,130
Deficit	Transfers	2,000	48	2,330	31	330
	Private (Emigrants)	1,480	35	2,770	37	1,290
	Public Transfers	120	3	1,980	27	1,860
	Public Funds ¹	-	-	-400	-5	-400
	Returns on Capital	170	4	-180	-2	-350
Total		3,770	90	6,500	88	2,730
Reserve Changes		340	8	400	5	60

¹Exterior Public Loans.

Table 13: Balance of Payments Changes, 1976 to 1981
(million escudos C.V.)

	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>1981</u>
Imports, cif	-1,175	-1,535	-2,050	-2,670	-3,210	-4,185
Exports, fob	45	40	110	155	365	305
Services	25	-95	-	105	110	15
Balance of Goods and Services	<u>-1,105</u>	<u>-1,590</u>	<u>-1,940</u>	<u>-2,410</u>	<u>-2,735</u>	<u>-3,865</u>
Private Transfers	505	800	865	955	1,595	1,760
Investment Returns	5	35	20	50	135	25
Balance of Current Payments Public Transfers, Cash	<u>-595</u>	<u>-755</u>	<u>-1,055</u>	<u>-1,405</u>	<u>-1,005</u>	<u>-2,080</u>
Errors and Omissions	800	1,030	800	1,395	1,275	1,940
	310	130	165	230	-40	170
Total Balance	<u>515</u>	<u>405</u>	<u>-90</u>	<u>220</u>	<u>230</u>	<u>30</u>

percent per year during the same period, due to increased economic activity.

Investment, whose evolution during the 1976-81 period is shown in Table 9, comes almost entirely from foreign sources. The Cape Verde Bank's participation is about 7 percent and external funding 93 percent (of which 80 percent is grants and 20 percent is loans).

The public debt amounted to ECV 4.7 billion in 1981 with 1,978 million for the maritime industry and 2,745 million for others. (See Table 14.) External funding for projects under the First Plan amounts to about ECV 11 billion, of which 9.5 billion is in loans.

b. Currency

The currency of Cape Verde is the escudo (ECV). The Cape Verde Bank operates as the issuing central bank and as a credit institution. The escudo is not convertible.

4. Current economic plan

Under the objectives defined in the First National Development Plan for 1982-85, economic and social policies are to be oriented according to the following general priorities:

a. Developing productive capacity and production

The specific priorities under this general objective are the following:

- o Maintaining and increasing programs for soil protection and recovery, for improving the utilization of land, and for crop selection;
- o Promoting rational use of production factors, improving crop protection and developing crop research and agroclimatology;
- o Promoting agricultural redevelopment and designing a new, more reliable and efficient production system for agronomy and livestock;
- o Pursuing the implementation of the small fisheries program;
- o Creating and developing industrial units, especially those producing principally for the domestic market;
- o Organizing and strengthening the building construction sector; and
- o Laying the foundation for industrial development.

Table 14: Public Debt
(million escudos C.V.)

	Total Debt (1985)	Debt Amounts		
		1985	1990	1995
Public Debt	4,750	70	120	115
Public Enterprise Debt	8,450	320	475	345
Total	13,200	390	595	460

b. Unifying and stabilizing the domestic market

Improving the production system is necessary to stabilize the domestic market, which not only requires an increase in material supply, but also an improvement of marketing structures, employment level and purchasing power.

c. Increasing exports and accelerating the process of import substitution

Cape Verde imports most of its consumer goods and all of its intermediate and equipment goods, while exporting relatively little. As a consequence, there is a serious trade deficit with exports barely covering 6 percent of imports.

Because the development effort entails a higher level of imports, and because the international trade situation is worsening for small countries, it is necessary to limit or reduce the foreign trade deficit and to speed up the process of import substitution. This can be accomplished through the development of agriculture, livestock and industry. This will require the following actions:

- o Develop agricultural and industrial exports;
- o Consolidate and develop industrial fishing;
- o Develop infrastructure and port facilities for international navigation;
- o Sell refrigerated capacity to foreign ships, since such space is insufficient supply in Cape Verde;
- o Develop naval repair workshops (work will start very soon);
- o Build infrastructure to develop the airport at Sal;
- o Stimulate tourism by increasing hotel capacity throughout the country; and
- o Limit fuel imports and channel demand toward alternative energy sources.

d. Increasing economic efficiency and improving ability to use aid received

According to the constitution, the State is responsible for running the planned economy of Cape Verde. Given its lack of resources and its heavy dependence on foreign countries, Cape Verde must direct its economy toward efficiency and with strict planning. The country must also improve the conditions of capital formation and its ability to use foreign assistance. In order to achieve these goals, the relevant authorities are going to undertake:

- o A program to strengthen national capacity in the field of construction and public works projects;
 - o A national three-level planning system (central, regional, sectoral) and a country-wide statistics system;
 - o A local community development program;
 - o A professional training program, through the creation of the Professional Training Institute, the reorganization of the Civil Service Training Center and the creation of an Employment Service;
 - o A cooperative development program, which must promote and assist the development of the cooperative and people's production sector; toward this end a cooperative development fund is going to be created;
 - o The creation of: an assisting, coordinating and monitoring body for public companies; training and refresher training for managers; and a national accounting plan;
 - o The organization and development of research institutions concentrating on scientific and technical advancement;
 - o The strengthening of the financial and credit structure of Cape Verde; and
 - o The promotion of participation and intervention of workers (and the general population) in the development process.
- e. Improving the quality of life

Economic development includes raising the standard of living in terms of education, culture, health and environment.

The education system should be further transformed so as to enable a significant rise in the technical and scientific level of Cape Verdians.

The Cape Verdian cultural identity should be maintained so as to strengthen national solidarity, to create the new man, to eliminate alienation and to raise the national consciousness.

Objectives in health and social affairs concentrate on progressively raising the health status of the population.

Environmental conditions must be improved so as to insure the population a healthy and balanced life. Public investment in environmental improvement, health and education can be compared to other economic sectors in Table 15.

Table 15: Public Investment Changes from 1978-1981 to 1982-1985
(million escudos C.V. at 1982 prices)

	<u>Average Annual Investment</u>				<u>Changes</u>
	<u>1978-1981</u>	<u>Percentage</u>	<u>1982/85</u>	<u>Percentage</u>	<u>1982-85</u> <u>1978-81</u>
Rural Development	556	28	1,116	20	2
Fishing	103	5	188	3	1.8
Industry	141	7	1,078	20	7.6
Energy and Desalting	115	6	324	6	2.8
Building and Public Works	79	4	143	2	1.8
Transportation & Communications	479	24	1,148	21	2.4
Trade	38	2	137	2	3.6
Tourism	45	2	113	2	2.5
Education and Training	75	4	369	7	4.9
Health and Social Affairs	58	3	147	3	2.5
Housing, Urban Planning and Sanitation	132	7	373	7	2.8
Administration	170	8	391	7	2.3
Total	1,991	100	5,527	100	2.8
	=====	=====	=====	=====	=====

5. Foreign aid

a. National coordination and management of foreign assistance

In order to insure the coordination and management of foreign aid within the framework of the Plan, the government has created a State Secretariat for Cooperation and Planning, directly under the prime minister. All foreign aid will be negotiated through this department. The aid will be directly channeled toward priority projects under the Plan through this department and the General Directorate of Cooperation and of the Plan (see Tables 16 and 17).

In order to improve the efficiency of the economy and the conditions for use of the assistance received, a national planning system is currently being established. This consists of central, regional and sectoral levels as well as a nationwide statistics system. The central planning apparatus will thus be strengthened through the support given to the General Directorate for Planning. Planning structures are also being created within the different ministries, especially a study and planning department for priority sectors. Regional, flexible planning structures will be the first to be designed and the statistics system will be restructured and strengthened. Also planned is a central coordinating body for studies financed by the National Study Fund. This coordination will be formalized starting in 1985 with the establishment of the National Study Bureau. It should be emphasized that all these efforts will need a strong technical assistance component. The planning system will thus be an essential element in the assessment of aid programming and control.

b. Food assistance

Cape Verde began receiving international food assistance after independence in 1975. The country was then suffering from a long period of drought, which had started in 1968 and continues today. While such assistance constituted only 30 percent of the country's food needs in 1967, during the past five years it has risen to 80 percent.

Food assistance has been highly beneficial to the Cape Verdian economy. It has provided relief from malnutrition due to the drought, especially for the poor. It has satisfied part of the country's food needs in a period of severe budget constraints (the period immediately following independence). Also, it has generated employment in rural areas through revenues provided by the sale on local markets of goods supplied for financing labor-intensive development projects.

Table 18 presents the volume and value of food aid, by product, from 1978 to 1981. Maize, wheat, rice, beans and powdered milk are the main products. The countries and organizations which have regularly provided Cape Verde with food assistance are: the USA, the EEC, the Federal Republic of Germany, the Netherlands, the United Kingdom, Belgium, France and the World Food Program.

Table 16: Official Development Assistance
(in millions US\$)

	1975	1976	1977	1978	1979	1980	Total 1975-1980	Percen- tage
Liabilities								
Bilateral OECD Assistance	9.1	13.7	30.3	42.4	38.7	41.4	176.6	63.1
Multilateral Assistance ¹	9.5	2.8	6.6	15.8	12.2	17.7	64.6	23.1
Arab Countries and Financial Institutions	0.9	10.5	2.1	4.6	3.4	17.2	38.7	13.8
Total Assistance in Current Dollars	19.5	27.0	39.0	62.8	55.3	76.3	279.9	100.0
Total Assistance in Real 1975 Dollars ²	19.5	26.1	34.6	47.9	38.2	48.7	215.0	
Net Disbursements								
Bilateral OECD Assistance	2.1	6.8	15.7	25.0	27.2			
Multilateral Assistance ²	6.6	6.2	6.4	7.5	7.1			
Arab Countries and Financial Institutions	0.1	11.8	2.8	0.7	0.3			
Total Assistance in Current Dollars	8.2	24.8	24.9	33.2	34.3			
Total Assistance in Real 1975 Dollars ³	8.2	23.9	22.1	22.9	21.9			

¹These amounts do not include assistance from countries with centrally planned economies, from Portugal or from developing countries other than OPEC countries.

²Includes the UN, its specialized agencies, the EC institutions and the African Development Fund.

³Using the ODA deflator coefficient, as computed by the Development Assistance Committee.

Source: CILSS = Sahel Club.

Table 1/: Breakdown of Official Development Assistance by Sector¹
(in thousands US\$)

Liabilities 1975-1980

<u>Sector</u>	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>	<u>1980</u>	<u>Total 1975-1980</u>	<u>Percentage</u>
Non-Project Assistance	18,288	20,424	22,374	21,506	22,107	40,305	145,004	51.8
Assistance to the Balance of Payments	910	-	2,143	5,976	4,558	5,271	18,858	6.7
Food Aid	11,428	6,641	10,998	11,819	14,254	13,528	68,668	24.5
Support Program for Subsistant Crops	-	2,296	6,585	1,219	-	13,085	23,185	8.3
Technical Assistance	47	131	335	758	1,367	2,968	5,606	2.0
Scholarships	2	4	70	96	12	67	251	-
Emergency Assistance	5,901	11,352	2,243	1,638	1,916	5,386	28,436	10.2
Project Assistance	1,175	6,533	16,615	41,306	33,173	36,034	134,836	48.2
Agricultural and Rural Development	295	2,931	4,439	20,725	10,180	10,264	48,834	17.4
Natural Resources	229	1,516	3,070	11,594	7,035	4,683	28,127	10.1
Basic Infrastructure	400	798	6,390	6,148	9,731	5,320	28,787	10.3
Human Resources	251	1,185	2,714	3,286	6,219	5,763	19,420	6.9
Industry	-	103	-	3	8	10,004	10,118	3.6
Total Liabilities	19,463	26,597	38,989	62,812	55,280	76,339	279,840	100.0

¹These amounts do not include assistance from countries with centrally planned economies, from Portugal or from developing countries other than OPEC countries.

Source : CILSS = Sahel Club.

Table 18: Food Assistance Received Between 1978-1981
 (in tons)
 (prices in US\$/ton)
 (value in thousands US\$)

	1978	1979	1980	1981
<u>Maize</u>				
Quantity	33,095	15,000	24,303	18,605
Price	115	115	130	150
Value	3,806	1,725	3,159	2,971
<u>Wheat</u>				
Quantity	7,500	8,000	10,500	11,075
Price	150	180	180	190
Value	1,125	1,440	1,890	2,104
<u>Rice</u>				
Quantity	4,750	3,660	6,336	6,578
Price	220	280	390	430
Value	1,045	1,025	2,471	2,829
<u>Powdered Milk</u>				
Quantity	1,297	-	999	430
Price	700	-	700	900
Value	908	-	699	387
<u>Edible Oils</u>				
Quantity	810	1,100	608	393
Price	619	950	1,249	1,507
Value	501	1,045	759	592
<u>Beans</u>				
Quantity	-	1,500	11,500	157
Price	-	526	349	600
Value	-	789	4,113	94
<u>Other Products</u>				
Quantity	1,233	103	1,500	1,116
Price	617	806	143	125
Value	761	83	215	140
Total Value, fob	8,146	6,107	13,206	8,937
Total Value, cif	<u>10,176</u>	<u>7,817</u>	<u>16,856</u>	<u>11,722</u>

As illustrated in this table, the volume and value of food assistance sharply dropped from 1978 to 1979, increased in 1980 and decreased again in 1981 in spite of the worsening drought. This fluctuation in the level of food assistance has created serious problems for the Cape Verdian government, making supply planning more difficult. The economic importance of this aid is illustrated by the fact that food aid provided to Cape Verde covered about 40 percent of all food imports in 1975-81.

c. Food assistance and the First National Development Plan

The government is fully aware of the importance of food assistance. It not only helps the country cover its food deficit, but also helps finance the public investment program. The authorities hope that donors will provide a higher level of food aid and will follow a regular schedule of several shipments per year. It would thus be possible, for the period 1982-85, to count on a guaranteed volume of food products, the sale of which would raise a predictable revenue. This is necessary to integrate food assistance into the implementation of the First National Development Plan (1982-85).

Average needs and the deficit, by product, are presented in Tables 19, 20, 21 and 22.

The government hopes that the donors are ready to assist the country to change from receiving emergency food aid to receiving regular food assistance several times a year. Thus, in the framework of the First National Development Plan, food aid can be used as an instrument to achieve self-sufficiency in food, while structural problems are being addressed.

E. Rural Sector

1. Natural resources related to agricultural development

a. Climate

(1) General characteristics

The Cape Verde archipelago represents an extension of the large semi-arid zone which stretches across the African continent from the Red Sea to the Atlantic Ocean. It is located approximately between isohyets 250 mm (north) and 900 mm (south), with an average width of about 500 km.

The climate of Cape Verde is influenced by the following atmospheric currents:

- o The Azores anticyclone, located between 35° and 40° north, whose pressures vary between 1,019 and 1,022 millibars, and which is at the origin of the trade winds;

Table 19: National Food Needs and Production, 1982-1983
(tons)

<u>Products</u>	<u>Needs</u>	<u>Production</u>	<u>Deficit</u>
Maize	45,000	10,000	35,000
Wheat	12,000	0	12,000
Rice	0	0	9,000
Powdered Milk	2,500	0	2,500
Edible Oil	2,000	0	2,000

Table 20: Desired Food Aid by Product, 1982-1985
(tons)

Products		Annual Average in the Period	Total 1982-1985	Total 1978-1981
Maize	Total	25,000	100,000	91,003
	(USAID)	(15,000)	(60,000)	(60,000)
	(Others)	(10,000)	(40,000)	(31,000)
Wheat		12,000	48,000	37,075
Rice		9,000	36,000	21,324
Powdered Milk		2,500	10,000	2,726
Edible Oils		2,000	8,000	2,911
Beans		3,000	12,000	13,157

Table 21: FDN Income for Desired Food Aid, 1982-1985
(thousand escudos)

Products		1982	1983	1984	1985	Total 1982-1985
Maize	Total	123,875	145,166	165,301	187,050	681,392
	USAID	78,275	91,566	103,701	117,450	390,992
	Others	45,600	53,600	61,600	69,600	230,400
Wheat		62,880	80,880	98,880	120,480	363,120
Rice		187,245	211,698	238,374	251,199	888,516
Powdered Milk		3,750	4,250	4,800	5,405	18,205
Edible Oils		45,000	52,200	60,120	68,832	226,152
Beans		48,000	254,240	361,104	68,664	232,008
Total		470,750	548,434	628,579	701,630	2349,393
		=====	=====	=====	=====	=====

Table 22: Influence of the Desired Food Aid on the Balance of Payments, 1982-1985
 (Quantities in tons)
 (Prices in US\$/ton)
 (Value in thousands US\$)

	1982	1983	1984	1985	Total 1982-1985
<u>Maize</u>					
Quantity	25,000	25,000	25,000	25,000	100,000
Price	146	159	171	184	
Value	3,650	3,975	4,275	4,600	16,500
<u>Wheat</u>					
Quantity	12,000	12,000	12,000	12,000	48,000
Price	190	209	230	253	
Value	2,280	2,508	2,760	3,036	10,584
<u>Powdered Milk</u>					
Quantity	2,500	2,500	2,500	2,500	10,000
Price	900	900	1,089	1,198	
Value	2,250	2,475	2,722	2,995	10,442
<u>Edible Oils</u>					
Quantity	2,000	2,000	2,000	2,000	8,000
Price	2,400	2,640	2,904	3,194	
Value	4,800	5,280	5,808	6,388	22,276
<u>Beans</u>					
Quantity	3,000	3,000	3,000	3,000	12,000
Price	490	539	539	652	
Value	1,470	1,617	1,779	1,956	6,822
Total, fob	18,320	22,112	22,024	24,123	184,580
Total, cif	22,720	24,940	27,310	29,910	104,080
	=====	=====	=====	=====	=====

- o The Saint-Helen anticyclone, located between 28° and 30° south, whose pressures vary between 1,019 and 1,024 milibars, and which also is at the origin of trade winds;
- o A non-permanent active center located on the African continent: the Lybian anticyclone during boreal winter, replaced during boreal autumn by a continental thermal pressure; and
- o In the Atlantic Ocean, between the two anticyclones, an equatorial low pressure zone which moves around the equator, following the relative movements of both anticyclones, which are linked with the apparent movement of the sun.

The axis along which the trade winds converge, whose general direction is east-west, is called Intertropical Convergence Zone (ICZ) or Intertropical Front (IF).

In July, the IF is in its northernmost position, which affects Cape Verde. Over the ocean, the IF is bordered on the north and on the south by two high-pressure zones. The trade winds are from the northeast in the northern hemisphere and from the southeast in the southern hemisphere.

In the eastern part of this zone, the southeasterly trade winds come from the equator, where the Coriolis force is non-existent. They are drawn by the Saharan and Lybian depressions, deviate toward the east, and reach the African continent in the form of southwesterly winds. These winds can reach as far as the 35° W meridian.

On the continent, the IF is bordered on the south by the Saint-Helen high pressures and on the north by the Saharan depression. South of the IF the trade winds are reversed by the drawing current caused by the low pressure region on the African continent, and are then called monsoon.

Thus, trade winds prevail north of the IF and monsoon south of the IF, coming from equatorial warm waters, with hot, humid and very rainy characteristics.

Cape Verde is located in the western part of the IF where the thickness of the monsoon band is slight (1,000-1,500 meters). The IF is characterized by annual and occasional variations. Cape Verde has a rainy season when the IF moves north.

The overall climate of the islands is tropical-arid and semi-arid, tempered by the moderating influence of the ocean. Micro-climates develop according to the relief and exposure to trade winds. In the mountainous islands there is permanent fog between 600 and 1,700 m of elevation, but sectors of humid climate are few.

As regards elevation, the islands can be divided into two groups: those with a maximum elevation of less than 750 m (Santa Luzia, Sal, Boavista and Maio) and those with elevations of between 750 and 3,000 m

(Santo Antao, S. Nicolau, Fogo and Santiago). The slopes facing northeast are more humid than those facing southwest, especially at elevations under 750 m; aridity is limited in the higher parts of the slopes facing northeast. In the other islands, the coasts are arid while the higher areas, especially those facing northeast, are less dry.

(2) Climatic factors

(a) Rainfall

In Cape Verde, the rainy season occurs from August to October and the dry season from April to June. July and November are transitional months. There is an intermediate season from December to February, with very low rainfall, if any.

On an annual basis, rainfall is extremely irregular. For example, the average amount of rainfall on Mindelo from 1901 to 1930 was 115.5 mm, with 19.5 mm in 1920, and 330.1 mm in 1906. Even in the humid areas of the more favored islands, the annual fluctuations of rainfall are very high. In Monte Velha, at almost 1,300 m of elevation, on the northeastern side of Fogo island, the average annual rainfall was 1,360 mm during the 1943-60 period; however, the figure was 350.7 mm in 1947 and 2,462 in 1951.

Rainfall intensity is high. For example, the average annual figure for the 1943-1960 period was 1,610.3 mm in Monte Valha, with a daily maximum of 589.6 mm. During the same period, the Praia station in Santiago (elevation 27 m) recorded an average annual rainfall of 260.5 mm, with a daily maximum of 212.6 mm.

(b) Temperature

The average annual temperature and the average minimum temperature are strongly influenced by elevation. The annual maximum is not. The minimum temperatures occur in January and April and the maximum in July and October. (See Table 23.)

(c) Relative humidity

Table 24 presents the average annual figures for reference stations.

As shown in this table, the average annual relative humidity is lower than 75 percent for the areas of low elevation (the coasts). The stations higher than 600 m above sea level have an average relative humidity higher than 80 percent because of frequent fog and haze. Relative humidity is highest in June and November.

(d) Sunshine

Data on sunshine is presented in Table 25. July and December usually get the fewest hours of sunshine.

Table 23: Temperatures

Station	Elevation (m)	Annual Temperature					
		(Average)	(Max.)	(Min.)	----Absolute Values----		(Period)
					(Max.)	(Min.)	
Tarrafal Monte Trigo	10	27.1	29.6	24.6	38	10	1940/60
Ponta do Sol	16	23.4	25.2	21.7	34	16.2	"
Mindelo	2	23.6	25.5	21.7	33.6	13.5	1931/60
Preguiça	25	23.9	26.2	21.6	34	15	1900/60
Sal Rei	10	24.2	26.8	21.6	34	11.3	1931/60
Serra da Malagueta	85	19.8	24.3	15.2	35	9	1940/60
Trindade	280	23.6	28.1	19	34	11	"
Santa Catarina	555	19.9	23.1	16.7	32.8	10	"
S. Jorge dos Orgaos	319	22	27	17	32.5	7.5	"
Curralinho	950	18.7	23.4	14	30	10	"
Monte Velha	1300	18.9	23.4	14.4	34	4.5	1943/60
Praia	27	24.4	27.2	21.7	36.2	16.2	1940/60
S. Filipe	60	24.8	27.8	21.7	37.6	15	1931/60
Nova Cintra	490	20.2	22.2	18.5	32	11.1	1940/60

Table 24: Relative Humidity

Station	Elevation (m)	Average Annual Temperature	Period
Ponta	16	73.6	1940/60
Mindelo	2	71.3	1930/60
Preguiça	25	71	1940/60
Sal Rei	10	77.5	1930/60
Serra da Malagueta *	850	74	1940/60
Trindade *	280	69	1940/60
Santa Catarina	555	80	1940/60
S. Jorge dos Orgaos*	319	68	"
Curralinho*	950	84	"
Monte Velha*	1,300	64	"
Praia	27	65.6	"
S. Filipe	60	71	1930/60
Vila Nova Cintra	490	85.3	1940/60

* These figures are the relative humidity at 10 a.m., which is always lower than the daily average.

Table 25: Annual Sunlight

Station	Elevation	Total Sunlight (h)	Period
Praia	27	2,668.3	1981/1982
Trindade	280	2,835.05	1981/1982
S. Francisco	140	2,617.50	"
S. Jorge	319	2,167.40	"
Santa Cruz	15	2,070.60	"
Chao Bom	15	2,307.20	"
Mindelo ¹	2	2,977	1930/1960
Praia	27	2,927.8	1940/1960

(e) Winds

Northeasterly winds prevail (78 percent in Mindelo and 72 percent in Praia). Non-windy days are rare, occurring only about 4 percent of the time. A very dry easterly wind sometimes blows, but not frequently. The least windy months are from July through October.

(f) Evaporation

Table 26 shows the average annual amount of evaporation (piche) for some stations.

b. Land use

Due to the hilly nature of some of the islands and to the eroded relief of the others, there is little well-developed soil. Even in the mountains, where the climate is more humid, the steep slopes make development of thick, differentiated soils difficult. However, on less steep slopes, more developed and sometimes deep soils can be found, with varied horizons.

The maps of land-type and land-use were drawn by SCETAGRI in 1981 and published in "Outlines for the rural development of the Cape Verde islands."

The land-use map identifies two principal land-use categories: agricultural land and pastoral or silvo-pastoral land.

(1) Agricultural land

Agricultural land can be divided into three major types: irrigable alluvial and valley-bordering land, land for dry crops, and multiple use land.

(a) Irrigable, alluvial land and land along valley edges

Irrigated or irrigable alluvial land is found at the bottom of valleys. The arable surface area of this type includes 85 percent of all such land, estimated to be 1,330 ha.

Terraced land is also included in this category. These soils, which are normally irrigated, cover an estimated 1,635 ha, of which 65 percent is cultivable.

Another type of such land is that of rough riverbed sediments. These lands are not normally available, but are recoverable through diversion of water. Total soil surface of this kind is estimated to be 3,375 ha.

Table 26: Average Annual Evaporation

Station	Elevation (m)	Annual Evaporation (mm)	Period	Average Daily Evaporation (mm)
Tarrafal Monte-				
Trigo	10	1,124.9	1940/60	4.08
Ponta do Sol	16	1,551.2	"	4.24
Mindelo	2	1,684.4	1930/60	4.61
Preguiça	25	1,749.4	1940/60	4.79
Sal Rei	10	1,178.7	1930/60	3.23
Serra da Malagueta	850	574.9	1940/60	1.57
Trindade	280	254	"	0.7
Santa Catarina	555	929.5	"	2.54
S. Jorge dos Orgaos	319	1,129.8	"	3.10
Cerralinho	950	497	"	1.36
Monte Velha	1,300	2,247.7	1943/60	6.16
Praia	27	2,730.1	1940/60	7.50
S. Filipe	60	1,395.5	1930/60	3.82
Nova Sintra	490	480.5	1940/60	1.32

(b) Land currently used for dryland crops

This category includes land with an average slope of less than 15 percent, suitable for irrigation depending on the availability of water. Total land of this kind is estimated to be 8,483 ha, of which only 80 percent is currently in use.

Heterogeneous land with an average slope of greater than 25 percent, found in mountainous areas, is also extensively used for dryland crop farming (40-70 percent). Such land covers an estimated 12,010 ha.

(c) Multiple-use land (agro-sylvo-pastoral)

On the average, only 30 percent of these soils are cultivable; the balance is covered with vegetation. Total land area is 33,515 ha (humid zone, 2,755 ha; sub-humid zone, 11,420 ha; and semi-arid zone, 19,340 ha).

Sylvo-pastoral land totals 44,570 ha.

It should be noted that in some humid zones reforestation can be undertaken, at great expense. Only 16 percent of such area can be reforested at normal cost.

c. Water

Rivers in most valleys flow only during the rainy season, from July to October. Very rarely rivers flow in November and December in the mountainous islands, due to the winter rains created by the cold and humid air masses coming from the northern Atlantic.

As rains are usually very heavy and short, the streams created do not last for more than a few days or even hours. Sometimes, even during humid periods, there is no flow at all, because the small amount of rain quickly evaporates or filters into the soil. On the other hand, there can be as much rain in one day as the average annual rainfall. The consequences of such heavy rains are disastrous, as torrents carry along basalt blocks and fine particles, up to as much as 1,500 to 10,000 g/m³.

There are some permanent rivers, especially on the northern side of Santo Antao, facing the northeasterly trade winds, as well as on S. Nicolau, Brava and Santiago. Most of this water is used for irrigation.

The quality and quantity of underground water resources depend on numerous factors, varying from one island to another. Under the alluvium of most valleys there are large or small underground rivers, whose depth varies between 8 and 15 m (hence the numerous wells, particularly on Santiago).

The circulation of ground water is highly impeded by eruptive rock. Actually, due to the nature of the relief, most of the drainage water flows into the ocean. This is the reason why the Cape Verde islands are generally poor in abundant springs, even when these are fed by heavy rainfall. There are, however, a number of springs on each island, whose flows vary throughout the year. On Santo Antao, S. Nicolau, Fogo and Brava, some aquiferous strata, more or less abundant, cut the littoral slightly above sea level.

On the S. Vicente and Sal islands, water resources have not been sufficient to cover household and industrial needs. This led the government to decide to build sea water desalination plants in the early 70's. New facilities eventually necessitated the construction of new plants on these islands, due to the growing population, industrial development, and the aging of the first plants. By the end of 1983, processing capacity was 2,400 m³ per day in S. Vicente and 660 m³ per day in Sal. The storage capacity on both islands has also grown to 11,500 m³ per day.

The volume of underground water resources currently being exploited, as well as estimates by the United Nations Development Program (UNDP) and BURGEAP of exploitable resources, are listed in Table 27.

Surface waters offer some potential, in that can be dammed. The maximum daily rainfall figures, as well as the soil and relief characteristics, show that a large amount of water flows to the ocean as surface water. Although anti-erosion and stream diversion projects can reduce this loss of water to the ocean, 40 percent of the rainfall would still be lost to the ocean after establishment of a good anti-erosion/stream diversion system. These resources have not yet been evaluated but the estimates made for Santiago suggest the possibility of storing 15 to 20 million cubic meters per year. A number of storage possibilities are already being studied, such as at Fontao, Garca, Canico, S. Nicolau, Santa Clara, Rui Vaz, Poilao and S. Joao Baptista.

2. Farm land

The farm land enumerated here represents land currently in use. Total cultivated land in the country covers 36,784 ha, distributed as follows: 1,790 ha irrigated; 7,614 ha dryland crops farming in the humid zone; 15,570 ha dryland crops farming in the sub-humid zone; and 11,810 ha dryland farming in the semi-arid zone.

3. Land tenure system

In Cape Verde, the land tenure system is heterogeneous. There are large, intermediate and small landowners (the latter are usually also farmers and/or tenant farmers), as well as farmers who do not own land. An average of 39 percent of farmers rent their land; this varies from 51 percent on Santiago to 16 percent on Boavista. About 29 percent of farmers, although owning small lots, also have to work on a tenant farming and/or sharecropping basis, in order to

Table 27: Exploitable and Exploited Underground Water Resources

Island	Exploitable Resources (in m ³ /day) as per:		Exploited Resources in 1980 (as per UNDP)
	BURGEAP 1974	UNDP 1980	
Boa Vista	1,200	1,600	1,000
Brava	4,500	7,000	4,700
Fogo	60,000	60,000	1,500
Maio	3,000	2,000	500
Sal	300	300	270
Santiago	60,000	85,000	31,000
Santo Antao	80,000	71,000	28,000
S. Nicolau	12,000	8,000	2,400
S. Vicente	800	500	1,500
Total	220,000 =====	235,000 =====	74,240 =====

increase their cultivated land area and production. On average, there are five farmers per arable hectare; this varies from 9.1 for Maio to 7.5 for Santo Antao.

The area of the average farm (i.e., irrigated and rainfed land) is 1.3 ha, ranging from 1.8 ha on Brava to 0.5 ha on Maio. This is not only small, but represents very parcelled holdings. The average plot area is 0.5 ha for rainfed land and 0.1 ha for irrigated land.

Cultivation by farmers, not owners, the fragmentation of the land, and the climate are the limiting factors of production growth. The land reform law, enforced in January, 1983, is intended to improve this situation. Its major provisions are the following:

- o General elimination of all forms of work rents; and
- o Transfer to the State of all holdings of more than 1 ha of irrigated land or more than 5 ha of rainfed land, which is cultivated on an indirect basis (tenant farming and sharecropping).

This transfer will take place through compulsory purchase of the land in question after payment of compensation to the former owners. This land will be given by the State to the farmers cultivating it at the time of the transfer, on an usufructury basis (posse util). The law will be progressively enforced, according to the characteristics of each island and the possibilities of compensation payment to the former owners. (See Table 28.)

4. Main crops - general data

a. Irrigated farming

The total area of irrigated farmland is 1,790 ha: Santo Antao has 716 ha (2 ha per 100 rural inhabitants); Santiago has 975 ha (1 ha per 100 rural inhabitants), which is 55 percent of the irrigated land of the country; all seven other islands combined have 5 percent (although they have 50 percent of the rural population). (See Table 29.)

Mixed farming is commonplace. Fruit production is the yield from 20,000 trees, or 10 trees per irrigated hectare.

In terms of 1980 production prices, average production amounts to ECV 313.79 million. (See Table 30.) Approximately 5 percent of the banana production of Santiago is exported to Portugal. The sugar cane is used for making brandy.

Farming costs per hectare, excluding labor, are presented in Table 31.

Table 28: Land Tenure

(Percentage of farmers according to development basis)

Island	Direct Development	Indirect Development	Mixed Development
Santiago	17,5	31	31.5
Fogo	29,7	40	30,3
Brava	46,1	17	36,9
Maio	62,4	27	10,6
Santo Antao	49,7	24	26,3
S. Nicolau	49,5	19	31,5
Boavista	70,3	17	12,7

Table 29: Speculations on Irrigated Land
(in percent)

	<u>Santiago</u>	<u>Santo Antao</u>	<u>S. Nicolau</u>	<u>Autres îles</u>
Sugar cane	50	70	60	25
Banana	23	5	10	25
Potato and Sweet Potato	25	13	10	25
Maize	4	6	3	3
Cassava	8	7	15	13
Vegetables	10	5	10	20
Others	2	2	2	2

Table 30: Irrigated Sector Production

	Area ha	Yield t/ha	Prod. t	Price esc CV	Value Price 10 ⁶ esc CV	DEP/ha esc CV	DEP 10 ⁶ esc CV	Value 10 ⁶ esc CV
Alcohol	1029	12	12344	125	154.30	42000	43.21	111.09
Exported Banana	49	35	1706	8	13.55	30000	1.46	12.19
Banana	132	25	3301	5	16.15	4000	0.66	15.85
Potatoes	100	15	1500	20	30.00	35000	3.50	26.50
Sweet Potatoes	255	12	3062	13	39.81	525	0.13	39.67
Maize	85	1	85	12	1.02	110	0.91	1.01
Cassava	142	12	1704	15	25.57	350	0.05	25.52
Vegetables	143	13	1856	15	27.85	30000	4.28	23.56
Fogo Vegetables	6	30	180	15	2.70	52000	0.31	2.39
Other	36	-	100	12	1.20	1000	0.04	1.16
Fruit	-	-	200	6	1.20	-	-	1.20
Total					313.79		53.65	260.14
					=====		=====	=====

Table 31: Farming Costs Per Hectare

<u>Farming Costs</u>	<u>Escudos</u>
Sugar cane	42,000
Exported Bananas	40,000
Potatoes	35,000
Vegetables	30,000
Bananas	5,000
Sweet Potatoes	525
Cassava	350
Maize	110

The land area of each island irrigated by pumps is indicated in Table 32. The estimated cost of pumping is ECV 75,000/ha. State subsidies reduce the user charge for pumping to approximately ECV 25,000/ha.

b. Dryland crops farming

Dryland crops farming covers a total of 34,994 ha. (See Table 33.) The islands with the largest cultivated area are Santiago (with 58 percent), and Fogo (18 percent). According to data collected before the drought, there were 58,000 cultivated ha in the entire country, with 30,000 ha on Santiago, 14,000 ha on Fogo, 8,000 ha on Santo Antao and 2,000 ha on S. Nicolau.

The average density of such land is 18 ha per 100 rural inhabitants. This ranges from 30 ha for Brava to only 0.1 ha for Sal, with the other islands falling in between: 24 ha for Fogo, 21 ha for Santiago, 17 ha for S. Nicolau, 14 ha for Santo Antao, 7 ha for Boavista and 6 ha for Maio.

There are 200 ha of coffee crops, divided as follows: Santiago, three; Fogo, 147; Brava, 20; and Santo Antao, 20. Except for coffee, little single cropping exists: 10 percent in humid zones (beans and other crops), 4 percent in sub-humid zones (beans and other crops), and 10 percent in semi-arid zones (maize). Data on mixed cropping appears in Table 34.

In the humid zones, the other important crops are: sweet potatoes (50 percent of total); other tubers, including cassava (25 percent); vegetables, including potatoes (2.5 percent); and various fruits (12.5 percent). In the sub-humid zone, other important crops include sweet potatoes (80 percent), other tubers (10 percent), and various fruits (10 percent).

Cultivated land areas and yields are given in Table 35.

The average yield of maize relative to the arable land area amounts to 465 kg/ha, with considerable variation by zone (720 kg/ha in humid zones, 490 kg/ha in sub-humid zones, and 300 kg/ha in semi-arid zones). Maize production for the whole country varies from up to 24,000 tons in a good crop year to 950 tons in a poor crop year.

The average yields for bean production equal 50 percent of the maize production in humid zones and 60 percent of the maize production in semi-arid zones.

The average estimated yields for the other crops are: sweet potatoes - seven tons in humid zones, four tons in non-humid zones; other tubers - five tons in humid zones, 2.5 tons in sub-humid zones; vegetables - five tons in humid zones; and coffee - 250 kg.

Total fruit production is estimated at 400 tons, including 300 tons of mangoes (10,000 plants), 35 tons of cashews (3,000 trees), and 25 tons of breadfruit (500 trees). Cashew and breadfruit trees are

Table 32: Areas Irrigated by Pumping

<u>Pump Irrigation</u>	<u>Land Area</u>
Santiago	650
S. Nicolau	11
Maio	17
Boavista	2
S. Vicente	17
Fogo	6
S. Antao	45

Table 33: Distribution of Cultivated Areas of Dryland Farming

Islands	Humid Zones	Sub-Humid Zones	Semi-Arid Zones	Total
Santiago	4,794	10,740	4,878	20,412
S. Nicolau	466	423	781	1,670
Maio	0	0	165	165
Boavista	0	0	154	154
Sao Vicente	0	28	96	124
Fogo	1,210	2,667	2,515	6,392
Brava	468	861	242	1,571
Santo Antao	675	851	2,973	4,500
Sal	0	0	6	6
Total	<u>7,614</u>	<u>15,770</u>	<u>11,810</u>	<u>34,994</u>

Table 34: Mixed Cultivation
(percentage)

	<u>Humid Zones</u>	<u>Sub-Humid Zones</u>	<u>Semi-Arid Zones</u>
<u>Maize</u>	90	98	100
<u>Beans</u>	90	98	100
<u>Maize</u>	7	2	-
<u>Other Crops</u>	7	2	-
<u>Maize</u>	1.5	-	-
<u>Beans</u>	3	-	-
<u>Other Crops</u>	3	-	-

Table 35: Yields of Cultivated Areas

Zones	Good Crop Year		Average Crop Year		Poor Crop Year	
	Cultivated Area Yield in t/ha (percent)	Yield t/ha	Cultivated Area Yield in t/ha	Yield t/ha	Cultivated Area Yield in t/ha	Yield t/ha
Humid	100	0.7	90	0.8	30	0.3
Sub-Humid	100	0.8	80	0.65	10	0.2
Semi-Arid	100	0.65	60	0.5	5	0.1

found principally on Santo Antao island, an area of less than ten km³. Cashew trees are also found on Fogo and Santiago.

At current prices, the average production of dryland crops farming has a total value of ECV 486.44 million. Humid zone production represents 40 percent of this, sub-humid zones 42 percent, and semi-arid zones 18 percent.

The costs of farming are approximately ECV 600/ha in humid zones, ECV 500/ha in sub-humid zones, and ECV 500/ha in semi-arid zones.

The average added value is estimated at ECV 467 million or ECV 13,346 per cultivated ha, broken down as follows: ECV 24,978/ha in humid zones, ECV 12,487/ha in sub-humid zones, and ECV 6,980/ha in semi-arid zones. (See Table 36.)

5. Livestock products

Livestock distribution, by type, is given in Table 37.

Half of the livestock of the country is on Santiago, 16 percent on Fogo, 14 percent on Santo Antao and 8 percent on Boavista. Volume and value of meat and milk production are given in Table 38. The total value of livestock production is ECV 203.49 million. (See Table 39.)

Operating expenses in livestock production are very low, consisting only of purchases of agricultural by-products, medicine and concentrated feed for the cattle. They represent a total of 3 percent of the production value. The added value, therefore amounts to ECV 197.39 million.

Production is estimated at 2,388 tons of meat and offal (8.1 kg per capita) per year and 1,750 tons of milk (6 kg per capita) per year.

Pigs and poultry supply much of the meat available in many areas: 71 percent in Santiago and Santo Antao, and 75 percent in Sal and S. Nicolau.

6. Forestry

a. Natural vegetation

(1) Location and importance

Forest areas and species can be found on all the mountainous islands (Santiago, Santo Antao, S. Nicolau and Fogo). However, the forests including important species are usually limited. In most zones, trees are scattered on farm land, surviving witnesses to the extensive forest-clearing that has been taking place for centuries. Forest-clearing is undertaken both for the wood and to grow crops (maize and sweet potatoes). (See Table 40.)

Table 36: Breakdown of Value Added
for Dryland Farming

Island	Dry Land Area		Dry Land Farming Value Added		Value Added (per ha)
	Ha	Percent	1000 Esc. CV	Percent	Escudos
Santiago	20,412	58.3	282,810	60.6	13,855
Fogo	6,392	18.3	85,660	18.3	13,401
S. Antao	4,500	12.9	48,730	10.4	10,829
Brava	1,571	4.5	24,440	5.2	15,557
S. Nicolau	1,670	4.8	21,890	4.7	13,108
Country Total	34,994	100	467,040	100	13,346

Table 37: Livestock Estimate and Breakdown in 1980-1981

	<u>Cattle</u>	<u>Goats</u>	<u>Sheep</u>	<u>Hogs</u>	<u>Poultry</u>
Santiago	9,190	20,866	463	24,473	77,756
S. Nicolau	205	2,106	161	1,597	7,872
Maio	530	2,625	367	605	2,114
Boavista	153	11,168	12	517	1,644
S. Vicente	14	2,464	67	564	4,012
Fogo	828	16,059	209	7,839	21,519
Brava	207	2,540	1	1,092	4,074
Santiago	856	13,655	215	8,073	26,983
Sal	17	517	5	240	3,926
	<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
Total	12,000	72,000	1,500	45,000	150,000
	=====	=====	=====	=====	=====

Table 38: Production of Average Livestock and Livestock By-Products

	<u>Meat Production</u>		<u>Value Added</u>	
	<u>Total Live Weight (t)</u>	<u>Available (t)</u>	<u>Total in million escudos</u>	<u>Per Rural Inhabitants (escudos)</u>
Santiago	1668.6	1217.72	103.46	1058
S. Nicolau	707.17	79.23	6.15	621
Maio	78.71	53.57	6.45	2425
Boavista	159.37	103.30	9.54	4613
S. Vicente	57.03	40.34	3.26	646
Fogo	569.57	411.00	32.76	1205
Brava	86.69	62.17	5.07	990
S. Antao	556.71	406.03	31.42	925
Sal	20.05	14.83	1.21	245
Total	<u>3303.9</u>	<u>2388.19</u>	<u>197.39</u>	<u>1046</u>

Table 39: Livestock Production

	<u>Number</u>	<u>Kg/Head</u>	<u>Produce (T)</u>	<u>Price Esc/kg</u>	<u>Value Price 10⁶ Esc</u>
<u>Meat</u>					
Cattle	12,000	34.20	410	85	34.88
Goats	72,000	11.70	842	45	37.91
Sheep	1,500	6.40	10	45	0.43
Pork	45,000	42.70	1,922	50	96.08
Poultry	150,000	0.80	120	65	7.80
Leather/Wool		53.00	0	12	1.77
<u>Milk</u>					
Cattle	12,000	53.00	636	12	7.63
Goats	72,000	15.50	1,116	12	13.39
Eggs			45	80	3.60
Total					<u>203.49</u>

Table 40: Estimated Areas of Natural Vegetation in the Islands
(in ha)

<u>Islands</u>	<u>Location</u>	<u>Elevation</u>	<u>Arid</u>	<u>Species</u>
Santiago	Achada Mosquito		100 Ha	Acacia Albida Zizyphus mauritiana
Fogo	Monte Velha	200 Ha	200 Ha	Euphorbia tuc- keyana Jatropha Cur- cas
Brava	Monte Grande (dispersed)	20 Ha	10 Ha	E. Tuckeyana Jatropha Cur- cas
S. Nicolau	Monte Gorio (dispersed)	30 Ha	30 Ha	E. Tuckeyana Jatropha Cur- cas
Total		<u>250 Ha</u> =====	<u>340 Ha</u> =====	

(2) Action on the environment

Unfortunately, the effect of the forest on the environment is very limited, because the forest area is so small.

Except for Achada mosquito or Santiago island, all forests are located in favorable climatic zones. This, and the fact that forests located above 700-800 m in elevation have been maintained, may explain why the forest has been regenerated. Rainfall is usually high (800 to 1,500 mm, occasionally 2,000 mm), erosion is very limited, the soil humidity is relatively high, and the rate of humidity is almost constant throughout the year. This phenomenon is confirmed by the existence of an almost permanent gramineae cover, as well as moss and lichen (Estancia de Pedras, Agua das Caldeiras, Monte Gordo and Monte Velha). As a result of these conditions, cash-cropping is developing in nearby areas, even during the dry season: coffee (Coffea arabica), sweet potato (Impomea batatas), quince trees (Cydonia oblonga), etc. These ecologically favored areas play the roles of water towers for the islands. The main woody species in these forests are: Euphorbia tuckenyana, Dracaena draco, Acacia albida and Zizyphus mauritiana.

In areas lower than 400 m above sea level, extensive agricultural land use and the need for firewood have caused the forests to disappear, except for some isolated areas. In these regions, the following species can be found in the riverbeds: Tamarix gallica, Ficus gnaphalocarpa, Jatropha curcas, Ricinus communis and Terminalia catappa. These plants, in addition to their use as firewood, play an important role in reducing surface water flow, and therefore in feeding aquiferous strata.

The following species can be found scattered along the slopes in areas of cultivation: Tamarindus indica, Acacia albida, Zizyphus mauritiana, and Acacia scorpiodes. The sole importance of these plants rests in their use as lumber or firewood. Due to their scarcity, these trees have practically no influence on soil conservation or on humus buildup. However, their roots do play a major role in the physical meteorization of rock and contribute to improving the infiltration of rain into the soil.

(3) Problems of natural vegetation

There are numerous problems affecting natural vegetation. The principal ones found in each ecological zone are discussed below.

(a) Mountainous humid zones

Most forests have been destroyed gradually over the centuries in order to clear land for farming and to obtain firewood. However, some clusters have been able to survive and regenerate because of difficult access to these regions, their favorable ecological characteristics, and the protection of the forest program. The strong demand for cultivable land and the constant needs

for firewood and livestock grazing have led people to settle on the land bordering these clusters, thus preventing them from expanding. The situation has been compounded by the current drought. In these areas, the forest has to compete with agriculture and cattle breeding, although this land is not the best suited to agriculture because of its steep slopes. As a result, erosion has again begun, having previously been stabilized by natural vegetation. On Fogo island, with its north-northeast exposure, coffee is grown on the appropriate land and slopes of these areas, using anti-erosive techniques.

The conservation and rational utilization of these zones have been carefully explained to the local populations. Efforts made to reforest nearby areas with exotic species, such as "congo" (Cajanus cajan), have mitigated to some extent the above-mentioned competition, and have allowed for forest resources protection.

(b) Lower arid and semi-arid zones

In these regions, vegetation has been almost totally destroyed as a result of:

- o The need for firewood;
- o The use of land for farming; and
- o Cyclical drought, the latest cycle of which has been ongoing for more than ten years.

It is only in areas without easy access that some scattered forests can still be found. Species in these forests include Zizyphus mauritiana, Acacia albida, Ficus gnaphalocarpa, Tamarindus indica, and Tamarix gallica. In other regions as well, some small forests have survived, possibly because the population living nearby has long been cooking with kerosene burners.

Apart from these exceptions, there are only scattered trees on the slopes, usually Zizyphus mauritiana and Tamarindus indica. The tree density varies from one island to another, and on each island, from one area to another. This phenomenon may be attributed to the initial colonization process, independent of climatic factors.

Several species, such as Tamarindus indica and Zizyphus mauritiana, have been developed in recent years, not only because of their economic value, but also because of their protection by public services. For example, as biological actions complementary to the mechanical soil protection efforts, nurseries have been created for these species as part of the terraces built on slopes least suitable for farming.

(c) Other problems

As some of the species mentioned are disappearing, efforts should be undertaken to protect them. Their multiplication in their natural environment, as well as the creation

of protected forests, should be a specific task of the Center for Agrarian Studies at the Ministry of Rural Development.

The following species, both wood and grass, should be mentioned: Dracaena draco, Sideroxylon marnulana, Echium spp., Tamarix gallica, Gossypium barbosum, Cytisus stenopetala, and Papaver gorgoneum. The Tamarix gallica species was an essential element in the stabilization of the dunes on Boavista island.

b. Forage needs

Due to the years of drought (1960-1982) livestock has been considerably reduced, so that (as of 1980) forage resources on the various islands are now in keeping with the needs of the remaining livestock. It is estimated that agricultural by-products provide the same amount of available biomass as would natural pasture, if the same land were not cultivated (six tons in irrigated zones, two or three tons in sub-humid farming zones, 0.25 to 1.5 tons in other zones and 0.1 to 0.25 tons in zones not even suitable for pasture).

Problems will obviously arise in sub-humid and humid intensively cultivated zones, concerning the use of areas in reforestation. Free, uncontrolled pasture, especially for goats, will pose a serious constraint to the normal growth of planted trees. This problem can only be solved by an intensive extension program, encouraging the population to feed livestock with agricultural by-products and to keep animals penned near the house.

On the other hand, plantings made in semi-arid and arid zones have a clear sylvo-pastoral function.

Experiments carried out on Maio indicate that the pod production of Prosopis juliflora is 200-400 kg/ha, depending on the density of planting. The green leafy biomass production of Parkinsonia aculeta was found to be 400-600 kg/ha. It is reasonable to estimate forage production in semi-arid zones at 0.75 tons/ha, except on certain land having favorable soil conditions, where forage production is estimated at one ton/ha.

In the semi-arid and arid zones where trees are being planted, it will be necessary to enforce some pasture rotation.

c. Necessity to permanently protect soil

In Cape Verde, people are clearly aware of the ecological problems to be solved. This may be a legacy of Portuguese rule, which hoped to change the climate by planting trees. This concern was clearly expressed in the forestry regulations of that period, which strictly prohibited tree cutting without official authorization, and provided for very serious punishment of violators. Although the protection of the environment and the restoration of the ecological balance are certainly essential concerns, they should be addressed in a sensitive manner.

Given the naturally arid conditions prevailing in a large part of the country (at least 50 percent), the use of land by man and animals is very limited, and protection processes will take place either naturally or not at all, considering the costs involved. The farm land deficit precludes the possibility of prohibiting all use of land for agriculture. Between these two extremes, there is marginal land (30 percent of total area) where some use is possible but where protection efforts will have to be undertaken. This land has some possible use, even if marginal, for "random farming," sylvo-pasture, reforestation, pasture and sylvo-agriculture. A part of this land must be completely set aside from agricultural uses.

Studies should take into account local and national needs, the potential of the soil for various types of use, erosion factors, and other ecological aspects. It should be emphasized that a number of soil uses can provide protection themselves, if they are well conducted.

d. Current energy needs and their level of satisfaction by firewood

Several estimates of total annual firewood consumption and demand have been made. (See Table 41.) It is difficult to judge the value of the various estimates shown in the table. However, one estimate is based on a detailed survey of 133 rural households distributed among three ecological zones and Santiago island.

In rural Cape Verde, the average firewood consumption is probably 0.35 kg per capita per day, that is 130 kg per capita per year. The figures used as a basis for calculations are: current rural consumption (other islands): 50 kg per capita/year. Using these figures, the Cape Verdian population consumed 29,000 tons of firewood, including 800 tons for baking wood, in 1980. For a total population of 295,260, this is an average of 100 kg per capita/year.

These figures confirm that the portion of the urban population using energy sources other than wood is larger than in other Sahelian countries. About 27 percent of the Cape Verdian population does not use wood for its energy needs. Table 42 summarizes current energy needs in Cape Verde.

Table 43 presents the amounts of paraffin oil and liquefied gas imported from 1978-1980.

e. Projected demand for firewood through the year 2000

The estimated needs and consumption of firewood must take population growth into account. The total demand for firewood between 1990 and 2000 is estimated at 100,000 tons per year. This estimate presumes a rate of population growth of 1.5 percent, an urbanization rate of 60 to 70 percent, an average annual per capita need for wood of 500 kg, and a production of the population using

Table 41: Estimated Firewood Needs and Consumption

	<u>Needs</u>	<u>Consumption</u>
	-----	-----
	ton	
FREEMAN et al. (1978)		108,000
Dir. Gen. of Industry (1980)	80,000	30,000
VAN DER HUIST (1980)		45,000
Conference, ONU. PMA (CV 1981)		
Outline Director of Rural Development Cape Verde (1982)	80,000	73,000
FAO (Report BERMEJO-ZUBELZU, 1981)		29,000
Prop. evaluation mission from the study of GIER (FAO/GCP-CVI-002-BEL)	730 kg/inhabit/yr or 500 kg/inhabit/yr	(or 18 to 27 percent of needs)

Table 42: Current Energy Needs (1980)

<u>Category/ Region</u>	<u>Population in 1980</u>	<u>Percentage Population Using Firewood</u>	<u>Energy Needs (tons)</u>	
			<u>730 kg/yr^a</u>	<u>500 kg/yr^a</u>
Rural/ Urban	188,674	100	137,732	94,337
Santiago and S. Vicente	84,127	22	13,511	9,254
Urban				
Other Islands	22,459	38.5	6,312	4,323
Cape Verde	195,260	73	157,555	107,914

^aPer capita

Table 43: Paraffin Oil and Liquefied Gas Imports

	<u>1978</u>		<u>1979</u>		<u>1980</u>	
	<u>Tons</u>	<u>1,000 esc.</u>	<u>Tons</u>	<u>1,000 esc.</u>	<u>Tons</u>	<u>1,000 esc.</u>
Paraffin Oil	6,430	33,480	7,422	56,784	4,292	65,161
Propane and Butane	322	4,194	1,880	20,747	1,138	28,403

firewood for energy of 25 percent in urban areas and 100 percent in rural areas.

It is currently difficult to assess the demand for building and industry wood, since the sector currently has no national production. However, given the expected population growth, the estimated urbanization rates and some improvement in purchasing power, it can be assumed that the use of these types of wood will increase by 25 percent by 1990 and 50 percent by the year 2000. It could reach the equivalent of approximately 20,000 m³ of unhewn wood.

f. Reforestation program through the year 2000

The soil and water conservation department within the Ministry for Rural Development has proposed an ambitious reforestation program to the government, which illustrates the will to take into account ecological problems and to address the increasing shortage of wood products (firewood, building wood and forage). (See Table 44.)

g. Areas reforested from 1976 to 1981

The achievements shown in Table 45, obtained over a five-year period, can be compared to the ambitious plan for the period up to the year 2000.

h. Wood product supply and demand

This section is designed to assess the extent to which the needs for wood products (building and industrial wood, firewood and bush forage) can be satisfied by the potential resources of Cape Verde by the year 2000.

As Cape Verde is not in a favorable ecological and industrial environment for such products, needs for wood to make paper and cardboard have not been taken into account in the following analysis. Table 46 indicates the extent to which needs for industrial and building wood can be satisfied by reforestation in humid and sub-humid zones.

Reforestation to meet this demand is located principally in mountainous, humid zones which are in general sparsely populated. These zones are managed by the state. However, on S. Nicolau and Santiago islands, some land (635 ha) in more densely populated areas has been set aside for reforestation. This land, also suited for agriculture, is intended specifically for the needs of these islands. The total area to be reforested for the production of building and industrial wood is 4,750 ha.

i. Firewood

(1) National strategy for firewood

Under this strategy, most reforestation must be done by official services, following the plan designed by the Ministry for Rural Development. Projects totalling 49,780 ha are planned for semi-arid and arid zones. In humid and sub-humid zones, less than

Table 44: Area to be Cultivated on Each Island
from 1982-2000

Islands	Elevation Zones			Semi-Arid Zones			Total
	1982-85	1986-97	1998-2000	1982-85	1986-97	1998-2000	
Sao Vicente	-	-	-	200	600	150	950
S. Antao	1,080	1,600	545	700	6,630	1,500	12,055
S. Nicolau	200	200	80	590	1,840	540	3,360
Sal	-	-	-	40	100	30	170
Boavista	-	-	-	1,400	900	220	2,520
Maio	-	-	-	730	900	220	1,850
Santiago	900	2,340	575	6,460	14,600	3,700	28,575
Fogo	660	1,550	240	1,240	4,900	1,200	9,790
Brava	100	150	-	200	190	90	730
Total	2,940	5,840	1,440	1,560	30,660	7,560	60,000

08

Table 45: Areas Reforested from 1976-1981
(ha)

Islands	Elevation Zones						Arid Zones					
	1976	1977	1978	1979	1980	1981	1976	1977	1978	1979	1980	1981
Sao Vicente	-	-	-	-	-	-	-	-	150	75	50	50
S. Antao	26	23	131	246	250	100	-	38	-	130	9	25
S. Nicolau	-	33	11	38	58	17	30	5	125	30	25	107
Sal	-	-	-	-	-	-	-	-	-	8	10	10
Boavista	-	-	-	-	-	-	-	-	450	202	327	430
Maio	-	-	-	-	-	-	-	-	28	80	61	219
Santiago	15	13	43	259	335	260	50	-	126	416	1160	1131
Fogo	33	16	54	133	153	48	50	25	50	36	17	412
Brava	-	-	7	11	9	-	25	25	5	13	13	-
Total	74	85	246	687	805	420	155	93	934	990	1672	2374

Table 46: Supply and Demand of Lumber and Timber

<u>Islands</u>	<u>Demand</u>	<u>Lumber and Timber (m³)</u>	
		<u>Supply</u>	<u>Shortfall</u>
Boavista	200	-	- 200
Brava	500	-	- 500
Fogo	2,050	4,780	2,730
Maio	250	-	- 250
Sal	400	-	- 400
Santiago	9,400	8,720	- 680
Santo Antao	2,850	7,350	4,500
Sao Nicolau	750	600	- 150
Sao Vicente	<u>3,600</u>	-	- <u>3,600</u>
Total	<u>20,000</u>	<u>21,450</u>	<u>1,450</u>

half the area will be reforested (4,115 ha out of 10,220 ha) by these services.

Reforestation will take place on state land and on private land used only for pasture. As all this work is carried out and managed by the state, it will be necessary to determine the status of the forests planted on private land. This type of reforestation would not call for an intensive rural extension program, as is the case for the alternative strategies mentioned below.

In arid and semi-arid zones, the ground is usually flatter and more homogeneous, so that reforestation costs are estimated at ECV 14,000 per ha, whereas it varies between ECV 24,000 per ha and ECV 30,000 per ha in humid and sub-humid zones. The cost of the government program is approximately ECV 900 million.

(2) Alternative strategies

Both alternative strategies encompass larger areas, because they also take into account land currently cultivated under poor conditions. They provide for governmental intervention for most reforestation in arid and semi-arid zones (29,285 out of 35,455 ha), and for a considerable part in humid and sub-humid zones (4,155 ha out of 17,870 ha). Part of the reforested land will be private (6,170 ha in semi-arid zones and 13,755 ha in humid and sub-humid zones); it will have to be reforested by individuals or organizations, with the help of the government (technical, administrative, and possibly financial assistance).

The first alternative strategy provides for the reforestation of humid and sub-humid zones with tree species (Acacia). The second alternative strategy proposes a silvo-agricultural use of land, combining acacia or Leucaena with the Congo pea.

These strategies are preferable in that firewood is grown where demand exists, therefore requiring little infrastructure for transport, marketing and sale. They also better contribute to refilling aquiferous strata. Moreover, the rural population will be more directly engaged in protecting the environment, and even in the case of partial subsidization by the state, this type of reforestation will cost less than if it were entirely state-supported.

7. Fishing sector

Located in the Sahel region, Cape Verde has been suffering from drought for several years, making agriculture uncertain. This forces Cape Verdians to search for other means of subsistence which are less dependent on rainfall variations.

Although the continental shelf is very limited (10.15 km²), tropical waters around the islands are home to approximately 50 families and more than 105 species of fish and other marine organisms such as shellfish, molluscs, etc. Having adopted exclusive economic rights within a 200 mile radius, Cape Verde controls 630,000 km² of

ocean surface. Despite recent industrialization efforts, fishing, like agriculture, remains a subsistence activity.

One of the government's principal goals is to develop the fishing sector in order to insure food supply to the population, to solve the unemployment problem created by the drought, and to reduce the trade deficit by exporting fish products.

There are currently about 4,000 people earning a living off small-scale, industrial, or semi-industrial fishing.

a. Future investment program for the fishing sector

Until now, fishing resources have been only roughly estimated. Although the teams who have prospected in Cape Verde's territorial waters unanimously report that resources are under-exploited, there is still no precise data available on the economic potential of these resources. This not only prevents resources from being used in the most rational manner, but also makes it difficult to design an effective fishing policy.

There are several types of species of interest in the fishing sector.

Tuna, a migrating species, is found in relative abundance and represents a large part of national fishing production. One of the traditional methods used to catch tuna employs a line and live bait. This necessitates extensive research on species used as bait, in order to assess resources and prospects.

Crayfish is another species that could have a commercial impact. Research on its ecobiology and its economic potential is urgently needed in order to plan its exploitation.

Shrimp is often found in stomachs of caught tuna and in fishing nets with other fish, but there is no data available as to its existence or abundance in these waters.

Other shellfish include Anatifes, sometimes caught by fishermen and the abundance of which is unknown, as well as crabs and spider crabs, occasionally caught with crayfish and whose abundance and ecobiology are also unknown.

Deep-sea species, when not used as bait, are normally reserved for human consumption. Although it is unlikely, given the small-scale methods used by fishermen, that a level of over-exploitation could easily be reached, it is necessary to achieve the best possible level of knowledge about the ecobiology of these species, their abundance, efficient catching methods and sea-beds as yet unexplored.

Sharks are still considered a disruptive factor of small-scale fishing. However, they could acquire commercial importance if fishermen were sufficiently interested in their capture and achieved it rationally. It would thus be useful to undertake studies about

existing species, their biology and their abundance. Moreover, since this resource is not traditionally exploited in Cape Verde, fishing techniques and processing methods should also be studied.

According to historical data, coral was an economically important resource for Cape Verde in the past century. Coral is known to exist in these waters but its abundance, biology and exploitation methods are unknown.

b. Priority projects

In light of the preceding, the General Directorate for Fishing has given priority to the following studies:

- o Studies on ecobiology, resource assessment and living habits of species used as live bait for catching tuna; of crayfish and other shellfish, such as Anatifes, crabs, spider crabs and shrimp; of deep-sea species; of sharks; of coral; and of molloscs;
- o Study on fishing gear technology;
- o Study on fishing product technology; and
- o Study on bathymetry.

c. Human and material resources

The implementation of these studies requires international assistance with, as a minimum, the following resources:

(1) Human resources

In addition to local personnel, expatriate specialists would be necessary in the fields of physics, chemical biology and product technology.

(2) Equipment

The following would be needed:

- o On land: a properly-equipped oceanographic laboratory, suitable for the above mentioned studies, with: a biostatistics section, a physical oceanography section, a chemical oceanography section, administrative facilities, a library, and a fishing gear warehouse; and
- o At sea: a refrigerated ship of approximately 33 m in length, equipped with: a physical and chemical oceanography laboratory, deep trawls, trawls with large vertical openings, deep-sea trawls, longlines, and bires.

(3) Training

As the program must include national counterparts for expatriate specialists on physics, chemistry, biostatistics, gear and product technology, an effort should be made to train personnel either in the country or abroad.

(4) Budget

The budget should be the subject of a special study, in light of the range of material and human resources required for the program, and the scale of training to be undertaken.

(5) Expected results

The implementation of this program should provide a more thorough understanding of the abundance and economic potential of fishing resources. This, in turn, should allow for the formation of a national policy on fishing and allow for the rational exploitation of the available resources.

8. Principal agricultural and livestock production systems

a. Agricultural production

There are two different systems of agricultural production, irrigated farming and dryland crops farming.

(1) Irrigated farming

This is the most important system as far as food self-sufficiency is concerned, since dryland crops farming is always uncertain due to drought. There are two irrigated systems:

(a) Modern irrigated areas

These are either former banana plantations that have been nationalized or recently created growing areas. Lot sizes and irrigation networks are standardized and the cultivated area covers over 80 percent, the remaining 20 percent being occupied by facilities and plots under development.

(b) Traditional irrigated areas

These are irrigated by springs, wells, or occasionally, by drillings or water diversion. Due to the current drought, irrigated areas and irrigation amounts have had to be reduced, some crops now only receive "survival" irrigation. The 500 m² average size of parcels varies between 100 and 500 m². The density of planting is extremely variable, fruit trees, in particular, being mixed and planted at various elevations.

(c) Semi-irrigated areas

These are former irrigated areas which have been more or less abandoned due to the reduction in water availability. Very often only palm and mango trees remain, as they tap underground water strata. However, the San Vicente gardens (hortas) in this category remain well irrigated. Some of these areas enjoy irrigation by surface water flow, which, for instance, allows maize growing in arid zones.

In each case, a finer categorization of irrigated areas has been made according to percent of theoretically-available area actually cultivated (over 70 percent, 40 to 70 percent, and under 40 percent).

(2) Dryland crops farming

Most dryland crop systems are closely related to local climatic conditions. The three bioclimatic zones where dryland crops farming is possible are the humid, sub-humid and semi-arid zones. Table 47 indicates the main characteristics of these systems in each zone.

(a) Farming systems in humid zones

Climatic conditions, and particularly humidity during the dry season, allow for some diversity in dryland crops: sweet potatoes, cassava, tobacco, maize and beans are the basic crops.

Beans give fairly regular yields. In particular, late autumn production may last as late as February. The Angola or Congo pea (Cajanus cajan), however, makes the best use of climatic conditions, with an almost continuous production during nine months of the year. The most common cropping combination is maize, bean and Angola pea, except on Brava where the Angola pea is not grown at all.

Dryland tree farming is frequent, but confined to deep, well-irrigated soils. Mango and tamarind trees are the most frequent species cultivated. Some favorable locations allow coffee growing (Arabica) on Fogo, Santo Antao and S. Nicolau. The areas currently planted are very limited.

Sensitivity to drought is not as strong here as in other parts of the archipelago. Maize yields, however, drop sharply when rainfall distribution is poor (1980), and perennial plants such as coffee suffer serious damage when rainfall is inadequate for several years.

Most farming systems located in humid zones are found on Santo Antao, Santiago and Fogo.

Table 47: Principal Characteristics of Dryland Farming

<u>Zone</u>	<u>Exposure to Humid Trade Winds</u>	<u>Average Elevation</u>	<u>Average Annual Rainfall</u>	<u>Cultivation Systems in Use</u>	<u>Characteristics of Dry Periods, 1970-1980</u>
Humid Zone	Favorable (North-East)	500 to 900m	600mm and greater	Maize, beans, Angola peas. Arboriculture in frequent dry periods. Local sweet potato and tobacco.	Sown areas without change. Average yield for maize. Results slightly better for beans. Angola pea areas improving.
Sub-Humid Zone	Favorable (North-East)	200 to 500m	400 to 600mm	Maize, beans, local Angola peas. Arboriculture in frequent dry periods.	Areas sown with maize and beans without change. Average to low yields for corn and average for beans.
	Little or no influence	900 to 1,800m 500 to 1,200m			
Semi-Arid Zone	Favorable (North-East)	150 to 300m	300 to 400mm	Maize, beans.	No yield of maize or beans. Sown areas in constant reduction during dry year cycles.
	Little or no influence	300 to 1,500m		No Arboriculture in dry periods.	

(b) Farming systems in sub-humid zones

In these zones, inter-cropping of maize and beans is the basic farming system, because the Angola pea never covers more than 20 percent of cultivated areas and its yield is poor.

Dryland fruit tree farming is insignificant and limited to tamarind and cashew trees. Some trees, often reduced to bushes, have remained in cultivated areas. These are usually Acacia albida or Zizyphus.

The maize and bean production is largely dependent on the distribution of rainfall.

(c) Farming systems in semi-arid zones

The areas under cultivation can only be roughly estimated because cultivated areas are decreasing every year due to the drought, and this diminution of cultivated areas varies from one island to another, and from one natural region to another. The only intercropping here is maize and bean. During the 1980-81 campaign, production was practically nonexistent. Since 1965, insufficient and poorly distributed rainfall have caused yields to be very low or nonexistent, especially on Fogo and Santiago.

However, large areas are still being sown every year, in the hope of a return of the climatic conditions which prevailed from 1950-65, when yields were sufficient to ensure subsistence for a population comparable to that of other agricultural regions. For all dryland crops systems, a finer classification can be made on the basis of the average density of cultivated areas, which reflects soil constraints, namely: over 70 percent, 40 to 70 percent and 10 to 40 percent.

b. Livestock production

(1) Animals, races and quantities

(a) Cattle

The bovine cattle have descended from animals imported for several centuries. They are small animals, the average adult weighing 250 to 350 kg, with different colors and conformations. Their productivity has not been well studied. Some black and white Frisian milk cows were brought over to state farms in the 1950's (23 to Sao Jorge and 88 to Saos Domingos). The total number of bovine animals was estimated at 12,000 in 1980 (there had been more than 27,000 in 1968).

(b) Sheep

Their number is estimated at 1,500 (1980), which makes them the least numerous race. The local sheep population is varied as the result of numerous crossbreedings, and their productivity has not been studied. A Karakul herd (350 head) was set

up for the production of astrakhan (in Trinidad and Calhete de Maio), and 150 Sahelian Peul sheep, offered by Niger, have recently been introduced.

(c) Goats

The present goat population is very heterogeneous as the result of numerous crossbreedings. Productivity is, therefore, not well known. A dozen Anglo-Nubian and some American goats have been added to the herds in order to improve the race. The total goat herd numbered 66,000 to 72,000 head in 1980, and had been as large as 80,000 in 1968.

(d) Swine

The local pigs are of Spanish origin and either black or black and white. There are two different morphologies: a rather long one, the better meat producer; and a rather short one, perhaps better suited for producing fat, in great demand by the population. Swine productivity is not well documented. Improved swine have been introduced in some state centers and farms where they seem to perform well. A dozen Korhogo pigs, imported from Senegal, are being raised in Trinidad. (Korhogo pigs are produced in Ivory Coast from multiple crossbreedings, with Large White predominant.) A dozen Large White pigs are being raised in Sao Jorge. In 1980, the total number of swine was estimated at 35,000-45,000, much the same as in 1968, when there were 37,500. The Industrial Swine Breeding Project at Santa Cruz is considering using Swedish Landrace and some Yorkshire.

(e) Poultry

There were a total of 150,000 fowl in 1980. Local chickens are small, and the population is very heterogeneous. Their productivity is not well documented, but is probably poor. On small farms, some New Hampshire, Leghorn, Rhode Island and crossbred chickens can be found, as these races were previously introduced by the Animal Production Services. The National Poultry Breeding Company (ENAVI), located in Praia and Mindelo, uses the Shaver race (Canadian) for meat production and the Cobb race for egg production.

(f) Other species

These are basically horses, donkeys and mules, found on almost every island. The total number is unknown, but donkeys are probably at least three times as numerous as horses and mules together. There were 20,000 head in 1968, before the drought.

A small number of rabbits has recently been introduced.

(2) Livestock production

The most important factor is that the number of animals has decreased sharply since 1968, due to the drought. The prolonged absence of rainfall resulted in a decrease in the amount of forage available.

The forage potential of natural pasture has seen its volume reduced by the increasing scarcity and underdevelopment of plants, on one hand, and by the reduction of pasture areas for expanding crop areas, on the other hand. Moreover, agricultural yields have decreased, which has led to a decrease in by-products suitable for forage. However, comparison of current and pre-drought numbers of livestock is made difficult by the lack of reliable data.

Finally, it should be noted that cattle breeding methods, due to the configuration of the islands and the land ownership system, are much more settled than in other Sahelian countries. Common grazing land is very rare and is used almost exclusively for goats. Most other animals are led to and guarded in pasture and receive a feeding complement at the stable, if they are not permanently confined.

The only data on livestock production is for cattle slaughter. These data indicate a relatively constant annual level (3,000 head/year) until 1968, then a strong increase (5,000 head/year) from 1969 to 1973, which seems to reflect voluntary slaughtering due to shortage of forage, followed by a very low period (less than 1,000 head/year), undoubtedly due to the lack of animals good enough to slaughter.

There are only a few large-scale livestock farms, among which only one owns more than 100 head (0.02 percent) and 13 own more than ten head (0.3 percent). Table 48 shows the number of cattle on some of the main islands (Santiago, Maio, Fogo, Santo Antao and S. Vicente).

(3) Reproductive potential and productivity of traditional livestock

Because there is virtually no concrete information or monitored performance available, it is difficult to correctly estimate the productivity of the various races bred by traditional methods.

However, animal health is generally not too serious a problem, and nutrition, based on only superficial observation, appears satisfactory in spite of environmental hardships. It seems reasonable to assume that reproduction, mortality and growth parameters, which condition reproduction, must be relatively good. (See Table 49.)

Table 48: Number of Cattle Per Farm

<u>Islands</u>		<u>1</u>	<u>2-3</u>	<u>4-5</u>	<u>6-10</u>	<u>11-20</u>	<u>21-40</u>	<u>41-100</u>	<u>100</u>	<u>Total</u>
Santiago	Number	1,567	1,427	203	47	4	2	2	1	3,253
	Percent	48.2	43.9	6.2	1.4	0.1	0.1	0.1	0.03	
Maio	Number	167	76	12	1					256
	Percent	65.2	29.7	4.7	0.4					
Fogo	Number	133	141	10	4					289
	Percent	46.0	48.8	3.5	1.4	0.3				
S. Antao	Number	79	43	9	8	2	1			142
	Percent	55.6	30.3	6.3	5.6	1.4	0.7			
S. Vicente	Number	1	5	3						9
	Percent	11.1	55.6	33.3						

Source: D.S.P.A. Documents.

**Table 49: Variations in Average Carcass Weight
as Recorded at Praia Slaughterhouse**

<u>Years</u>	<u>Cattle</u>	<u>Goats</u>	<u>Sheep</u>	<u>Pigs</u>
	(kgs)			
1972	96.0	11.2		44.3
1973	81.0	9.2		53.6
1974	113.9	12.1		38.6
1975	133.0	13.3		40.1
1976	156.0	13.9		41.8
1977	117.1	13.9	11.3	40.9
1978	85.5	10.6	11.7	42.0
1979	147.3	12.9		42.2
1980	146.6	13.2		43.5
1981	163.0	13.1	10.0	43.9

Source: D.S.P.A. Documents.

(a) Cattle

Fertility and mortality data include: age of cow at first offing, three years; fecundity, 60 percent; mortality rate from zero to one year, 20 percent, from one to two years, 8 percent, two years and above, 2 percent.

Data on the structure of cattle herds indicate that, for females: cows (three years old and above) constitute 39.1 percent, heifers (one to two years) 17.6 percent, and female calves (zero to one year) 10.6 percent, for a total of 67.2 percent of the average herd. For males, bulls (three years and older) constitute 4.7 percent, bull-calves (one to two years) 17.6 percent, and calves (zero to one year) 10.6 percent, for a total of 32.8 percent.

The average milk production potential is about 750 kg of milk per lactation period. Two-thirds of this are consumed by the calf and one-third is taken for human consumption. The amount of milk taken for consumption is about 135 kg per year per calving cow (UZ), that is about 53 kg per head of cattle.

Other cattle productions are mainly animal labor and manure, which are currently difficult to quantify and to estimate.

(b) Goats

A few months ago, the Livestock Development Center at Trinidad began collecting data on goats and sheep.

Fertility and mortality data for the local race of goats include: age at first birth 348 ± 100 days (N=6), space between births 316 ± 16 days (N=13), fertility 1.7 ± 0.2 (N=37), post-birth mortality 14.3 ± 3.1 percent (N=63), weight at birth 2.2 ± 0.2 kg (N=28), and weight at three months 10.5 ± 1.7 kg (N=10). Fertility and interval between births represent a fecundity rate of 1.96. The 14.3 percent mortality concerns the period from birth to weaning, which takes place at three to four months.

At the Livestock Center in Trinidad, goats are milked after kids have been fed. The average daily milk production, according to six readings made during one month, is about 210 ± 85 g.

(c) Sheep

The data gathered at the Trinidad Livestock Center, give the following information about the Peul sheep imported from Niger: age at first birth, 15 months (N=3), space between births, 261 ± 19 days (N=32), fertility 1.2 (N=108) and annual fecundity 1.7.

At the Animal Husbandry Center in Colhete (Maio), the Karakul sheep herd had the following characteristics in 1980: overall mortality rate, 19 percent, and an exploitation rate of 33.7 percent. (The exploitation rate is based on the ratio of sales (247) to the

total number, which progressively decreased from 539 to 336 head in one year.) In light of these data, 35 percent of the herd is suitable for exploitation each year, while weight productivity per carcass is 3.9 kg, and of carcass and offal, 4.3 kg.

(d) Swine

The following data are those available for swine: first birth, one year; number of piglets weaned per litter, six; age at sale, 15 months; number of litters per year, 1.5 (one litter every eight months); weight per slaughtered carcass, 41.7 kg, per carcass and offal, 47.0 kg. On the basis of the above data, the production features are as follows: 70 percent of the herd is available for slaughter each year; weight productivity - carcass 29.9 kg/animal bred, carcass and offal 32.9 kg/animal bred; or carcass, 370 kg/reproductive sow, carcass and offal, 406 kg/reproductive sow.

9. Marketing systems

The marketing system for agricultural and livestock products is open. Farmers can sell their products either directly to the consumer or to a middleman, who then sells them to the public. Prices for basic products are officially determined, but official prices are not always respected, especially in case of shortages.

The Ministry of Rural Development has created an institution, the Livestock and Agricultural Development (FAP - Fomento-Agro-Pecuario) for marketing inputs; this institution may occasionally be responsible for selling agricultural or animal products.

The Public Supply Company (EMPA - Empresa Publica de Abastecimento) is responsible for marketing export crops such as bananas, as well as for selling plant or animal products imported in case of shortages. This company is basically designed to distribute staple goods imported or received by the country. The National Cooperative Institute, within the MRD, has set up a network of consumer cooperatives for staple goods marketing in rural areas. The Institute is currently organizing production cooperatives, which will have an influence on product marketing.

10. Inputs

At the national level, inputs are marketed by the FAP.

a. Chemical fertilizers

Chemical fertilizers are not in general use in Cape Verde, but are usually reserved for high-yield crops (bananas, sweet potatoes, potatoes and some vegetable crops). This is primarily because farmers are not aware of the advantages of using fertilizers. The amounts of fertilizers sold in 1981-82 are indicated in Table 50. These fertilizers are also marketed by the FAP.

able 50: Chemical Fertilizers Sold
(t)

	<u>1981</u>	<u>1982</u>
Nitrogen-Phosphorus-Potassium	300	12,950
Calcium Superphosphate	7,050	1,000
Urea	26,800	2,450
Ammonium Sulphate	9,150	1,550
Potassium Sulphate	19,000	1,050
Potassium Chloride	9,850	12,000

b. Seeds

The seeds used for maize and bean crops in dryland crops farming (sequeiro) are domestically produced. Farmers select and keep seeds from each harvest (retiradas). However, during drought years most farmers cannot do this due to the very poor, sometimes non-existent, production. Usually Fogo island is the best source of seeds, given its geographical and ecological conditions.

Horticultural seeds are imported by the FAP, in accordance with the technical data provided by specialized services. Imported seeds include onion, tomato, apple cabbage, watermelon and carrot seeds; potato seeds are imported from the Netherlands by the same system. Because of transport and other difficulties, seeds have sometimes reached the country too late for sowing.

Horticultural seeds have been marketed in the following amounts: 1981, 246.24 kg; 1982, 214.10 kg; potato seeds: 1981, 300 tons; 1982, 200 tons.

c. Pesticides and spraying equipment

These inputs are also imported by the FAP, in accordance with technical data provided by the relevant services. Insecticides used against locusts are supplied free of charge to farmers.

The products sold in 1981-82 produced the following revenue: ECV 320,005 in 1981 and ECV 610,827 in 1982.

d. Farming equipment, power pumps, etc.

This type of equipment is marketed both by the FAP and private companies, so that it is difficult to estimate the total value.

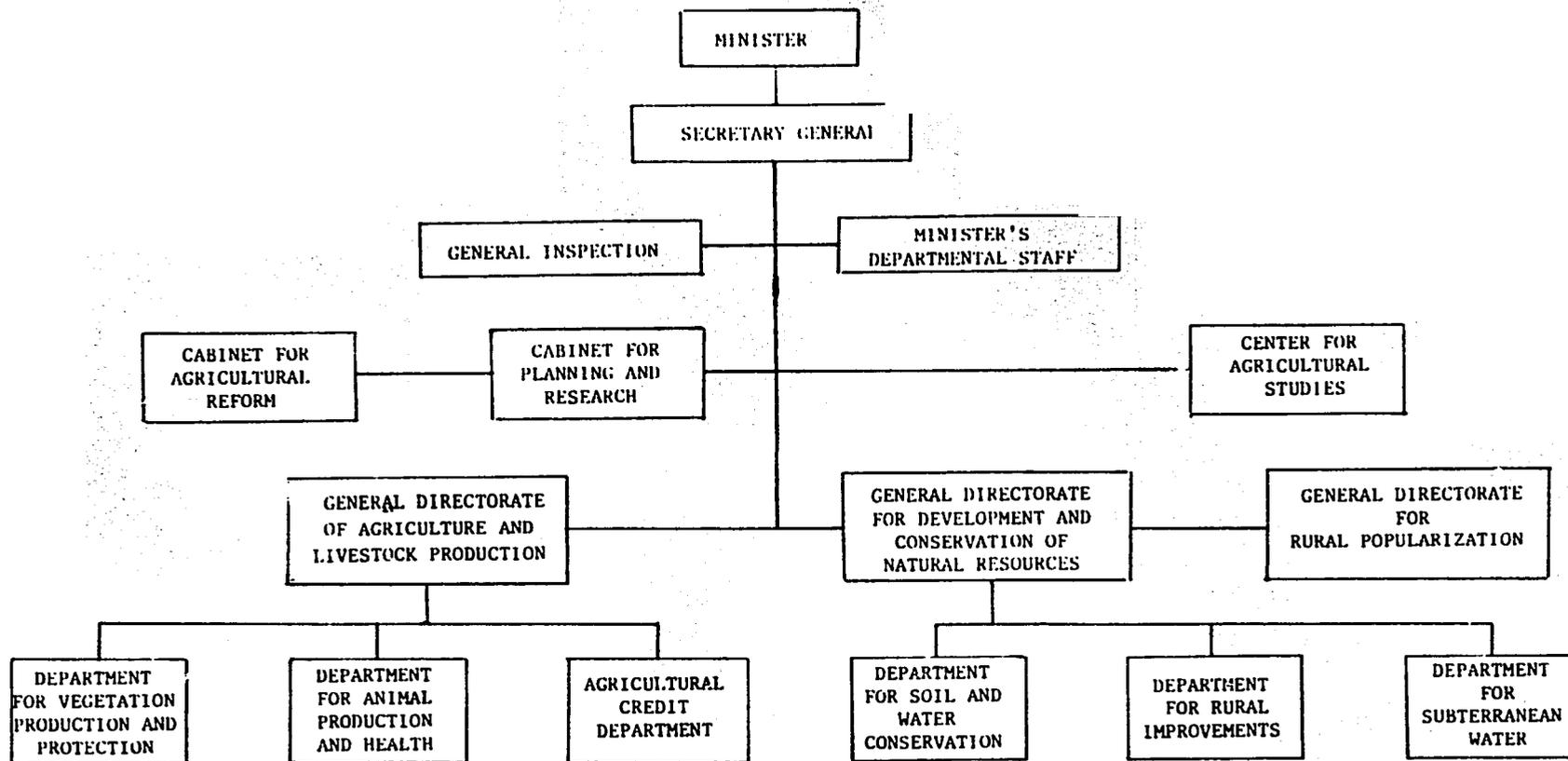
11. Ministry involved in agriculture

The only ministry handling agriculture is the Ministry of Rural Development (MRD). (See Figure 3.)

12. Food balance

In Cape Verde, there is a serious deficit in the national food balance. However, efforts are being made to improve food production. In this respect, research is very important, and the current programs are expected to achieve a streamlining of operations, as well as an increase in yields. Although it will not be possible to cover the grain deficit (estimated at 15,000 tons/year) completely, an attempt will be made to reduce it. Table 51 shows the long-term production potential of dryland crops farming.

Coffee is likely to yield large harvests.



CAPE VERDE

Figure 3: Structure of the Ministry for Rural Development

Table 51: Production Potential of Dryland Farming

<u>Product</u>	<u>Area</u> (ha)	<u>Production</u> (ton)
Corn	28,199	20,404
Beans	27,438	11,497
Sweet Potatoes	718	6,830
Tubers	239	1,710
Horticulture	90	743
Fruits	-	2,000
Other	-	400

The long-term production potential of irrigated farming is estimated in Table 52, and the livestock production potential is estimated in Table 53.

13. Farm Credit Bank

This institution is operated by the Bank of Cape Verde. Only the FAP and the National Cooperative Institute currently provide farmers with credit for input purchase.

14. Agricultural research institutions

These are the Center for Agrarian Studies (CEA) and the Center for Livestock Development (CDP - Centro de Desenvolvimento Pecuário).

Table 52: Production Potential of Irrigated Farming

<u>Product</u>	<u>Area (ha)</u>	<u>Production (ton)</u>
<u>Traditional</u>		
Sugar Cane	1,100	22,000
Sweet Potatoes	100	1,793
Tubers	84	1,504
Potatoes	88	1,750
Horticulture	86	1,726
Fruits	75	1,501
Beans	-	-
Maize	170	306
<u>Modern</u>		
Ex. Banana	875	35,000
Loc. Banana	-	3,500
Prim. Exp.	500	10,000
Prim. Int.	-	3,000
Sweet Potatoes	215	5,378
Potatoes	175	5,250
Tubers	151	3,786
Horticulture	418	12,534
Fruits	223	6,700

Table 53: Livestock Production Potential

	<u>Number</u>	<u>Production</u> <u>(ton)</u>
Beef	6,450	275.64
Goat	112,700	1,611.61
Mutton	3,920	30.57
Pork	60,415	3,148.69
Cow's Milk	6,610	429.65
Goat's Milk	112,700	2,141.30
Eggs		60.47

III. AGRICULTURAL RESEARCH INSTITUTIONS

There were no research institutions in the country before independence. As soon as independence was gained, however, the government felt that the development of the national agricultural sector required exhaustive knowledge of its various components, in order to achieve better planning and use of rural land.

Given the lack of renewable natural resources, the problem of desertification, the less than adequate land tenure system, the need to achieve food self-sufficiency, the rural human environment and the necessity to rationalize land use, the government decided upon the creation of a research institution charged with studying, creating, designing, and adapting new resources and technologies for the country's rural development.

In this framework, the Center for Agrarian Study was created on June 5, 1977. Its basic objectives are the above-mentioned. This creation has required building basic infrastructure as well as designing a training policy for management personnel. When the center was ready to start operations, however, it was not possible to staff it adequately, as a sufficient number of domestic administrative personnel could not be found. Nevertheless, a number of basic functions could be defined for the center and international contacts could be initiated in order to obtain operating funds. The Federal Republic of Germany provided funds for building and equipping a laboratory for integrated pest control, supplied two technicians for setting up the facility, and initiated an applied research program, including local and overseas training of native technicians. Almost simultaneously, the Netherlands funded the construction of a soil, water and plant analysis laboratory, whose equipment was supplied by the FAO, the German Democratic Republic and USAID. As applied research activities had to start, some actions have been undertaken by current development projects and by various departments in the MDR.

In January 1981, the Ministry for Rural Development appointed the head of the Center for Agrarian Studies, thus initiating its formation. The Center for Agrarian Studies includes the following departments:

- o Department of Renewable Natural Resources, for soil and vegetation problems;
- o Department of Agroclimatology and Hydrology, concerned with water resources;
- o Department of Agronomy, in charge of plant production and protection;
- o Department of Livestock, for animal pathology;
- o Department of Agroecology and Rural Sociology; and
- o Department of Documentation and Information (planned).

The planning body within the Center for Agrarian Studies is the Coordination Council, staffed by the Center's Director, the Services Directors of the MDR, and the delegates from the Ministry of Education and Culture, the Ministry of Health and Social Affairs, the Ministry of Transport and Telecommunications, the State Secretariat for cooperation and Planning, and the National Institute of Research and Technology.

Program implementation is coordinated by the Technical Council, headed by the director and staffed by the directors of all departments and the director of administrative services. The Technical Council operates as a planning and programming body. Due to the country's lack of technical resources some departments have not yet been adequately staffed.

Once the center was designed, the support structures were planned and their funding programmed. In addition to the already mentioned laboratories, the following were planned:

- o Animal Pathology Laboratory: physical plant, equipment, technical assistance and operating budget have been funded for two years by French cooperation;
- o Soil and Rock Mechanics Laboratory: equipment funded by USAID under a development project; physical plant financed by national funds and the EEC;
- o Headquarters: supported by USAID under the Food For Development Program (PL 480, Title II, Section 206).

The United Kingdom provided funds for equipping part of a food production analysis laboratory, which would be used not only for controlling imported food products but also for analyzing the quality of local agricultural products, and especially testing for residue of chemicals used in farming. This would support a sub-unit of agricultural and food technology, currently in the planning stage. The construction of physical facilities has not yet been funded.

Considering the fact that researchers should live where they work and that the Center for Agrarian Studies is supposed to employ foreign researchers, whether in the framework of cooperation or not, plans have been made to provide a number of housing units for the center. In addition to seven housing units scattered on the grounds around the center, a residential area has been defined for which 15 housing units have been planned. Four of these have already been financed under the Food Crop Research Project supported by USAID, one under the Veterinary Pathology Laboratory Project, and another under the MDR management training project sponsored by Italy. A residential center with ten rooms, a restaurant, a conference room and annexes has been financed by USAID under the regional Integrated Pest Management project, and will be built soon.

As livestock is a potential development area of the country, the MDR created the Livestock Development Center (CDP) which is independent of the Center for Agrarian Studies and represents the initial stage for a research and extension institution specifically oriented toward livestock problems. The CDP is in its organizational phase and is already partly staffed (see below).

The Center for Agrarian Studies operates without any administrative or financial autonomy. Considering this fact, the current extent of the center's development and its projected needs, it has been proposed to transform it into an Amilcar Cabral National Agrarian Research Institute (INIAAC-Instituto Nacional de Investigacao Agraria Amilcar Cabral). The proposal was accepted by the MDR and is now pending approval by the Council of Ministers.

The following refers to INIAAC. Departments are the same as in CEA and will be included in the internal regulations of INIAAC.

A. Amilcar Cabral National Agrarian Research Institute (INIAAC)

1. Sponsoring Ministry

INIAAC is under the authority of the Ministry for Rural Development.

2. Mission and objectives

The headquarters of INIAAC is at S. Jorge dos Orgaos, Commune of Santa Cruz. INIAAC is a collective body with legal identity and endowed with administrative and financial autonomy. It is under the authority of the MDR. The Institutes' objectives are the promotion and coordination of research pertaining to rural development throughout the country, especially in the fields of renewable natural resources, irrigated farming, livestock, hydrology, agroclimatology, agronomy, rural sociology, and farming technology.

3. Administrative structure

a. General Directorate

The director of INIAAC is appointed by the Council of Ministers at the suggestion of the MDR, and chosen from among competent and qualified technicians. The director runs, directs and coordinates INIAAC activities, and handles the day-to-day management. When absent, the director's responsibilities are taken over by one of the departmental directors appointed by the Minister of Rural Development.

b. Administrative Council

The Administrative Council is composed of the director, who acts as president, the departmental directors of the MDR and the administrative director. The administrative council is the administrative body of INIAAC. The Administrative Council usually

meets once a month, and more often if circumstances require it. In such case the director takes the initiative of calling the meeting upon request by a majority of members. The administrative council can only operate satisfactorily if the majority of its members are present. It operates by consensus. However, if members request a vote, the council votes on a simple majority basis, the director determining the outcome in the case of a tie.

All meetings are recorded in minutes, written down in an adequate record book. The minutes are approved and signed by all the members present.

c. Coordination Council

The Coordination Council is presided over by the director and composed of the general directors of the MDR and one delegate from each of the following institutions: Ministry of Education, Ministry of Health and Social Affairs, Ministry of Transport and Communication, State Secretariat for Cooperation and Planning, and the National Research and Technology Institute.

Meetings of this council may be attended by other persons, without voting rights and upon invitation, after approval by the council. The Coordination Council is designed to program and coordinate the technical and scientific activities of INIAAC with those of other relevant state institutions. The council normally meets once every six months. It can be summoned by the director or upon request of the majority of its members. The council can only operate satisfactorily with the presence of the majority of its members and it operates by consensus. When no consensus is reached or when a member requests a vote, the council makes decisions in accordance with the absolute majority of the votes of the present members. The provisions mentioned in article 6, paragraph 6, apply to the Coordination Council, with the necessary adjustments.

d. Scientific and Technical Council

This body consists of the director (president), the department directors and the administrative director. Technicians or institutions having competence in the matters listed on the agenda may be authorized to attend meetings, without voting rights.

This council is the coordinating body for the implementation of technical programs at INIAAC. The council normally meets twice a month, and more if necessary, on the president's initiative or upon request by other members. It can only operate satisfactorily with at least half its members present. The Technical Council functions by consensus. When no consensus is reached or when a member requests a vote, the council decides on the basis of absolute majority of the votes cast by the members present.

All meetings are recorded in minutes, approved at the next meeting and signed by all members present at the meeting in question.

e. Services

Central and regional technical departments and administrative services will be established. Organization and operation will be determined by internal regulations.

f. Financial and material management

(1) Revenue

The following will be considered the revenue of the INIAAC: assets, endowments and subsidies from the state or other public bodies; return on goods and services owned by the INIAAC; donations, inheritances, legacies and all authorized gifts; operating profits; and all other resources attributed to INIAAC by law, regulation or contract.

(2) Assets

INIAAC's assets consist of all goods and values received or purchased for reaching its objectives. The general rules which apply to other state services also apply to the financial and material management of INIAAC.

INIAAC funds are deposited at the Bank of Cape Verde and withdrawn in the form of checks or money orders signed by the appropriate authority. For smaller expenses INIAAC may use a petty cash fund, within regulatory limits.

(3) Personnel

INIAAC personnel are part of the civil service. Management staff may be appointed through common decrees by the Prime Minister and the Ministers of Economy and Finance and Rural Development. The government will promote the creation of a specific status for technical and scientific research personnel.

(4) Authority of the MDR

As the responsible authority, the MDR is in charge of defining INIAAC's general plan of action; enforcing, controlling and monitoring its activities; and approving the annual report on activities, the annual budget, the action program or activity plans and the internal regulation, as well as other activities approved by the law.

INIAAC's internal regulation provides for one deputy director per research field and for a technical office whose duties are to plan, program and coordinate activities with the central rural extension and activity institution, currently being designed by the Ministry for Rural Development.

4. Research stations and centers

The only stations available at the moment are those of S. Jorge dos Orgaos, seat of the Center for Agrarian Studies, and Tarrafal, in northern Santiago. There are some tentative research and testing activities carried out in other parts of the country. As funds have been made available for the creation of some stations, those stations will be described below and their present status mentioned. Given the small size of the country, stations and centers will not in general house laboratories, but will instead be supported by the central office. Exceptions will be indicated.

Considering the large potential for agricultural development existing on Fogo and Santo Antao, the research and testing units to be established will be considered as stations for the time being.

a. Main station at S. Jorge dos Orgaos

The existing infrastructure has been described in the section concerning the Center for Agrarian Studies. In addition, there are administrative facilities, marketing units (for sale of the station's products) and a cowshed, a pigsty and a henhouse. The station is equipped with its own electric power station, property of the CEA, and supplied with water.

b. Tarrafal Station

This station was originally created for irrigation activities. Eight hectares are available for irrigation experiments, as well as spray and local irrigation systems, and equipment for gathering soil samples and testing their pH and the soil humidity. The station is also equipped with strain-measuring devices, Bouyoucos humidity-measuring devices, farming gear, a tractor and simple plowing tools.

c. Fogo Center

Funded by the Federal Republic of Germany, a Demonstration, Extension and Applied Research Center is being set up in Fogo. It includes:

- o A main station for agro-forestry and fruit farming;
- o A sub-station for irrigated crops and coffee;
- o A sub-station for fruit farming in temperate zones; and
- o A sub-station for agro-forestry.

The regional Integrated Pest Management project, financed by USAID, provides for the construction (1983) of a small laboratory for integrated pest control, and for housing of technicians. Funding is

available for laboratory equipment, housing furniture, technical training and operating costs for three years. At present only some facilities are operating.

d. Santo Antao Center

A cooperation program with the Netherlands provides for a center similar to the Fogo Center. As irrigated farming is the major type of farming on this island, the establishment of a soil analysis laboratory is planned for supporting this activity. The regional Integrated Pest Management project financed the construction of a laboratory for integrated pest control and its equipment, technical assistance, operating costs and technical training.

5. List of programs and projects, by sector of activity

The activities listed below are sometimes carried out by MDR departments other than the CEA, but all are coordinated by the CEA.

a. Improvement of food crop production program

This program consists of the food crop research project financed by USAID; the improvement of maize, legume, millet and sorghum production funded by the EEC; the garden vegetable production project financed by Switzerland; the integrated pest management project sponsored by USIAD and GTZ (RFA), the West German Ministry for Technical Assistance and Cooperation; and the variety and production trial project on banana crops in Santiago and Santo Antao.

b. Forest production and reforestation program

This consists of: testing of new species in mountainous and arid zones; production trials using Parkinsonia acculeata and Prosopis juliflora; carbonization trials with Proposis; irrigated planting trials; trials of production potential in older areas; and study of the rooting process in both new and old species.

The trials have been carried out under the Reforestation Project (FAO/GCP/CVI/00Z/BEL).

c. Water and soil studies program

Components of this program are: use of run-off water by forests in arid and semi-arid zones; sample infiltration measuring in the semi-arid zone of Santiago; preliminary trial of mechanized soil cultivation support of physical and chemical analysis of soil in Santiago; study of the influence of substratum texture on rooting process and growth of Eucalyptus Camaldulensis in nursery; and study and improvement of soil fertility.

d. Pasture use program

This program includes study of the bromatologic features of the leaves and fruit of Parkinsonia acculeata and Proposis juliflora, and testing of goat, sheep, rabbit, and swine feeding with the leaves and fruit of Parkinsonia acculeata and Proposis juliflora.

This work is being carried out under the same project in collaboration with CDP and CEA.

e. Production systems program

No project has as yet been designed for production systems.

f. Assessment of renewable natural resources

This program encompasses the projects listed in Table 54.

g. Establishment of an agro-industrial unit at CEA and research in collaboration with the National Scientific Research Institute of Portugal

This program includes: study of the banana grown on Santiago; study of oily seeds from *Jatropha curcas*; study of coffee on Fogo and Santo Antao; and organization of an agro-industrial service at CEA.

h. Establishment of a documentation unit at CEA

The establishment of a documentation unit at CEA is an important ongoing project.

6. Resources

a. Human services

Human resources available to CEA are limited, although some management personnel are being trained. The existing staff are, in general, recently trained, with only limited professional experience. Table 55 shows the number of available technicians, their skills and professional experience:

One of the technicians was trained in irrigation for two years in the USA.

The expatriate personnel consist of: one agricultural engineer, one chemist (Ph.D), one soil scientist (Ph.D), and one entomologist (Ph.D or M.Sc.), a position which is presently vacant.

Table 54: Projects and Financial Sources for the "Characterization of Renewable Natural Resources" Program

<u>Title of Project</u>	<u>Funding</u>
ACL/IN/17.02/001 - Installation of hydrological agroclimatology stations and hydrometric posts in the islands, their management and operations.	AGRHYMET National
ACL/FM/17.02/002 - Training of twenty water and agricultural observers for the national stations.	National
ACL/EM/17.02/002 - Estimation and calculation of the evapotranspiration at several locations on Santiago Island and establishment of correlation with free surface evaporation data.	National
Calculation of the water balance of several basin and sub-basin slopes on Santiago Island.	National
ACL/FN/17.02/005 - Phenologic observations at several locations on Santiago Island.	National
ACL/EP/17.02/006 - Study development and agroclimatology forecasts.	
CRN/CP/16.02/001 - Distribution and utilization of landscape units on Santiago Island.	Portugal
CRN/CD/16.02/003 - Incline maps of Santiago Island.	Portugal
CRN/CI/16.02/003 - Ipsometric maps of Santiago Island.	Portugal
CRN/MS/16.02/004 - Soil cartography of the principal plateau on Santa Catarina--Santiago.	Portugal
CRN/MS/16.02/005 - Soil cartography of Faja, S. Nicolau and map of irrigation potential.	France
CRN/CS/16.02/006 - Instrumentation of three sub-basins in the hydrographic basins of Picos, Ribeira Seca and Flamings for the study of erosion and water conservation.	ORSTOM France
CRN/RH/16.02/007 - Annual evaluation of the water system of the principal plateau of Santa Catarina.	National

Table 54: Projects and Financial Sources for the
"Characterization of Renewable Natural
Resources" Program (cont.)

<u>Title of Project</u>	<u>Funding</u>
CRN/SH/16.02/008 - Characterization of halomorphic soils from the Rabil River and recuperation trials.	National
CRN/MS/16.02/009 - Soil cartography and characterization of the experimental stations on Santiago Island.	National
CRE/ET/16.02/010 - Stability tests of embankments at two locations on Santiago Island.	USAID
CRN/CF/16.02/011 - Phytogeographic and agro-sylvo-pastoral capacity map of the country.	Portugal
HID/IN/17.05/001 - Installation of hydrologic and hydrographic stations for the study of rising outflow, water balance and erosion (Santiago Island, S. Nicolau and Santo Antao).	USAID, UNDP ORSTOM
HID/ED/17.05/002 - Superficial flow trials directed at Santiago: Soil impermeability techniques, collection and conservation of water.	
HID/ED/17.05/003 - Comparison of calculation techniques of the hydric balance for two basins on Santiago Island.	
CRN/FL/16.02/013 - Identification of vascular plants, supporting the phytogeographic map project and agro-sylvo-pastoral potential.	Portugal
CRN/EE/16.02/014 - Ecoenergetologic study of the basin slopes of Santa Bruz.	Fund Gulbenk
CRN/PT/16.02/015 - Botanical identification of the constituent species of natural pastures.	Portugal

Table 55: CEA Technicians, Their Qualifications and Professional Experience

<u>Professional Qualifications</u>	<u>Number</u>	<u>Years of Experience</u>			<u>Years of Education</u>
		<u>5</u>	<u>Between 5 and 10</u>	<u>10</u>	
Agricultural Engineer	1			x	University Entrance Exam plus 5 and thesis dissertation
Agricultural Engineer	2		x		University Entrance Exam plus 5
Agronomist	2	x			University Entrance Exam plus 4
Entomologist	1	x			
Food Eng.	1	x			
Mathematician	1	x			University Entrance Exam plus 4
Agroclimatologist	1	x			University Entrance Exam plus 4
Cartographer	1	x			M. Sc.
Soil Specialist	1	x			University Entrance Exam plus 4
Adv. Eng. in Agroclimatology	3	x			M. Sc.
Adv. Eng. in Hydrology	1	x			University Entrance Exam plus 2
Adv. Eng. in Instrument.		x			University Entrance Exam plus 2
Adv. Eng. in Electronics		x			University Entrance Exam plus 2
Agricultural Technician			x		High School Degree
Agricultural Technician		x	x		University Entrance Exam plus 3
Technician		x			University Entrance Exam plus 3
Agro-Technician					University Entrance Exam plus 3
Technician				x	Agro. Diploma
			x	x	Diploma

b. Training policy

The training policy for management personnel was described in the relevant section. Among the management personnel presently in training, some will be appointed to CEA, the future INIAAC. The management training policy has up to the present been the following:

- o Training as part of projects funded for CEA, either at a basic or at a specialized, superior level;
- o Refresher training for management personnel currently employed by CEA for funded projects; and
- o Local specialization training, taking advantage of the presence of foreign specialists.

On-site training is conducted during work and/or through training seminars. In the framework of the FRG-funded integrated pest control project, two plant protection technicians are being trained in Germany, and two technicians now working at CEA have taken specialized training programs.

Under the Food Crop Research Project, the following graduate training has been planned: one Ph.D in soil science and soil/plant/water interaction; one Ph.D in plant production and protection; one M.Sc. in irrigation; two M.Sc.'s in plant production; one M.Sc. in fruit farming and horticulture; one M.Sc. in entomology; one M.Sc. in plant genetics; one M.Sc. in plant pathology; one M.A. in agricultural anthropology, and one M.Sc. in administration.

This training will include technicians now working at CEA and students now completing their basic academic training. This type of training is special insofar as it takes place both in the country and abroad. The local training will be conducted at CEA under the supervision of permanent technical assistants provided for four years by the project, and/or by consultants. Short training sessions abroad are also planned for technicians not at university level.

c. Financial resources

The sources providing financial resources to CEA are the following:

- o The Cape Verdian Government provides CEA's general operating budget and finances some research efforts;
- o External sources supply funds for contribution of facilities and for conducting research programs and projects; and
- o External funding is provided for research efforts supporting other projects.

CEA's operating budget was about ECV nine million in 1983.

d. Scientific and technical information resources

CEA is in the process of establishing a documentation and information unit. The library of the Ministry for Rural Development will be organized in a manner comparable to this documentation unit. On a national level is the National Documentation Center for scientific and technical documentation which is used by CEA. For more specific needs, the assistance of the National Tropical Scientific Research Institute of Portugal is available.

B. Livestock Development Center

1. Mission and objectives

The Livestock Development Center (CDP - Centro de Desenvolvimento Pecuário) is under the authority of the Ministry of Rural Development. It is a technical scientific institution designed to develop efforts in support of the national program for livestock development. The CDP is located in Trinidad, on Santiago island, and establishes regional delegations when necessary. In the near future when legal procedures are completed, the Animal Husbandry Center of Calheta (Maio) will be integrated into the CDP's scope of action.

The CDP has the legal status of a collective body, and is administratively and financially autonomous. It is governed according to current statutes and is under the authority of the MDR.

The CDP's objectives are the following:

- o Promoting livestock improvement through the genetic improvement of goat and sheep species, and the diffusion of chicks and piglets of pure or improved race;
- o Promoting the rational development of forage resources by improving pasture, harvest and forage storage methods;
- o Studying and adapting more complex management and feeding techniques to the conditions prevailing in Cape Verde; and
- o Promoting practical training for farmers on the basis of collected data, taking the prevailing rural conditions into account.

In carrying out its duties the CDP will maintain close links with training, research and extension institutions, as well as with cooperatives.

2. Structure

The CDP's components and services are as follows:

a. Coordination Council

The Coordination Council is designed to plan programs and coordinate CDP's technical activities.

It is composed of the Director for Animal Production and Health, who is the President of the Council, the Director of the CDP, and delegates from FAP, ENAVI, the pig-breeding company, the Center for Agrarian Studies, the Directorate of the Rural Extension Services, and the National Cooperative Institute.

Upon invitation, CDP technicians or other civil servants may attend meetings of the council, but have no voting right. The Coordination Council normally meets every three months, and the president may summon additional meetings when necessary.

b. The Management Council

The Management Council consists of the CDP's director, president of the council, the chiefs of the technical divisions, and the chief of administrative services. The Management Council meets once a month to discuss matters pertaining to the center's activities.

c. Research centers and stations

The CDP, having recently been created, is still in the organizational stage. Its headquarters are located in Trinidad, on Santiago. There is one sub-unit on Maio near Calheta, where the Karakul were raised.

Due to the recent date of CDP's creation and to the lack of technical personnel, programs are currently limited. The existing programs aim at improving goat species and animal nutrition.

4. Resources

The CDP has limited personnel and limited financial resources.

Information resources, in the form of scientific and technical information, are available in the CDP library.

C. Sectoral Analysis

1. Overview of the sector

The renewable natural resources available for an adequate development of the agricultural sector are relatively limited. Considering this fact and the ecological deterioration, it is clear that only an optimal structure and well defined programs can lead to

the achievement of the government's major objectives. These are food self-sufficiency, elimination or reduction of desertification and restoration of the ecological balance of the country.

The government's commitment to agricultural research was clearly emphasized by the State Secretary for Cooperation and Planning in his speech opening the meeting on "Basic needs in a fragile ecosystem: research and development in Cape Verde." He declared that "in a system where agriculture, forestry and livestock must be developed with serious consideration for the deteriorating ecosystem, where erosion control must be a constant concern, and where no significant progress will be made without radically modifying rural society, the essential reform of rural structures and the necessary organization of farmers should be linked with a technical revolution."

He also stated that the important part played by research applied to rural development was confirmed by an empirical assessment of the growth of agricultural production following input increase (estimated at ECV 590 million), compared to the growth resulting from improved techniques (ECV 580 million) and to the present value of production (ECV 940 million).

The present situation of agricultural research is that the CEA is being reorganized and transformed into INIAAC. Thus, current efforts remain scattered, despite attempts at coordination.

2. Major constraints on institutional capacity

The major constraints are:

- o Lack of experience of technical personnel at all levels;
- o Lack of scientific and technical personnel;
- o Scattering of research activities among several MDR departments;
- o Lack of infrastructure (some facilities are being built);
- o Lack of supplies and equipment in some sectors;
- o Lack of logistical support;
- o Inadequate definition of programs; and
- o Lack of quantitative knowledge of a number of problems.

3. Assessment of problems by research personnel

The survey confirms most of the above. Thus, the lack of technical and scientific personnel, their inadequate experience, the inadequacy of the operating budget, of infrastructure, and of logistical support have been considered as serious problems by all researchers. Better and more efficient coordination of research

activities has been indicated by all as the priority action to be undertaken.

D. Analysis of Specific Problems by Sub-Sector

1. Crop production

As this sub-sector is now organizing research, the problems of quantity and quality of technical and scientific personnel are undoubtedly the most serious. The various problems hindering the development of this sector cannot be addressed for want of qualified personnel able to pinpoint them and to design and implement adequate programs and projects.

Cape Verde has always been a natural laboratory, where plant species and varieties from the whole world have been introduced, so that today it has become difficult to identify not only their origin but also their genetic potential. Because of the geographic situation, microclimates are varied, but too often the same plants are introduced without preliminary adaptability studies.

2. Animal production

Research in this field has been very limited, and the same problems of the introduction of new races or species occur.

The problems of quantity and quality of technical and scientific personnel are even worse in this sub-sector. Fortunately, Cape Verde is an archipelago, so that animal health is not a serious problem. The feeding problem is more acute due to the drought and the deterioration of the ecosystem. An assessment of the health status of the national livestock should be undertaken. The recently created Livestock Development Center (CDP) and Animal Pathology Laboratory at CEA will allow research development in this sub-sector.

3. Forestry

The forestry sub-sector seriously lacks management personnel, especially Cape Verdian nationals. The research mentioned is carried out by expatriates under the FAO-BEL Reforestation Project. These actions are designed and conducted in close collaboration with the Center for Land Study (Agroclimatology and Hydrology Departments and Soil, Water and Plant Analysis Laboratory).

The native management personnel being trained abroad will not be sufficient for the planned development and research efforts (see project list). On a short-term basis, at least three higher officers should be trained at the level of "design engineer in water and forestry," and another in agro-forestry, for research activities. Over the long term, twice as many such staff should be hired.

Intermediate management personnel will be trained in Cape Verde's training institutions.

Forestry research should be integrated into the Renewable Natural Resources Department at the Center for Agrarian Studies.

4. Fish production

Fishing is one of the main resources of the country. Efforts made in recent years have contributed to improved operations in the whole sub-sector. Following implementation of the first generation of projects related to small fisheries, the installation of refrigerated facilities for industrial fisheries, and the creation of a public company for marketing fish and assisting small fishing businesses, production volume and real income of fishermen have increased.

In this sub-sector, the annual growth of production has reached 18 percent (in 1976 prices). As of the end of 1981, the refrigeration capacity was 12,000 tons for storage, 71 tons/day for freezing and 60 tons/day for ice production.

Each island currently has an assistance project for small fisheries. There are presently about 1,000 small fishing boats (among which 200 are motor boats) which employ a total of 3,000 fishermen. As concerns industrial fishing, there are three boats, employing 70 fishermen. Semi-industrial fishing is done on 21 boats by 360 fishermen.

The four canning factories presently process 3,000 tons of fish, but they could be reorganized to significantly increase production.

The main problems of this sub-sector, which the First Plan is going to address in an innovative way, are the following:

- o Lack of knowledge about existing resources and the need to define a framework for the activities to be undertaken;
- o Absence of typological identification of fishing boats, based on criteria such as economic efficiency;
- o Need to strengthen nascent small-scale fishing projects, and to coordinate them with the development of semi-industrial fishing;
- o Inadequate level of professional training for fishermen, and lack of technicians;
- o Need to standardize input supply conditions; and
- o Need to organize and improve fish marketing and supply channels for the population.

a. Objectives (1982-1985)

The basic objectives, as defined by the fishing development policy in the First Plan, are to increase the national consumption of fish per capita, to expand the export of Scombridae and shellfish, and to develop inshore and ocean fishing, and improve support structures.

In terms of volume, the fishing production target for 1985 is twice the 1980 production.

b. Activities to be undertaken

The specific efforts required are the following:

- o Evaluation of the results of initial small fishing projects (which are, in particular, meant to equip 600 boats with motors). Consolidation of this first generation of projects implies commercial and financial organization, diffusion of techniques, technical assistance and development of a cooperative movement;
- o Launching of the first phase of the second generation of small fishing projects, including action on storage, transport and technical assistance, as well as launching a first group of boats, seven to nine meters long;
- o Training at all levels, done locally whenever possible, for technical extension agents and fishermen;
- o Construction of port facilities to support small fishing business;
- o Collection and analysis of scientific, physical and economic data pertaining to this sector of activity; and
- o Development of industrial and semi-industrial fishing through completion and development of the national refrigeration system, creation of a coastal fishing fleet and participation in Atlantic Ocean fishing.

5. Production systems

a. Dryland crops systems

Dryland crop farming is sometimes practical in areas that are not of high potential, either for climate or soil reasons, which explains the low average yields. Farming techniques are extremely rudimentary.

Land located in semi-arid zones is often under-exploited, for instance in Santo Antao and Sao Nicolau. Areas not best suited for dryland crops should in the future be turned to sylvo-pastoral uses.

Studies should be undertaken in order to define and characterize the area suitable for this type of exploitation.

There is no precise knowledge base of existing plant stock. Plants are grown without attention to suitability to ecological zone.

In order to rationalize dryland crops farming, especially maize and bean dry farming, the following actions will be necessary:

- o Establish land suitability for dryland crops, reforestation, pasture or mixed farming (sylvo-pastoral or agro-sylvo-pastoral);
- o Specify a development system for zones with mixed farming;
- o Solve social problems resulting from changes in land use for farmers now working on land suited for forestry, pasture or mixed farming;
- o Support farmers with a credit system for production improvement and for modifying land use; and
- o Encourage farmers to use the proposed farming systems in the most rational way.

b. Irrigated farming

One of the major problems is the small size of holdings. Land is divided in small parcels, and financial and material resources are not always available for farmers to improve production and purchase inputs that would have a significant impact on yields. Sprinkling water for crops is sometimes a limiting factor, but it is also rarely well-used, due to poor supply systems and ill-organized spraying schedules.

In modern irrigated areas these problems are less serious but they still exist. The sub-sector of irrigated farming is probably the most promising for national agriculture, since its production is relatively stable.

In order to solve the above-mentioned problems, the following needs should be taken into account, some of which are already being studied.

- o Organization of cooperative farming systems;
- o Enforcement of regulations for exploiting and managing water resources;
- o Improvement of water storage and distribution;
- o Determination of needs for irrigation water in the SPAC system;

- o Establishment of a credit system in order to help farmers improve production and purchase inputs;
- o Improvement of farming techniques and screening of new varieties for increasing productivity and reducing water use; and
- o Regular technical support to farmers through an extension system.

All these production systems more or less incorporate livestock. In some areas more integration of livestock would be desirable.

6. Proposed solutions and possible activities in each sub-sector

Sub-sectors will not be separately reviewed here, since similar problems arise in all of them because the research system is still in the process of being organized. The following pages show fields where research should be undertaken. However, all programs or projects are not documented since the number that can be successfully undertaken in the next five years is limited. Only urgent national research programs have been considered.

Priority activities are:

- o Improving human resources in quantity and quality;
- o Increasing material and financial resources for carrying out priority activities;
- o Qualitative and quantitative inventory of problems in each sector, in order to provide a sound basis for the definition of medium- and long-term programs and projects;
- o Organization of scientific and technical career status to allow professional and income advancement for the relevant personnel;
- o National program coordination in order to harmonize implementation in relevant areas;
- o Support for employing highly qualified expatriate personnel;
- o Establishment of a data bank common to all institutions;
- o Creation on the national level, of a germplasm bank in order to facilitate importation of plant material;

- o Organization of a documentation system with adequate material and human resources and establishment of a communication system with foreign counterparts; and
- o Establishment of mechanisms for permanent contact between national research institutions and their foreign counterparts.

7. Suggested research programs and projects on short, medium- and long-term bases, in order of priority

a. Characterization and exploitation of renewable natural resources

This research program would be composed of the following projects:

- o Mapping agricultural soils and assessment of their physical and chemical features;
- o Study of pasture characteristics in Cape Verde and pasture development potential;
- o Testing exotic tree species in mountainous and low-lying arid zones;
- o Mapping soils suitable for forestry;
- o Exploitation trials for a number of species, especially Parkinsonia aculeata and Prosopis juliflora;
- o Qualitative and quantitative characterization of erosion and run-off water;
- o Use of soil conditioners for improving water retention capacity;
- o Calculation of production for older reforested areas;
- o Training forestry management personnel abroad and in-country;
- o Forest legislation;
- o Study of water balance of some spill-over basins and sub-basins in Santiago and their impact on crop and forest production;
- o Assessment of annual rainfall in high plateaus;
- o Assessment and recovery trials (alluvium) on halomorphie soils in Rabil, Boavista;

- o Studies of stability of soil structures on plateaus suitable for irrigated farming development; and
- o Water harvesting in Santiago, a pilot trial in Tarrafal, Santiago. (Project ready for implementation by the University of Tucson, Arizona, as soon as funding is available.)
- b. Irrigation needs (SPAC system) and schedule for main irrigated crops in Cape Verde
- c. Epizootic inventory in Cape Verde

This program is to be composed of the following projects:

- o Identification and control of both the farcioler parasite and its vector;
- o Gastrointestinal parasite diseases in livestock;
- o Protozoology of medical-veterinary interest;
- o Parasites and infectious diseases in poultry;
- o Infectious diseases in cattle;
- o Infectious diseases in small ruminants;
- o Infectious diseases in swine; and
- o Animal diseases in Cape Verde.
- d. Fishing development

This program consists of the following projects:

- o Oceanographic study of Cape Verde's territorial waters;
- o Eco-biological study and assessment of stocks of deep-sea fish subject to traditional fishing, as well as other species of substantial commercial value; and
- o Study of fishing gear technology.

e. Assessment of the agrarian system in Cape Verde

This program includes:

- o Analysis of the agrarian system in Cape Verde;
- o Study of the marketing of agricultural produce in Cape Verde; and
- o Survey of development in Assomada and Ribeira da Barca.

IV. AGRICULTURAL TRAINING INSTITUTIONS

A. Institutions

As there has been no higher technical or academic training facility in the country, training has been done abroad. Before independence (July, 1975) nearly all technical management personnel were trained in Portugal. Because some of their training is inapplicable to the problems of Cape Verde's agricultural sector, the government is planning a national training system.

With the help of FAO, national needs for management personnel at various levels have been identified, and training programs have been designed. The objectives are as follows:

1. Objectives

Considering the present situation and the need for management personnel for rural development, the government has decided upon the creation of a Polytechnic Training Center for Rural Development Officers, placed under the authority of the Center for Agrarian Studies within the MDR. It will be located in S. Jorge dos Orgaos on Santiago island, and will be responsible for a program of integrated training.

a. General objective

The general objective of the program is training and refresher training for all management personnel related to rural development in Cape Verde, at all levels from rural agents to senior management. The trained personnel should be able to solve the technical problems they face, on the basis of the prevailing ecological, social, economic, cultural and political conditions. They should also be able to set up the necessary organizational infrastructure and manage it.

b. Specific objectives

These objectives are as follows:

- o Improvement of the present system of training abroad for senior management personnel responsible for rural development;
- o Proficiency training for 30 currently employed senior management personnel, especially in the field of development organization and management;
- o Establishment and follow-up of intensive training for 35 mid-level management personnel working on rural development;
- o Refresher training for 60 assistant technical agents currently employed;

- o Establishment of a practical training system for rural agents responsible for project zones; and
- o Design and implementation of special training efforts aimed at specific needs (cooperative training).

Moreover, the program would also seek to eventually introduce classes on rural development into primary education, to train nationals of Cape Verde as trainers, to continue the program, and to design a training system for the young rural population, which could be implemented on a longer-term basis and could follow the pattern of Rural Family Centers found in West Africa. A research unit on rural technologies would also be established and research/training mechanisms would be established.

2. Supporting activities

To support this program, an Inter-Ministerial Commission for Rural Development Training will be created, whose president will be the director of the Center for Agrarian Studies. A budget will also be allocated specifically for rural development training, and other provisions necessary for implementing the program would be made.

3. Specific activities

The following specific activities will be undertaken as part of the program:

- o Training educators for rural education. This should involve a dozen trainers (five or six at level "A"). This training should take place abroad and in-country;
- o Introducing classes on rural development in primary education;
- o Offering refresher courses to senior MDR management personnel, especially in the fields of development organization, methodology and management;
- o Training new middle management at level "B". This training would involve 20 to 30 middle management employees and last for 42 months (36 months of classes and six months of practical training). Applicants should have the BEPC level and be between 18 and 20 years of age;
- o Training new junior management personnel at level "C". Training would involve 40 employees for 18 months. Applicants should have the BEPC level and be between 18 and 20 years of age;
- o Offering refresher training to junior management. Training would involve 60 employees (C level) for nine months, broken down into three phases (two months for basic subjects, four

months for technical subjects and three months for practical training, with preparation of a report);

- o Training farmers responsible for project zones. This effort involves 120 farmers, male and female, and aims at improving their technical skills and self-organizing capacity;
- o Organizing special training sessions on request by departments of the MDR;
- o Designing a training program for the young rural population; and
- o Setting up a research unit for rural technologies and organizing technical training for female management personnel.

4. Structures and institutions

The training program is under the authority of the Center for Agrarian Studies within the Ministry of Rural Development. It is supported by the Polytechnic Training Center for Rural Development Officers, which is being built in S. Jorge dos Orgaos (headquarters of the CEA), and which should provide the necessary infrastructure. The training program will also have the facilities of the CEA at its disposal.

The training center will be headed by the director of the CEA, who will delegate day-to-day responsibilities to an assistant director. When the CEA is transformed into INIAAC and given administrative and financial autonomy, the director of the institute will have two assistants, one of whom will handle exclusively training matters.

5. Financial requirements

a. Construction and operation of the Multidisciplinary Training Center

This is in the planning stage. The center will be located in S. Jorge dos Orgaos, where the CEA/INIAAC has its headquarters.

b. Budget

The budget is being financed by Italy through contributions to FAO. Table 56 presents the budget for a four-year period.

Training for middle and junior management started in January 1983, in facilities near Praia, with pre-financing by FAO's PCT. German and Portuguese cooperation also provided funds.

Table 56: Budget for the Multidisciplinary Training Center
(in US\$)

Services of Expatriate Personnel (hours/month)	724,200
Official Trips	76,000
Contractual Services	52,500
General Expenses	5,000
Supplies	9,500
Equipment	172,000
Construction	250,000
Training and Grants	386,000
Operating Expenses	217,776
Unforeseen Expenditures	<u>119,824</u>
Total	<u>2,012,800</u>

c. Rural agents

Plans have been made to train 120 farmers responsible for project zones, coming from areas where major agricultural development projects are being implemented. They will be taught useful farming techniques. Training will be carried out in the field for two weeks per year for two years. The cost is estimated at a total of US\$ 166,057 for two years.

6. Establishment of a research unit on traditional technologies

a. Objectives

The objective of establishing such a unit is to provide Cape Verde with an applied research unit capable of creating and transferring technology, especially that which can be used by women. This effort will emphasize: data gathering about traditional and improved techniques, either of local or foreign origin, adapting these techniques and/or creating new techniques; and disseminating techniques, especially among women.

b. Justification

In Cape Verde the position of rural women (54 percent of the population) is made especially difficult by very hard climatic conditions (intense drought since 1973), the irregular topography, and wood, water and farmland shortages. Very often male heads of households emigrate, leaving mothers alone with their children (36 percent of women are heads of households; in the Tarrafal region, this figure is as high as 47 percent).

c. Authority and administration

The project is under the authority of the Ministry of Rural Development and the Cape Verdian National Association of Women. The research unit will be placed under the administrative control of the General Director of the CEA. The research unit will be located in San Jorge dos Orgaos, next to the Polytechnic Training Center.

The unit is directly responsible for applied research on all subjects related to living, working, and production conditions in rural areas.

Training, including village-level training of women, is provided by the Polytechnic Training Center.

d. Resources

(1) Material resources

State-owned land will be available for the unit in S. Jorge dos Orgaos.

(2) Human resources

The unit is supported by the CEA and its researchers, and by the Polytechnic Training Center, with a team of three experts in technical teaching and two science and agronomy teachers.

e. Financing

The requested funding will be used for building facilities for the unit, salary for an experienced trainer (project chief, who should be a woman), carrying out training activities, and operating the unit. Contribution of personnel, particularly technical personnel, will be sought from bilateral assistance sources.

The total cost of the project is estimated at US\$ 841,000 not including expertise. Table 57 provides the budget figures for the two phases of the project.

f. Training

At the Multidisciplinary Training Center management training will be conducted on two levels. The first will consist of eighteen months of academic and practical training, followed by a six-month field training and presentation of a report. This type of training leads to the degree of Technical Agent for Rural Development (level C). The second type will consist of thirty-six months of academic and practical training, followed by a six-month field training and presentation of a report. This type of training leads to the degree of Agricultural Engineer (level B).

B. Estimated Training Needs for the Next Six Years

The needs are estimated at 180 B level and 122 C level officers. Training will be carried out by management personnel currently employed by the CEA and MDR, assisted by teachers employed by the center and trained abroad. These teachers are: a socio-economist (being trained in France); a senior technician in plant production; a senior technician in soil and water conservation; a senior technician in irrigation; and a senior technician in animal production. A number of scholarships might be offered by Italy.

The training center will use the CEA facilities, including laboratories, testing stations, etc. The library will be independent (funded by Italy) and its activities will be coordinated by the Documentation and Information Unit of the CEA.

Table 57: Budget for Research Unit Working on Small-Scale Technologies for Cape Verde Rural Development
(in US\$)

Phase I:

Expert (1) 24 (hours/month)	(135,000 US\$)
Construction Works	50,000
Equipment (vehicle, motorcycle, furniture and other tech. equipment, etc.)	40,000
Operating Expenses	36,000
Professional Training	<u>25,000</u>
Subtotal, Phase I	<u>151,000</u>

Phase II:

Expert (1) 24 (hours/month)	
Operating Expenses	48,000
Professional Training	<u>100,000</u>
Subtotal, Phase II	<u>148,000</u>
Total, Phase I and II	<u><u>299,000</u></u>

C. Recommendations for Improving Training Institutions in the Next Ten Years

Training institutions can be improved over the next ten years through the following:

- o Inclusion of training institutions in the general education reforms planned by the country;
- o Intensification of farmers' training, which will soon begin at the Polytechnic Training Center;
- o Advanced training for the center's permanent management personnel, including the director, in the field of management training;
- o Development of the planned library;
- o Establishment of links between the documentation unit of the CEA and its counterparts in other countries;
- o Creation of a journal for the Multidisciplinary Training Center;
- o Organization of seminars to review training problems in relation to rural development, with the participation of similar institutions from the Sahelian region and elsewhere; and
- o Integration of education and research.

D. Other Comments

Given the serious need for management and technician training, a number of state agencies have organized training programs, which has resulted in the scattering of efforts and of material and financial resources. The government then created the Professional Training and Proficiency Institute with a view to coordinating and promoting non-formal activities of professional training and trainers' training.

The Cape Verdian Solidarity Institute created the Professional Center of S. Jorginho in Santiago, where students are taught ironwork, woodwork, plumbing and electricity. For its own needs, the shipbuilding yard project in S. Vicente created a training program for administration, metallurgy and mechanics, official monitoring, etc.

Since the activities of the Multidisciplinary Training Center are limited, the National Cooperatives Institute has offered an organization and cooperative promotion course for technicians (21 students). This course is already in its final phase, with 18 students in their practical training.

A. Institutions

There is currently no extension institution in Cape Verde. The existing extension efforts are carried out by units created in the framework of rural development projects or by departments of the MDR.

Thus, the General Directorate for agriculture and livestock, through the Directorate for Plant Production, is carrying out technical support activities for farmers, essentially in Santiago, with a view to improving fruit and horticultural irrigated production. Each year the directorate provides support to farmers in the control of locusts, the principal pest of maize and beans in dryland crop farming.

The integrated development project of Assomada (in Santiago), which includes a well organized extension unit, provides very effective support to farmers for agriculture (fruit farming, horticulture and Cajan pea crops), livestock (goat, sheep, swine and poultry breeding), reforestation and nutrition education. In the agro-sylvo-pastoral component, development has been integrated. The budget for this project averages ECV 21,476,000 per year.

The Watershed Management Project in Santiago, which covers a larger sector, also carries out extension activities, especially in fruit farming and Cajan pea crops. The annual budget is ECV 1,875,000.

Two agronomic engineers and seven extension agents are made available to the integrated project at Assomada by the Plant Production and Protection Services. The watershed management project is provided with one agrologist, one technical engineer, and four extension agents.

Extension efforts usually result in increases in area cultivated and in horticultural productivity. Organizing a rural extension and activity service now seems urgent. To this end, aid from Italy has been obtained, through FAO's deposit fund, for the Agricultural Extension and Rural Activity Project (GCP/CVI/OB/ITA).

1. Agricultural Extension and Rural Activity Project

a. General objectives

A national agricultural extension service will be created by the MDR, in order to establish a channel of communication between the MDR and the rural population of Cape Verde. This will enable the MDR to provide the rural population with the necessary information, education programs, services, capital equipment, inputs, etc., and to receive feedback from the population involved.

b. Specific objectives

The specific objectives of this project consist of:

- o Offering the necessary technical assistance for the creation of a rural extension and activity service, especially in management training and organization of the service;
- o Assisting the MDR to coordinate this new service with other services of the Ministry and with existing development projects;
- o Performing field studies before setting up extension and rural activity centers in the field; and
- o Participating in the activities of the service, to the extent that local personnel are not in a position to do everything on their own.

The agricultural extension and rural activity service to be created by the project will have its headquarters in Praia (MDR) and activity and extension centers throughout the country, equipped with adequate facilities. Each center will be run by a rural agent, assisted by specialized agents.

2. National Cooperatives Institute

Taking into account the basic needs of the rural development sector, the government created the National Cooperatives Institute in 1978. The principal responsibilities of the institute are the supply of food products and agricultural inputs to the rural population, extension of more rational farming techniques and methods, expansion of farmers' credit bank, and settling populations by increasing local economic activity.

The National Cooperative Institute operates under the authority of the Ministry of Rural Development. It has carried out activities in 18 cooperatives so far, in three fields:

- o Group activation by various methods, including radio broadcasts followed by discussions in cooperatives, and functional literacy programs;
- o Technical assistance for identifying and formulating projects in agriculture, fishing and craftsmanship; and
- o Seeking funding for other activities.

A project being funded by Italy via the FAO's deposit fund, entitled "Support to the National Cooperatives Institute" (INC-GCPS/CVI/012/ITA), will enable this institution to play an important role in the areas of information and communications.

B. Resources and Analysis

1. Human resources

For the projects mentioned, working conditions and human resources are good and adequate for the current activities. Financial resources are available for additional personnel if necessary.

2. Liaison between research and extension

Contacts between extension and research in these projects are regular, and research results are easily transmitted to farmers. However, both available data and problem-solving capacity are limited.

3. Problems identified by personnel

There is a need to strengthen research in order to solve the more urgent problems. These problems include: farmers' reluctance to modify their habits in some areas, the need for a better organization of the departments responsible for input supply, the need for a national pricing policy satisfactory for both producers and consumers, and the urgent need for an agricultural credit service.

4. Survey results

In the absence of a national extension service, it is difficult to project survey results, as conditions vary considerably between islands and between zones. When the agricultural extension and rural activities project is implemented, reliable data will be available.

5. Other comments

On Santo Antao, Fogo and Sao Nicolau, MDR technicians have initiated some extension activities, although available facilities, human and material resources are limited. These activities include assistance to farmers in locust control.

VI. CONSTRAINTS

A. Crops

1. Dryland crops

a. Maize

The principal limiting factor for this crop is the poor level and distribution of rainfall. Maize is grown in various ecological zones, all affected by erosion, but soil deterioration in semi-arid zones makes development of this crop even more difficult there. The use of the same variety in these diverse zones represents a limiting factor for yield, as do a number of pests, especially the locust. Training farmers in new technologies and in selection of proper zones for this crop will also constitute an important factor for yield, regardless of the policies adopted.

On a short-term basis, the estimated average yield should increase to 400 - 500 kg/ha with the improvement of farming techniques. It could reach 600 kg/ha on a long-term basis. Presently, yields vary with rainfall. The average yields amounted to 265 kg/ha, 90 kg/ha and 137.5 kg/ha in 1980, 1981 and 1982, respectively.

b. Beans (Dolichos, Vigna and Phaseolus species)

Limiting factors are similar to those affecting maize. However, farmland in mountainous areas of humid or sub-humid zones have the benefit of humidity. Bean crops are less affected by rainfall distribution than maize.

The average yields in 1980, 1981 and 1982 were 298 kg/ha, 16.6 kg/ha and 98.6 kg/ha, respectively. The 1981 figure is low because of the rainfall deficit and the action of strong, dry winds.

Should new farming techniques be made available, it is estimated that short-term average yields could reach 300 kg/ha. The long-term potential value of production is estimated at 400 kg/ha.

c. Cajan pea or Angola pea (Cajanus cajan)

Angola pea crops are hindered by the same constraints as maize and beans, except in mountainous zones with micro-climatic conditions. However, native varieties resist rainfall variations relatively well.

The average yields in 1980, 1981 and 1982 were 150 kg/ha, 16 kg/ha and 90 kg/ha. Estimated yields take into account the fact that Angola pea crops are very spread out. The short-term yield, should new farming techniques be introduced, is estimated at 300 kg/ha, with a long-term potential of 400 kg/ha.

d. Coffee

The largest cultivated area is located on Fogo island, in the humid zone which enjoys a nearly constant fog. On Santo Antao, additional spraying is necessary. The major limiting factor for developing this crop is climate, although plant age also plays an influential role. In 1980, 1981 and 1982 yields averaged 150 kg/ha, 130 kg/ha and 130 kg/ha, respectively. The medium-term yields could reach 350 kg/ha with improved farming techniques. The long-term potential is 900 kg/ha, which implies introducing more complex farming techniques as well as new varieties, some of which are now being tested.

2. Irrigated farming

a. Vegetables

The major limiting factors are inadequate water supply, and non-use of organic and mineral fertilizers, pests, the marketing system, and the absence of credit and of organized extension. Research programs on farming techniques during planting periods and on the introduction of new varieties could assist these crops in diversifying cultivated species and in increasing yields. The current research on plant protection has helped increase total production.

In 1980, 1981 and 1982, yields averaged 12 t/ha, ten t/ha, and ten t/ha, respectively. Possible short-term yields are estimated at 16 t/ha and long-term yields at 25 t/ha.

b. Potatoes

Constraints are similar to those above. Average yields were 15 t/ha, 12 t/ha and ten t/ha in 1980, 1981 and 1982, respectively. The short-term potential is 20 t/ha and the long-term is 25 t/ha.

c. Sugar cane

No national policy has yet been defined for this crop. As sugar cane resists irrigation deficiencies relatively well, growth of this crop expanded in the late 1960's and early 1970's at the expense of food crops, such as bananas. The area used for sugar cane farming (1,029 ha) covers about 50 percent of the irrigated land in the county.

In several cases, sugar cane is grown on poor, shallow soils. The major constraints are water supply, soil nature and pests. Sugar cane is used for making "grog" (alcohol), which has commercial value. However, transportation problems have an influence on the marketing system.

Yields are expressed in terms of grog produced. In 1980, 1981 and 1982, the figures were respectively ten hl/ha, nine hl/ha and nine hl/ha. The short-term potential yield is estimated at 15 hl/ha and the long-term at 20 hl/ha.

d. Bananas

Bananas are usually grown on better soils, preferably alluvial land. However, soil fertility potential has been progressively declining because of the traditional banana-growing methods, which use no chemical fertilizers. An imbalance is now appearing in the soil, especially in micro-nutrients. Because it is an irrigated crop requiring large amounts of water, banana production and yields are now declining due to water shortages. There are no serious pest problems. Economic factors such as pricing, credit and the marketing system have an impact on production and yields. Transportation problems limit both exports and the augmentation of production areas.

Of the 181 ha now cultivated, 49 are devoted to export; the rest is for local consumption. The average yields for 1980, 1981 and 1982 were 30 t/ha, 30 t/ha and 28 t/ha, respectively, for the export zone. Yields of the area devoted to domestic consumption were 20 t/ha, 18 t/ha and 16 t/ha. Potential short-term yields are estimated at 40 t/ha and the long-term potential is 50 t/ha.

B. Livestock

1. Poultry

In Cape Verde, poultry breeding includes two aspects: industrial, large-scale; and traditional, small-scale activity.

As far as industrial poultry breeding is concerned, the main factors limiting production are the result of inadequate facilities. Animal diseases are also frequent and preventive action is needed. The same economic constraints affect poultry production, especially pricing, marketing and quality of feed. Current production amounts to four tons of meat per week and 6,000 eggs per day. With improved technology, a 40 percent increase in production would be possible.

The following are the current production parameters at ENAVI, the national poultry breeding company. For egg production, heavy breeders produce 115 eggs/chicken/ten months; semi-heavy breeders, 150 eggs/chicken/ten months; semi-heavy layers, 150 eggs/chicken/ten months; all with an incubation-hatching rate of 80 percent. Broiler weight 56 days after hatching is 1.6 to 1.7 kg, with a conversion index of 2.5 percent. Mortality rate for broilers is ten percent between the first and fourth week, while that for layers and breeders is 30 percent during the whole process. Annual production figures for eggs are 400,000 fertile eggs from broilers, 140,000 fertile eggs from layers, and a total of 1.6 million eggs for consumption. Annual production of broilers is 160,000.

The principal problem in traditional poultry breeding is animal health. There is no well-defined race; a local "race" which is very hardy but not very productive is utilized.

2. Goats

Production is essentially limited by feeding problems, directly resulting from inadequate rainfall, marketing problems and lack of information, especially as regards preventive health care.

The current average meat production is 5.8 kg per animal (carcass) and the annual milk production is 15.5 kg per goat. The average production growth is one percent per year for milk and for meat, for a 22 percent increase over 20 years. Figures are based on a utilization rate of 48.2 percent and an average carcass weight of 12.1 kg.

3. Sheep

Sheep have only recently been introduced in Cape Verde, so that no precise data is available on production. Development of this species is generally limited by the feed problem and by the lack of knowledge about possible diseases. The CDP data show a production of 3.9 kg per slaughtered animal (carcass) and 4.3 kg per living animal. Milk production is insignificant. It is hoped that production will increase by one percent annually.

4. Cattle

Factors limiting cattle breeding development are the lack of forage as a result of inadequate rainfall, health problems, especially diagnostic and preventative, and economic factors, such as pricing and marketing.

The current average yield is 17.1 kg per carcass (with an average carcass weight of 114.3 kg and an exploitation rate of 15 percent) and 135 kg of milk per cow annually, that is 53 kg per cow bred. Production is expected to increase by 22 percent over 20 years, and by one percent per year on a short-term basis.

5. Swine

In traditional breeding, limiting factors are inadequate rainfall (to the extent that animals are fed with left-overs and agricultural by-products unsuitable for human consumption), animal health (insofar as traditional breeding does not allow for immunization and disease identification where the animals are being raised even though resources for these exist in laboratories), and pricing and marketing systems.

The current yields average 29.9 kg per carcass and 32.9 kg per carcass and offal, that is 370 kg per breeding sow. A short-term increase of one percent is projected, that is a 22 percent increase over 20 years (1.5 percent per year).

C. Agroforestry

One of the main factors limiting the development of this sector is the inadequate level of rainfall and its distribution, especially in arid and semi-arid zones. However, during the years covered by the survey, this constraint was not very serious.

The government's program for this sector is ambitious. The lack of forestry legislation has not given rise to any problems so far. However, as the program expands, regulations will be necessary for dealing with land use in the humid mountainous zones, which will be reforested. These are currently being marginally used for dryland crops. A sufficient number of native agricultural officers with specialization in this sector will also be needed.

Several management officers are currently in training (university level), but when they return they will not work exclusively on research activities. A specific training program should therefore be established. Junior and middle management personnel will be trained on the job.

Planting is done during the rainy season, when farmers are working on agricultural tasks. The supply of labor is therefore limited which might hinder implementation of the planned program.

The average annual production is 3.5 m³/ha/year for building wood, and 2.5 m³/ha/year for firewood. Building wood production could be increased in the long-term to 6.4 m³/ha/year and in the medium-term to 4.5 m³/ha/year. It seems very unlikely that the firewood production could be increased. Total current production is 1,207 m³ per year for building wood and 17,400 m³ per year for firewood. In the short-term, these totals could be increased to 18,840 m³ per year and 27,840 tons/year if new technologies were adopted.

For the 1982-1985 period, production targets for normal conditions are 13,230 m³ for building wood and 17,340 m³ for firewood. The long-term targets (for the year 2000) are 21,450 m³ per year for building wood and 79,100-97,465 m³ per year for firewood, which represents 4,750 ha planted with trees in elevated areas and 48,565 ha in humid, sub-humid and arid zones having a smaller production potential.

The forestry division within the Soil and Water Conservation Service has undertaken some extension activities, which will be analyzed in the framework of the project financed by Italy.

Organizing a credit system, designing adequate forestry legislation and implementing a proper pricing policy are factors that will have a crucial influence on the medium- and long-term development of the sector.

It is therefore necessary to define land use suitability on the basis of biophysical and socioeconomic factors, which will insure regular implementation of development efforts.

D. Fishing

1. Small-scale fishing

Fishing activity is not measured in terms of work hours but rather in terms of trips. Small-scale fishing is done using rowboats of four to nine meters in length, sail boats, or speed boats. The production is consumed locally.

The production of each small-scale fishing unit was 8,224 kg in 1981 and 7,488 kg in 1982.

The main constraints are the inadequate technical training of the workforce, the difficulty of marketing products, and the shortages of inputs. Other, less serious, constraints have been hydroclimate, sales prices, credit, subsidy policy, sociological factors and port facilities.

The average production is estimated at 8,000 t/year and could reach 10,000 t/year in the short-term and 20,000 t/year in the long-term. The following steps must be taken to achieve these production levels:

In the short-term:

- o Territorial water studies of Cape Verde;
- o Ecobiological study and stock and commercial assessment of traditionally caught deep-sea and bottom-dwelling species;
- o Technology study of local manufacture of fishing gear and of product use;
- o Cost and efficiency study for means of production and labor, in order to fix sales prices;
- o Organization of fishermen into cooperatives;
- o Establishment of a credit system for input purchase; and
- o Construction of port facilities.

Long-term:

- o Physical-chemical study of waters;
- o Ecological study and assessment of deep-sea and bottom-dwelling species;
- o Use of new fishing and fish-processing techniques; and
- o Location of best fishing zones and research on proper boat type.

Conditions which urgently need to be met to reach the short- and long-term production targets are, in order of priority:

- o Access to investment and production credit;
- o Availability of qualified labor;
- o Access to extension services;
- o Establishment of a pricing policy enabling fishermen to cover production costs;
- o Information on local and external markets; and
- o Timely supply of inputs.

Training needs have been estimated at 15 senior managers and 45 middle managers, for research, extension and development in the fishing sector.

2. Industrial fishing

The annual production is estimated at 2,700 tons. The most frequently caught species are bottom-dwelling and deep-sea fish.

The main constraints limiting productivity are: the hydro-climate; lack of knowledge on the part of the workforce; distribution of products and prices; lack of credit; and difficulties in catching bait.

The use of new technologies could result in raising production to 5,000 tons in the short-term and to 15,000 in the long-term. The research required to reach these targets is the same as for small-scale fishing.

Urgent problems to be solved concern access to investment and production credit, access to extension and markets, market prices high enough to cover production costs, timely availability of inputs, and availability of qualified labor.

The management training needs identified for small-scale fishing apply to the whole fishing sector.

The government, aware of the importance of fishing for Cape Verde's development, has just created (September 1983) a State Secretariat for Fishing within the Ministry of the Economy and Finances, which will allow for a better identification of needs.

E. Comments on Survey Results

The main conclusions drawn from the surveys are the following:

Available resources for plant, animal and fishing production are few and limited. Some of them have deteriorated as a result of

drought and/or misuse. Even if drought is considered a cyclical phenomenon, plant and animal resources are not well utilized.

It will be possible to raise unit production and total production as soon as constraints can be removed by the following actions:

- o Organization of production services staffed with adequate personnel, both in terms of quantity and quality;
- o Close coordination of all development programs to provide basic data for designing proper research and testing programs;
- o Inventory of factors limiting agricultural development and agricultural and livestock productivity;
- o Support of national research institutions (material, financial and human resources) to enable them to carry out tasks for improving and increasing food production; priority support should be given to current projects and programs;
- o Establishment of regular and easy access to scientific and technical information, especially for researchers;
- o Material, financial and human support to training institutions;
- o Material, financial and human support to extension institutions; and
- o Support in creating a viable credit system for farmers.

Improving the use of natural resources will require an inventory of the renewable natural resources of the country. Priority actions are inventories of existing plant stock, improvement methods, introduction of new plants, livestock, animal health status, animal diseases and preventive health care measures.

VII. CONCLUSIONS AND GENERAL RECOMMENDATIONS

The survey analysis reflects the situation of agriculture, forestry, livestock and fishing, as well as research, training and extension institutions. The analysis shows that productivity improvement is possible for these sectors, even on a short-term basis. Absolute priority should be given to improving or developing institutional capacity through the activities detailed in the following paragraphs.

A. Research

Inventory must be taken of the potential of and the constraints on research development. Medium- and long-term research should be directed toward programs for reducing or eliminating factors limiting development in the mentioned sectors. This will assist in moving toward the major objectives of CILSS countries' self-sufficiency in food production and the restoration of ecological balance.

Reaching these objectives necessarily implies increasing national, technical and scientific personnel, helping native personnel to undergo specialized training, and providing technical and scientific support to local institutions through expatriate, highly qualified personnel. These last will identify and design research and training programs. Existing equipment should be increased and financial, logistical and other forms of resources should be made available.

B. Training

It will be necessary to find a sufficient number of competent national personnel, who know the specific characteristics of the country and are able to participate in the design, implementation and management of development projects. Material, human and financial support is urgently necessary for this task.

C. Agricultural Extension

Direct technical support should be offered to farmers to help them improve their living and working conditions by adopting measures to increase agricultural production. These measures would include the rational utilization of available resources according to their productive capacity, the adoption of techniques suited to local crops and conditions, the proper use of inputs and farming systems, and the use of communal exploitation systems where necessary.

D. Agricultural Credit

Agricultural credit should enable farmers to improve their working conditions, on the basis of data provided by extension services.

(The Food Crop Research Project funded by USAID for five years deals with the above mentioned issues in plant production.)

ANNEX 1

Programs and Projects: Research and Development

ANNEX I

Programs and Projects: Research and Development

A. Program No. 1A: Study and Improvement of Fertility Conditions

Background and Objectives

In a country such as Cape Verde where rainfall is inadequate, uncertain and ill-distributed, soil productivity, human survival and socioeconomic development are naturally dependent on the quantity and quality of the water available, and on its use.

Land suitable for agriculture (especially in irrigated farming) is limited, yet should produce most plant products for the country's consumption and for export. Urgent action is needed to review and study present production potential as well as to develop the means to improve it.

Begun twenty years ago, the first activities regarding soil fertility and the first fertilizer trials in Cape Verde aimed at improving banana production. This effort was discontinued, however, between 1970 and 1980. Santiago is the only island where fertility conditions have been generally charted for irrigated and irrigable soils. The success of this study proves that it should be pursued and extended to other islands and other crops. Such a study should also now take the water factor into consideration.

It is proposed therefore to implement projects on soil fertility inventory, especially for irrigable soils, on other islands. Also proposed are an inventory of available irrigation water, and irrigation trials on horticulture and fruit tree farming.

Project No. 1

1. Title

General survey of soil fertility on Santo Antao and Fogo islands (eventually S. Nicolau and Brava as well).

2. Justification

Past experience proves that fertilization is an efficient and rapid way of increasing soil productivity, especially when used in conjunction with improved seeds and plants adapted to local conditions. The efficiency of these techniques depends on the groundwork and preliminary trials proposed here.

3. Brief description

Leaf diagnosis of cultivated plants, whether local or introduced, trials in pots, and chemical analysis of soils should help identify the possible nutrient deficiency or surplus of soils, which will be mapped.

4. Project length

Two years.

5. Requirements

a. Human resources

- o One technical consultant (four months/year);
- o One senior technician; and
- o Two assistant technicians.

b. Equipment

- o One all-purpose vehicle;
- o One air-conditioned hothouse/greenhouse and warehouse;
- o Air-conditioner, humidifier, deionizer, precision and normal scales, laboratory hothouse and copier machine;
- o Pots for hothouse and greenhouse trials; and
- o Various other equipment for hothouse and greenhouse.

Soil and plant analysis will be performed at the INIACC laboratories, and funds will have to be provided for analyses that cannot be done there.

c. Budget in US\$

	First year	Second year
Technical consultant	PM	PM
Equipment	60,000	--
Operating expenses	15,000	15,000
Travel	10,000	5,000
Unexpected expenses	<u>15,000</u>	<u>5,000</u>
Total	US\$ 100,000	US\$ 25,000
		Grand Total US\$ 125,000

6. Expected results

- o Preparation of maps of soil fertility;
- o Last development stage for fertilization testing; and
- o More rapid development of fertilization and better adaptation.

Project No. 2

1. Title

Study of the use of brackish water for garden vegetable irrigation (Maio, Boavista, S. Vicente and Sal islands).

2. Justification

On these islands, drinking water supply is inadequate, even for human consumption. Irrigated land is very limited, and brackish water is used for irrigation.

It may be possible to increase the irrigated area and crop range, and to improve farming methods. Vegetable supply could thus be increased on these islands, and irrigation water could be available at reasonable cost and more regularly throughout the year.

3. Brief description

Sand farming, largely used in southern Spain, in the Canary Islands, and elsewhere under similar conditions, will be tried here, with the proper adaptations to currently cultivated crops or new crops. Other techniques suitable for the use of brackish water will also be tested.

4. Project length

Six to eight years.

5. Requirements

a. Human resources

- o One specialist (for four years);
- o One specialist (for two two-month stays per year, for four years);
- o One native agrologist;
- o Three native mid-level technicians;
- o Eight assistant technicians.

b. Equipment and supplies

- o Five all-purpose vehicles;
- o Local irrigation equipment;
- o Water pumping equipment; and
- o Various farm tools.

c. Budget in US\$

Specialists	PM
Equipment	125,000
Operating expenses	300,000
Travel	80,000
Unexpected expenses	<u>75,000</u>
Total	US\$ 580,000

6. Expected results

- o Improvement of national horticultural production;
- o Improvement in the nutrition of the population; and
- o Development of livestock production as a result of crop exploitation.

Project No. 3

1. Title

Introduction, adaptation and comparative study of irrigation water saving techniques for horticulture and fruit tree farming, in agricultural exploitation systems.

2. Justification

Although water is certainly the essential factor of soil productivity and even of human life in Cape Verde, it is one of the most wasted resources and one of the least studied and tested. It is now urgent to carry out studies and to test imported or improved local techniques for water use.

3. Brief description

Activities will include:

- o Inventory and selection of irrigation systems developed abroad;
- o Importation of selected systems;

- o Field trials on a large scale; and
- o Study, design and testing of systems adapted to local conditions.

4. Project length

Six years.

5. Requirements

a. Human resources

- o One specialist (for four years);
- o One native agronomist;
- o Four mid-level technicians; and
- o Eight assistant technicians.

b. Equipment

- o Six all-purpose vehicles;
- o Irrigation equipment; and
- o Farm tools.

c. Budget in US\$

Specialist	PM
Equipment	120,000
Operating expenses	315,000
Travel	60,000
Unexpected expenses	<u>75,000</u>

Total US\$ 570,000

6. Expected results

- o Improvement of national horticultural and fruit production;
- o Improvement of production in relation to the quantity of water used;
- o Improvement of the quality of plant production and protection; and
- o Development of farm production.

Project No. 4

1. Title

Study of and compensation for crop and edaphic-climatic factors limiting horticulture and fruit tree farming on Santiago, Santo Antao and Fogo islands.

2. Justification

Up until ten years ago, horticulture and fruit production were practically nonexistent. Horticulture started to develop after independence and garden vegetables and fruit now contribute significantly to the Cape Verdians' diet and to the national economy. Production could still be improved considerably through farming systems' improvement and fertilizer use.

3. Brief description

The project will consist of determining, from several farming systems, the following:

- o The proper rotation of crops;
- o The best seasons for each crop;
- o The fertilizers and quantities to be used; and
- o The farming techniques and systems best suited to each crop.

4. Project length

Four years.

5. Requirements

a. Human resources

- o One specialist (for four years);
- o One specialist (for two two-month periods each year for four years);
- o Three native agrologists;
- o Four mid-level technicians; and
- o Eight assistant technicians.

b. Equipment

- o Five all-purpose vehicles;
- o Irrigation equipment;
- o Production inputs;
- o Farming equipment; and
- o Scales.

c. Budget in US\$

Specialist	PM
Equipment	100,000
Operating expenses	425,000
Travel	80,000
Unexpected expenses	<u>90,000</u>
Total	US\$ 695,000

6. Expected results

- o Improved quantity and quality of national horticultural and fruit production;
- o Improved farm production;
- o Export opportunities for horticultural fruit products grown "out of season;" and
- o Positive influence of export on the Cape Verdian balance of payments.

B. Program No. 1B: Assessment of the Country's Renewable Natural Resources

Objectives

The use of renewable natural resources implies an exhaustive knowledge of their characteristics, so as to exploit them to best advantage without wearing them down. In a country where resources are inadequate, this knowledge is even more crucial. To ascertain the limits of exploitation, the land use suitability of the country has been mapped, and the vegetation map is being drawn. The former (1/25,000) provides general information about existing soil types. The latter shows vegetation types, without special reference to potential as pasture land.

Project No. 1

1. Title

Detailed mapping of soils suitable for agriculture, with physical and chemical description.

2. Justification

If agricultural production is to increase through the use of improved technologies, it is necessary to have a detailed knowledge of available soils, as well as their physical and chemical characteristics and the degree of erosion.

Productivity trials for dryland and irrigated farming are planned, and it is important to know the relevant soil characteristics in order to assess how representative they are on a national scale.

3. Brief description

The map of land use suitability classifies soils according to suitability based on eco-climate, relief, slope and physical characteristics as observed in the field.

For soils suited to agriculture, the assessment should be even more detailed, as follows:

- o Definition and physical and chemical characterization of soil units in each class;
- o Characterization of level and degree of erosion for each class;
- o Characterization of present and potential fertility;
- o Study of climate of zones;
- o Detailed study of water retention capacity for each soil unit; and
- o Drawing and characterization of agricultural or agro-climatic maps. For rainfed farming zones, the map should be 1/10,000, and for irrigated zones, 1/5,000.

4. Project length

Four years.

5. Requirements

a. Human resources

- o Two experts;
- o Technical consultants (for two months each year);
- o Two native technicians; and
- o Necessary assistants.

b. Equipment

- o Two all-purpose vehicles (Land-Rover type);
- o Field equipment; and
- o Laboratory equipment.

c. Annual budget in US\$ (first year)

Experts	PM
Technical consultants	PM
Equipment	40,000
Operating expenses	15,000
Travel	15,000
Miscellaneous	<u>10,000</u>
Total	US\$ 80,000

For subsequent years, budget does not include equipment..

6. Expected results

- o Farm use suitability maps for the different zones of the country;
- o Agro-climatic maps;
- o Knowledge of the fertility level of the most suitable land for agriculture;
- o Knowledge of the characteristics of land with potential as pasture;
- o Definition of technological characteristics for the soils best suited for agriculture; and
- o Use of the above results for designing farming systems.

Project No. 2

1. Title

Characterization and development of pastures in Cape Verde.

2. Justification

One of the constraints limiting the development of national livestock is the lack of pasture, due to drought or to soil deterioration by erosion and over-exploitation.

If the development goals set for livestock are to be reached, it is urgent to undertake characterization of pasture, multiplication trials for the best species, improvement of deteriorated areas, introduction of new species, etc. A research program is urgently needed in this sector.

3. Brief description

Activities to be undertaken:

- o Definition of land zones suitable for pasture;
- o Inventory of existing species;
- o Establishment of permanent parcels in each ecological zone for periodic observations of phyto-sociological evolution of species;
- o Collection of seeds from spontaneous legumes for multiplication;
- o Collection of nodules for identifying rhizobia and inoculating seeds;
- o Resowing trials with the legumes collected;
- o Introductory trials of exotic species; and
- o Bromatologic studies of major pastures.

4. Project length

Ten years.

5. Requirements

a. Human resources

- o One expert;
- o Two technical consultants (for two months each year);

- o One native technician; and
- o Necessary assistants.
- b. Equipment
- o All-terrain vehicles (Land Rover type)

c. Annual budget in US\$

Expert	PM
Technical consultants	PM
Equipment	45,000
Operating expenses	20,000
Travel	15,000
Miscellaneous	<u>8,000</u>
 Total	 US\$ 88,000

6. Expected results

- o Improvement in pasture production;
- o Reduction in livestock losses during drought;
- o Increase in livestock productivity;
- o Improvement in the population's diet; and
- o Zoning of land suitable for pasture.

C. Program No. 2: Improvement of Rainfed Crop Production

Objectives

One of the principal objectives of the government is to guarantee a minimum subsistence level to the population, through rational exploitation of existing natural resources.

Although the potential of dryland crops is limited by the uncertainty of rainfall, it is possible to improve the current production of most crops. With proper use of the soils in favorable climatic zones, it would be possible to introduce rainfed crops able to regularly provide part of the production needed by the country.

These soils cover about ten percent of the total dryland crops land, and it would certainly be possible to double the average yield. For the other 90 percent the potential increase in yield is lower, probably around 15 percent, depending on the ecological zone.

The dryland crop production could thus be increased by 20 percent if research is directed toward this goal.

Project No. 1

1. Title

Study of the production potential of the Angola pea.

2. Justification

Angola pea cultivation is very common in Cape Verde, particularly in sub-humid and humid ecological zones. This is an important crop as it can be used in human or animal diets, as a combustible fuel and for soil fixation. It is also very resistant to drought and yields consistently, even in poor conditions. A detailed study of the maximum potential of this crop should therefore be undertaken.

3. Brief description

Activities to be undertaken include:

- o Inventory and classification of local material;
- o Comparative study of existing material with respect to productivity, drought and pest resistance in the various ecological zones of the country;
- o Possible introduction of exotic material, study of its adaptability to local conditions and comparison with local plant material;
- o Study and improvement of traditional farming techniques; and
- o Impact study of soil and water conservation activities on production.

4. Project length

Six years.

5. Requirements

a. Human resources

- o One expert for three to four years;
- o Technical consultants (three months per year for three to four years);
- o Two native technicians; and
- o Necessary assistants.

b. Equipment

- o Two all-terrain vehicles (Land Rover type);
- o Six motorcycles;
- o Agricultural implements; and
- o Field laboratory equipment.

c. Budget in US\$ (first year)

One expert	PM
Technical consultants	PM
Equipment*	40,000
Operating expenses	10,000
Travel**	20,000
Training	10,000
Miscellaneous	<u>8,000</u>
Total	US\$ 88,000

* first year only.

** in-country and to foreign research center.

6. Expected results

- o Increase in crop production (from 90-150 kg/ha to 300-400 kg/ha);
- o Increase in area cultivated to 10,000 ha;
- o Ecological zoning of the crop;
- o Production increase and improvement in rural diet;
- o Reduction of erosion effects;
- o Improvement of livestock nutrition by use of leaves, branches and seeds not used by humans; and
- o Supply of firewood through trimming.

Project No. 2

1. Title

Improvement of maize and bean crops.

2. Justification

Maize and beans cover most of the land used in dryland crop farming in the country. The local plant material is not well-studied, especially with respect to adaptation and production potential in the different ecological zones. In the more humid zones and on better soils, yields could certainly be doubled. It is therefore necessary to undertake studies to increase production, particularly because maize and beans are staple foods. This project is a follow-up of previous efforts, carried out under a similar project financed by the EEC.

3. Brief description

The activities to be undertaken are:

- o Inventory and classification of local plant material;
- o Comparative study of inventoried material with respect to productivity and adaptation to ecological zones;
- o Possible introduction of exotic material, comparison with local material and improvement of selected local ecotypes;
- o Improvement of traditional farming techniques, and comparison of maize and bean production in single and intercropping;
- o Study of legume nodulation and its impact on soil fertility;
- o Impact study of soil conservation activities on crop productivity; and
- o Performance trial for imported sorghum varieties.

4. Project length

Six to ten years.

5. Requirements

a. Human resources

- o One expert for two years for legume study;
- o Technical consultants (for three months each year for four years);
- o Two native technicians; and
- o Necessary assistants.

b. Equipment

- o One vehicle (Peugeot 504 type);
- o One vehicle (Land Rover type);
- o Six motorcycles;
- o Farm implements; and
- o Field and laboratory equipment.

c. Budget in US\$ (first year)

Expert	PM
Technical consultants	PM
Equipment	45,000
Operating expenses	10,000
Travel*	20,000
Training	10,000
Miscellaneous	<u>10,000</u>
Total	US\$ 95,000

* between islands and research center.

The equipment component will not be included in budgets for subsequent years. During the sixth year of the project, the Peugeot-type vehicle and the six motorcycles will have to be replaced.

6. Expected results

In areas most favorable for these crops, the following results are expected:

- o Increase in average maize yield to 400-600 kg/ha;
- o Increase in average bean yield to 300-400 kg/ha;
- o Reduction in maize and bean imports and improvement in balance of payments;
- o Better use of limit zones for maize and sorghum crops;
- o Better diet for the rural population and increased production;
- o Ecological zoning of crops; and
- o Better feeding for livestock.

D. Program No. 3: Animal Diseases in Cape Verde

Objectives

- o Study the different diseases affecting the Cape Verdian livestock in order to raise productivity;
- o Establish control, elimination and eradication methods;
- o Reduce livestock losses due to diseases;
- o Establish preventive health care; and
- o Increase livestock productivity and hence the animal protein supply for the human population.

Project No. 1

1. Title

PEC/EP/07.09/001 - Fasciolosis: identification and control; identification and eradication of vectors.

2. Justification

In spite of the Cape Verdian climate, fasciolosis is very prevalent. Some studies on this disease are in progress, but they are not an adequate basis for a control program.

3. Brief description

The project will involve all parts of the country, with field work (technical visits to sources of water and slaughterhouses, sampling, etc.), office work and writing of a report.

4. Project length

Three years.

5. Requirements

a. Human resources

- o One veterinarian (expatriate specialist in parasitology);
- o Two sampling technicians;
- o One clerk;
- o One assistant for livestock identification; and
- o Personnel for animal pathology laboratory.

b. Annual budget in US\$

Expert	PM
Equipment	40,000
Operating expenses	15,000
Travel	15,000
Miscellaneous	<u>7,000</u>

Total US\$ 77,000

6. Expected results

- o Identification of vectors and eradication methods;
- o Identification of "Fasciola" biotopes and methods for reducing them; and
- o Establishment of control and eradication methods of fasciolosis.

Project No. 2

1. Title

PEC/EP/07.09/002 - Gastrointestinal parasite diseases of livestock.

2. Justification

No study has been made on gastrointestinal parasite diseases in Cape Verde, or on the economic losses they entail. An increase in livestock productivity through the elimination of limiting factors requires a study of parasite diseases and the design of a control program.

3. Brief description

The project is to involve all parts of the country and all domestic species. It will consist of field, laboratory and office work and will include a report.

4. Project length

Five years.

5. Requirements

a. Human resources

- o One veterinarian (same as Project 07.09/001);
- o Two sampling technicians;
- o One survey technician; and
- o Personnel for animal pathology laboratory.

b. Equipment

- o All-terrain vehicles;
- o Equipment for animal health care; and
- o Equipment for animal pathology laboratory.

c. Annual budget in US\$

Equipment	30,000
Operating expenses	15,000
Travel	10,000
Miscellaneous	<u>6,000</u>

Total US\$ 61,000

6. Expected results

- o Identification of gastrointestinal parasite diseases;
- o Assessment of potential losses; and
- o Establishment of a control and eradication program for gastrointestinal parasite diseases.

Project No. 3

1. Title

PEC/EP/07.09/003 - Protozoology and arachnoentomology of animal parasite diseases.

2. Justification

Parasite diseases and their vectors have never been studied in Cape Verde.

3. Brief description

The project will involve all the inhabited islands of Cape Verde and will include field, laboratory and office work as well as a report.

4. Project length

Two years.

5. Requirements

a. Human resources

- o One veterinarian (expatriate expert);
- o Two sampling technicians;
- o One clerk; and
- o Personnel for animal pathology laboratory.

b. Equipment

- o All-terrain vehicles;
- o Equipment for animal health care; and
- o Equipment for an animal pathology laboratory.

c. Annual budget in US\$

Expert	PM
Operating expenses	15,000
Equipment	30,000
Travel	15,000
Miscellaneous	<u>6,000</u>

Total US\$ 66,000

6. Expected results

- o Identification of parasite protozoa in Cape Verde;
- o Identification of arthropodal vectors of protozoa;
- o Impact on animal and human health care; and
- o Establishment of control and eradication program.

Project No. 4

1. Title

PEC/EP/07.09/004 - Study of parasite and infectious diseases in poultry.

2. Justification

Parasite diseases affecting poultry in industrial and traditional breeding are presently unknown. Identification of these diseases is necessary for eliminating factors limiting production.

Infectious diseases affecting poultry have never been studied in Cape Verde, in spite of a high mortality rate during a certain period of the year. In the commercial poultry breeding sector, prevention is carried out at random.

3. Brief description

Through field studies in the whole country, with support from a laboratory, the most frequent parasite diseases will be studied in the different ecological zones. For industrial poultry breeding, modern diagnostic methods will be used to study parasite diseases and to determine the appropriate control program.

Work will consist of sampling, field survey, laboratory and office activities. A report will be prepared on control, eradication and prevention methods.

4. Project length

Five years.

5. Requirements

a. Human resources

- o One veterinarian specializing in parasite diseases (same as Project 07.09/001);
- o Two field technicians;
- o One secretary; and
- o Laboratory personnel.

b. Equipment

- o Laboratory;
- o All-terrain vehicle; and
- o Equipment.

c. Annual budget in US\$

Equipment	30,000
Operating expenses	15,000
Travel	5,000
Miscellaneous	<u>5,000</u>
Total	US\$ 55,000

6. Expected results

- o Identification of parasite and infectious diseases in poultry in Cape Verde;
- o Determination of the control and eradication program to be followed;
- o Determination of preventive measures to be employed against parasite and infectious diseases affecting industrially and traditionally bred poultry; and
- o Identification of prevalence period for infectious diseases of poultry.

Project No. 5

1. Title

PEC/EP/07.10/001 - Study of infectious diseases in cattle.

2. Justification

The few observations made on infectious diseases in cattle show that it is necessary to carry out detailed studies in order to identify them and design control programs.

3. Brief description

The project is to involve every island in the country and will consist of field work (survey, sampling, etc.) and laboratory work, and will include a report suggesting a control program and preventive measures.

4. Project length

Five years.

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5. Requirements

a. Human resources

- o One veterinarian (expatriate expert specializing in infectious diseases);
- o Two technicians for blood sampling;
- o Two clerks for office work and surveys; and
- o One worker to put rings on animals' ears.

b. Equipment

- o All-terrain vehicles;
- o Equipment for an animal pathology laboratory; and
- o Equipment for animal health care.

c. Annual budget in US\$

Expert	PM
Equipment	40,000
Operating expenses	15,000
Travel	15,000
Miscellaneous	<u>7,000</u>
Total	US\$ 77,000

6. Expected results

- o Identification of infectious diseases in cattle;
- o Control and eradication program for the diagnosed infectious diseases; and
- o Preventive measures.

Project No. 6

1. Title

PEC/EP/07.10/002 - Study of infectious diseases in small ruminants.

2. Justification

Small ruminants play an important part in Cape Verde and will be even more important after reforestation is completed. Hence the necessity to identify the main infectious diseases affecting them and to define control, eradication and prevention methods.

3. Brief description

The project is to involve the entire country and will consist of field work (survey, sampling, etc.) and laboratory work. A report will be prepared.

4. Project length

Five years.

5. Requirements

a. Human resources

- o One veterinarian (same as Project 07.09/001);
- o Two technicians for blood sampling;
- o Two surveyors;
- o One worker to put rings on animals' ears; and
- o Personnel for an animal pathology laboratory.

b. Equipment

- o Equipped all-terrain vehicles;
- o Equipment for animal health care; and
- o Equipment for an animal pathology laboratory.

c. Annual budget in US\$

Equipment	20,000
Travel	10,000
Operating expenses	15,000
Miscellaneous	<u>5,000</u>

Total US\$ 50,000

6. Expected results

- o Identification of the principal infectious diseases in small ruminants; and
- o Establishment of control and eradication program for infectious diseases and preventive measures.

Project No. 7

1. Title

PEC/EP/07.10/003 - Study of infectious diseases in swine.

2. Justification

Losses due to infectious diseases in swine are numerous, and happen each year without advance indication of which area or period they will occur.

3. Brief description

The project is to involve the entire country and will consist of field work (survey, sampling, etc.) and laboratory work. A report will specify control and prevention measures to implement.

4. Project length

Five years.

5. Requirements

a. Human resources

- o One veterinarian;
- o Two technicians for blood sampling;
- o Two technicians for surveys; and
- o Personnel for an animal pathology laboratory.

b. Equipment

- o Equipped all-terrain vehicles;
- o Animal health care equipment; and
- o Equipment for the animal pathology laboratory.

c. Annual budget in US\$

Expert	PM
Operating expenses	15,000
Equipment	40,000
Travel	15,000
Miscellaneous	<u>7,000</u>
Total	US\$ 77,000

6. Expected results

- o Identification of infectious diseases in swine;
- o Determination of prevalent period; and
- o Control and eradication program for the diagnosed diseases, and preventive measures.

Project No. 8

1. Title

PEC/EP/07.11/001 - Study of animal diseases in Cape Verde.

2. Justification

There has been no study of animal diseases in Cape Verde so far, although numerous assumptions have been made on the basis of inadequate data. This study is made necessary by the social aspect of these diseases, as is a control and eradication program.

3. Brief description

The project is to involve every inhabited island and will consist of field, laboratory and office work. A report will be prepared.

4. Project length

Three years.

5. Requirements

a. Human resources

- o One veterinarian (expatriate);
- o One sampling technician;
- o Two survey technicians; and
- o Personnel for an animal pathology laboratory.

b. Equipment

- o All-terrain vehicle;
- o Equipment for animal health care; and
- o Equipment for an animal pathology laboratory.

c. Annual budget in US\$

Expert	PM
Operating expenses	15,000
Equipment	40,000
Travel	15,000
Miscellaneous	<u>7,000</u>
Total	US\$ 77,000

6. Expected results

- o Identification of existing animal diseases in Cape Verde;
- o Determination of the prevalence of animal diseases;
- o Determination of eradication methods;
- o Design of a control and eradication program; and
- o Establishment of preventive measures.

E. Program No. 4: Fish

Project No. 1

1. Title

Study of population dynamics and eco-biology.

Sub-projects

- o Deep-sea species used as bait for tuna;
- o Deep-sea species not used as bait;
- o Crayfish and shellfish;
- o Bottom-dwelling species;
- o Molluscs; and
- o Coral.

2. Justification

The stock of fish resources has been only roughly estimated in Cape Verde so far. The few estimates made to date indicate a large under-exploitation, but do not give a precise idea of the actual potential. This potential must be established if resources are to be exploited rationally and an exploitation policy is to be designed.

3. Brief description

The project will study the eco-biology and dynamics of species currently being caught and of species not yet exploited.

4. Project length

Five years.

5. Requirements

a. Human resources

In addition to the native personnel, some expatriate specialists will be needed.

b. Equipment

(1) On land

An oceanographic laboratory adequately equipped, including:

- o A biostatistics section;
- o An oceanography and physics section;
- o Offices and a library; and
- o A storage building for fishing gear.

(2) At sea

A 33 m ship with refrigerated hold, equipped with a physical oceanography laboratory and a biological oceanography laboratory, equipped for fishing with:

- o A bottom trawl;
- o A trawl with large opening;
- o A deep-sea trawl;
- o Long lines; and
- o Covos and cercos.

c. Training

The participation of native personnel in the project implies a training effort, in-country or abroad. Counterparts would thus be trained for the physics, chemistry and biostatistics specialists.

6. Budget

Considering the large amount of required material and human resources and training effort, the budget will have to be the subject of a special study.

7. Expected results

It is hoped that the project will result in the identification of stocks and potential for sea resources significant for the country, so that their rational exploitation can be programmed and a national fishing policy can be designed.

Project No. 2

1. Title

Fishing gear technology.

2. Justification

Fishing gear currently used in Cape Verde includes lines with live bait, hand lines, draw nets and covos and cercos. It is assumed that the use of alternative gear could enable fishermen to increase their catch, both of commercial species already known and of little caught or yet unknown species, living in unexplored areas.

3. Brief description

The project is designed to improve gear currently used, and for testing other gear, such as the cercos for tuna, long lines, emalhar nets, etc. and to select the most efficient ones. A first step will be to study bathymetry, the nature of sea-bed and the density of schools.

4. Project length

Five years.

5. Requirements

a. Human resources

Native management personnel and technical assistance by foreign specialists.

b. Equipment

(1) On land

- o One office for fishing statistics, with adequate equipment for analyzing gear performance;
- o One storage building with a range of different fishing gear;
- o One workshop for repairing and adapting gear.

(2) At sea

A 33 m long ship with refrigerated hold, equipped for studies on bathymetry, sea-bed nature, hydrologic conditions, location and density of schools, and suitable for operation with the different fishing gear, especially bottom, large vertical opening and deep-sea trawls, long lines, and covos and cercos.

c. Training

The participation of native personnel in the project implies a training effort, in-country or abroad, in order to provide native counterparts to foreign specialists.

6. Budget

Considering the large amount of human and material resources required, as well as the training effort to be undertaken, the budget will be the subject of a special study.

7. Expected results

Identification of fishing gear best suited to local conditions, in order to program their rational use.

F. Program No. 5: Assessment of Agrarian Systems in Cape Verde

Background and Objectives

Development policies require an exhaustive knowledge of environment, but very few reliable data are available about the characteristics of agrarian systems in Cape Verde.

The proposed studies aim at gathering information about production systems and about agricultural product marketing. A third study of one region attempts to describe the current situation.

These studies are designed to be operational: the analysis will lead to proposals for action and will attempt to obtain participation of the relevant population. Information collected will be systematically presented to and discussed with the people.

Project No. 1

1. Title

Analysis of the agrarian system in the Cape Verde islands.

2. Justification

It is essential to study the traditional sector because it is at the very center of development efforts. All too often, projects are production-oriented and their objectives do not take into consideration relations between activities or between social groups.

Data on farming methods, crop yields, irrigation systems and the division of labor are essential for the introduction of land reform, the management of national finances and the design of development projects.

This project is to carry out surveys on production systems, particularly in areas where development projects are planned.

3. Objectives

The planned survey will seek to establish the correlations between:

- o Eco-system features, such as rainfall, soils vegetation, soil/vegetation/climate relations;
- o Production system features, such as farming techniques (differences between islands), yields and irrigation; and
- o Social organization characteristics, such as access to inputs, labor distribution and foreign relations.

4. Methodology

The study will be carried out through surveys and analyses, in collaboration with producers.

Due to the island configuration, personnel should be trained on each island, to follow farming operations, measure production and seek correlations between systems. The farmers concerned will participate in every stage of the study. After processing, the data collected in the survey will be presented to the farmers and discussed with them.

The study of agrarian systems will include several steps and last for five years.

a. First phase

The first phase will consist of:

- o Collection and analysis of existing data;
- o Contacts with leaders (e.g., MDR, Party) and informally selected farmers' delegates; and
- o Selection of survey areas.

b. Second phase

The second phase will consist of data gathering.

c. Third phase

During this four-year phase, the study team will visit the selected zones every two months to collect new data and to present analyzed data to the farmers.

5. Requirements

a. Human resources

- o One expert;
- o One consultant agronomist (for two months);
- o Three native technicians; and
- o Assistants.

b. Equipment

- o One copier machine; and
- o Calculator.

c. First-year budget in US\$

Daily allowances	40,000
Equipment	10,000
Operating expenses	5,000
Travel	4,000
Miscellaneous	<u>6,000</u>

Total US\$ 65,000

In subsequent years, equipment will no longer be a budget item.

6. Expected results

This study will provide data on the following points:

- o Production and yields of the main crops;
- o Farming techniques;
- o Irrigation systems; and
- o Land tenure systems.

Knowledge about these systems should facilitate the design of development projects and of the Second Development Plan.

Project No. 2

1. Title

Study of agricultural produce marketing in Cape Verde.

2. Justification

Because domestic trade usually reflects the economic structure of a country, it should be studied to obtain useful information for planning and for development projects.

There have to date been no studies on the marketing of agricultural produce in Cape Verde; the present project is intended to fill this gap.

3. Brief description

The project consists of three phases and deals with the physical, sociological, institutional and economic aspects of marketing.

The system description phase will study principally the volume of goods produced and marketed, location of production zones, transport infrastructures, weights and measures, and flow charting.

The sociological aspect will deal with the people in charge of gathering and distributing (particularly women, who play an important part in produce marketing), with state companies and with credit. On the economic level, study will include pricing at production level, gross margins, and profit use.

The second phase of the study will assess physical, sociological and economic situations, communications between production and consumption zones, transport and storage equipment, and marketing channel adaptation to sociopolitical and economic reality.

A third phase will propose improvement measures: technical measures, new infrastructure, creation of cooperatives, credit intervention, etc.

4. Survey objective

The survey will be designed to study the following points

- o Describe commercial techniques and behaviors;
- o Inventory internal channels (on the islands and between the islands) and external networks;
- o Measure produce quantities sold by producers;
- o List volume and weight of produce marketed; and
- o Measure price variations between both ends of marketing circuits.

5. Methodology

a. Location and subjects of survey

The marketing study will include a survey of agricultural producers, especially from development project zones, state companies which supply a significant part of marketed produce, the state company responsible for seed marketing (FAP) and the major markets.

Surveys will be carried out on several islands, to take into account Cape Verde's insularity and to describe the inter-island trade.

The islands and surveys involved are the following:

- o Santiago: survey of producers, the state companies of S. Domingos and Justino Lopes, and the Praia and Santa Catarina markets;
- o S. Vicente: survey of the Mindelo market and producers;
- o Fogo: survey of producers, the state company of Monte Genebra and the S. Filipe market;
- o Santo Antao: survey of producers and state companies; and
- o S. Nicolau: survey of producers.

b. Produce to be studied

The produce to be studied is the following:

(1) Irrigated crops (regadido):

- o Garden vegetables;
- o Bananas; and
- o Sugar cane.

(2) Rainfed crops (sequeiro):

- o Maize;
- o Beans;
- o Cassava and sweet potatoes; and
- o Fruit and coffee on Fogo and Santo Antao.

6. Project length

The marketing study is planned for five years. There will be two phases:

a. First phase

This will be a preparatory phase of four months, which will emphasize:

- o Collection of documentation;
- o Meetings with managers of state companies, of marketing companies, and of the MDR;
- o Selection of survey zones for survey of producers; and
- o Training of survey personnel (Rural Survey Service and MDR personnel).

The study team will spend one week on each island selected.

b. Second phase

The survey system will be implemented in the various islands. A first series of data will be collected, which will be used as a basis for defining and formulating the permanent data-gathering system on marketing at different levels: state companies, producers, and markets.

7. Requirements

a. Human resources

- o One expert;
- o Three native technicians; and
- o Assistants.

b. Equipment

- o Gestetner offset machine.

c. First-year budget in US\$

Equipment	50,000
Operating expenses	5,000
Travel between islands	5,000
Miscellaneous	<u>10,000</u>

Total US\$ 70,000

In subsequent years, equipment will not be a budget item.

8. Expected results

The study of agricultural produce marketing will provide information about marketing channels, different stages in pricing and possible bottlenecks. It will describe existing marketing systems and propose measures to improve them.

Project No. 3

1. Title

Survey of the development of the Assomada-Ribeira de Barca region (Santa Catarina council - Santiago).

2. Justification

This region is a high plateau mainly devoted to livestock breeding and rainfed crops, with deep valleys where crops are irrigated.

Considering the erosion resulting from a hilly relief and the disordered development of housing on this agricultural land, the government has planned to develop the region.

On the basis of a geo-graphological map, different zones have been defined: urban development; industrial; agricultural (irrigated and rainfed land, pasture); and environmental conservation.

The proposed study is to analyze the existing systems in order to define agricultural potentials and to find solutions.

The analysis will seek to establish the correlations between the ecosystem, the production system, and social organization. This triple analysis is needed; a historical analysis of these systems will also be carried out.

3. Objectives

The survey will deal with the following:

a. Eco-system features:

- o Rainfall;
- o Soils;
- o Vegetation; and
- o Soil/vegetation/climate relations.

b. Characteristics and changes of rural systems

(1) Production system

- o Farming techniques;
- o Production levels; and
- o Livestock breeding methods.

(2) Social organization system

- o Land tenure system;
- o Access to inputs;
- o Labor distribution; and
- o Foreign relations (supply, marketing).

4. Methodology

This project is based on surveys and survey analysis, including the participation of farmers in the internal analysis. Information obtained from farmers when they are motivated is as reliable as external analysis and much easier to gather. It can be used as a basis for common discussion.

Different approaches should be considered for the farmers to participate in the survey, so that surveys are not just instruments of power, but jointly-managed instruments able to mobilize the population around a common project. The "consciousness raising" type of survey

is one of these methods. Problem awareness and problem solving attitudes can be inferred from actions carried out by the population as an answer to problems.

As this type of action implies long periods of implementation, the project proposes to train officers from the Rural Survey Service (GIR) to do this type of work. They in turn will train the personnel responsible for surveying and activities.

The first phase will consist of obtaining a more profound understanding of the environment through a triple analysis of systems. The second phase, after identification of the major active groups in selected zones, will carry out research on subjects selected and defined with the population.

5. Location

The project will be based in northwestern Santiago, in the Santa Catarina council. It involves 45 zones with a total population of 35,000.

6. Project length

The study should last for three years.

During the first phase, the study team will set up the structures to enable community participation and data collection. Survey results will be studied and then released to and discussed with the relevant communities.

During the subsequent phases data will be collected and proposals for action will be designed.

The team will collaborate with the extension services and a team of rural promoters.

7. Requirements

a. Human resources

- o One socio-economic expert;
- o One consultant agronomist (for two months);
- o Four native technicians; and
- o Rural promoters and extension agents.

b. Equipment

- o One Peugeot station wagon;
- o One portable generator;
- o One slide projector; and
- o One tape recorder.

c. First-year budget in US\$

Consultant agronomist	PM
Land use consultant	PM
Daily allowances	30,000
Equipment	20,000
Operating expenses	10,000
Miscellaneous	<u>6,000</u>

Total US\$ 66,000

In subsequent years, equipment will no longer be a budget item.

8. Expected results

The study seeks to define proposals for action in accordance with the relevant communities. Its results should enable the government to program development for this important region of Santiago.