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PD-AAG-417

UNITED STATES GOVERNMENT

memorandum

662000200420

Only copy.

July 31, 1979

Project Committee

Seychelles Food Crops Research (662-0001)

2

Mr. Alexander R. Love, Director, REDSO/EA

August, 1979

Problem: AA/AFR has redelegated authority to you to approve and authorize the Food Crops Research project in Seychelles. The total life of project cost is $1,520,000. A PID for the project has been reviewed and approved by AID/W, and a Project Paper has been prepared and cleared by the Ambassador to Kenya and Seychelles and the Charge d'Affaires in Victoria.

Discussion: The Seychelles Food Crops Research project will assist the Government of Seychelles to expand and strengthen its capability to (a) conduct applied and adaptive food crop research, (b) extend selected, proven results of the research to smallholder farmers and (c) protect the agriculture sector from the introduction of pests and diseases from abroad. Assistance will be directed at improving the quality and quantity of information concerning the natural and technical constraints to food crop production. The number of trained research and, to a lesser extent, extension personnel will also be increased. Outreach of the results of applied and adaptive research in horticulture, plant pathology and soil science will stretch in two directions: from the agricultural research station (GAC) to the Seychellois farmer and from the GAC to other countries in the Indian Ocean, to other international agricultural research centers dealing in tropical agriculture and to a U.S. university with experience in tropical horticulture. Collaboration with the Peace Corps has been incorporated in the project to reinforce the outreach effort to Seychellois farmers through the extension service.

The project will be incrementally funded. AID will grant $450,000 to the Seychelles in FY 1979 and $570,000 in FY 1980 and $500,000 in FY 1981, subject to the availability of funds.

The A.I.D. grant assistance will be used to finance a contract with a U.S. university to provide the long-term services of a Horticulturalist (3 years), a Plant Pathologist (3 years) and a Soil Scientist (1 year), plus short-term advisory services in entomology, soil science and evaluation. Short-term training will also be provided in research methodology, plant protection, plant pathology, soil science and plant quarantine. Laboratory equipment and supplies will be purchased with grant funds to establish a joint plant pathology and soil laboratory

at the research station. Funds have also been budgeted in the project for the international travel of Seychellois research and agricultural officers to attend seminars and conferences on topics in tropical agriculture and to enable the GOS to host such a conference prior to completion of the project. The Peace Corps will provide the services of two Volunteers in horticulture and extension for four years each. The GOS will contribute the equivalent of $560,000 for the full- and part-time services of research and agricultural personnel, commodities, renovation of laboratory space and other costs.

The project has been reviewed by the REDSO/EA project committee and has been found to satisfy relevant legal requirements and A.I.D. rules and regulations.

An Initial Environmental Examination (Annex M of the Project Paper) has been prepared for the project, and the REDSO/EA Threshold Decision for a Negative Determination has been concurred in by AID/W.

A waiver for the procurement of two vehicles from countries included in A.I.D. Geographic Code 935 is attached to the Project Paper (Annex I) for your approval.

Recommendation:

It is recommended that you (1) approve the project by initialling this memo and (2) authorize the project by signing the attached PAF subsequent to receipt of allotment numbers and notice that the congressional notification period has expired.

Attachments:
PAF I and PAF II
Project Paper with Annexes

Drafter: DBlane: bk

Clearances of the Project Committee:
Mr. George Rublee
Mr. John Lewis
Mr. Robert Lester
Mr. Brandon Robinson
Ms. Helen Soos
Mr. Curtis Andersen (prepared the approved IEE)

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PAF II

Name of Country: Seychelles
Name of Project: Food Crops Research
Number of Project: 662-0001

Pursuant to Part I, Chapter I, Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize a Grant to the Seychelles (the "Cooperating Country") of not to exceed Four Hundred Fifty Thousand United States Dollars ($450,000) (the "Authorized Amount") to help in financing certain foreign exchange and local currency costs of goods and services required for the project as described in the following paragraph.

The project will assist the Grantee in its efforts to expand and strengthen its capability to (a) conduct applied and adaptive food crop research, (b) extend selected proven results of such research to smallholder farmers and (c) protect the agriculture sector from the introduction from abroad of pests and diseases. Assistance provided under the project will be directed at improving the quality and quantity of information available to the Grantee concerning natural and technical constraints to food crop production and will increase the number of trained research and, to a lesser extent, extension personnel. A.I.D. assistance will include financing for technical services, participant training, commodity procurement and certain other costs.

I approve the total level of A.I.D. appropriated funding planned for this project of not to exceed One Million Five Hundred Twenty Thousand United States Dollars ($1,520,000), Grant, including the funding authorized above, during the period FY 1979 through FY 1981. I approve further increments during that period of Grant funding up to $1,070,000, subject to the availability of funds in accordance with A.I.D. allotment procedures.

I hereby authorize the initiation of negotiations and execution of the Project Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority subject to the following essential terms and covenants and major conditions as A.I.D. may deem appropriate:

a. Source and Origin of Goods and Services

Goods and services, except for ocean shipping and except as provided in paragraph c below, financed by A.I.D. under the project shall have their source and origin in the Cooperating Country or in the United States except as A.I.D. may otherwise agree in writing. Ocean shipping financed under the Grant shall be procured in the U.S. except as A.I.D. may otherwise agree in writing.

b. Covenants

The Grantee will covenant, in substance, as follows:

1. To keep A.I.D. advised of any changes in its pricing policy for fruits and vegetables and to consult with A.I.D., at mutually agreeable times, concerning pricing policy and its effects on the project.

2. To provide, on a timely basis, all required counterpart personnel and candidates for participant training as these are identified in the amplified description of the project agreement; and to recruit and employ such technicians as may be required for the plant pathology and soils analysis laboratories and such other personnel as may be necessary for the implementation of the project.

3. To take such steps as may be necessary to assure that the use of pesticides on the project is consistent with A.I.D.'s environmental regulations on the procurement and use of pesticides.

c. Waivers.

Based on the justification contained in Annex I of the Project Paper, the following waiver to A.I.D. regulations is hereby approved:

The requirement under Handbook I Supplement B that commodities procured with grant funds have their source and origin in the U.S. (A.I.D. Geographic Code 000) is waived to permit the procurement of two project vehicles at an approximate cost of $20,000, which have as their source and origin countries included in A.I.D. Geographic Code 935 (Special Free World). It is hereby determined that exclusion

of procurement of the project vehicles from countries included in Code 935 would seriously impede attainment of U.S. foreign policy objectives and the objectives of the foreign assistance program and the special circumstances exist which justify waiver of the requirement of Section 636(i) of the Act.

Alexander R. Love, Director
REDSO/EA, Nairobi

Aug 24, 1979
Date

Drafter: RLester: bk

Clearances: DBlane (draft)
GRublee
JLewis
BRobinson
HSoos
EAAC: GRobinson

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: A (A = ADD, C = CHANGE, D = DELETE) — PP
2. DOCUMENT CODE: 3

3. COUNTRY/ENTITY: SEYCHELLES

4. DOCUMENT REVISION NUMBER: Original

5. PROJECT NUMBER (7 digits): 662-0001

5. BUREAU OFFICE: A. SYMBOL: AFR; B. CODE: 06

7. PROJECT TITLE (Maximum 40 characters): Food Crops Research

8. ESTIMATED FY OF PROJECT COMPLETION: FY 83

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 79; B. QUARTER 4 (Enter 1, 2, 3, or 4); C. FINAL FY 81

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 –)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL	408	42	450	1,464	56	1,520
(GRANT)	(408)	(42)	(450)	(1,464)	(56)	(1,520)
(LOAN)	(–)	(–)	(–)	(–)	(–)	(–)
OTHER U.S. 1. Peace Corps	13	24	37	27	48	75
OTHER U.S. 2.						
HOST COUNTRY	–	169	169	–	560	560
OTHER DONOR(S)						
TOTALS	421	235	656	1,491	664	2,155

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 79 F. GRANT	E. 1ST FY 79 G. LOAN	H. 2ND FY 80 I. GRANT	H. 2ND FY 80 J. LOAN	K. 3RD FY 81 L. GRANT	K. 3RD FY 81 M. LOAN
(1) FN	111	080	–	450	–	570	–	500	–
(2)									
(3)									
(4)									
TOTALS				450	–	570	–	500	–

A. APPROPRIATION	N. 4TH FY ___ O. GRANT	N. 4TH FY ___ P. LOAN	Q. 5TH FY ___ R. GRANT	Q. 5TH FY ___ S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1)					1,520	–
(2)						
(3)						
(4)						
TOTALS					1,520	–

12. IN-DEPTH EVALUATION SCHEDULED: MM 07 YY 83

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

2 (1 = NO, 2 = YES)

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: Alexander R. Love

TITLE: Director, REDSO/EA, Nairobi

DATE SIGNED: MM 05 DD 14 YY 79

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

AID 1330-4 (3-78)

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT IDENTIFICATION DOCUMENT FACESHEET

To Be Completed By Originating Office

1. TRANSACTION CODE: [C] A = Add, C = Change, D = Delete

PID

2. DOCUMENT CODE: 1

3. COUNTRY/ENTITY: SEYCHELLES

4. DOCUMENT REVISION NUMBER: Face Sheet only

5. PROJECT NUMBER (7 digits): 662-0001

6. BUREAU/OFFICE: A. Symbol: AFR; B. Code: 06

7. PROJECT TITLE (maximum 40 characters): Food Crops Research

8. PROPOSED NEXT DOCUMENT: A. [3] (2 = PRP, 3 = PP); B. DATE (MM YY): 07 79

10. ESTIMATED COSTS ($000 or equivalent, $1 =)

FUNDING SOURCE	Life of Project
a. AID Appropriated	1,520
b. OTHER U.S. 1. Peace Corps	75
b. OTHER U.S. 2.	
c. Host Country	560
d. Other Donor(s)	
TOTAL	2,155

9. ESTIMATED FY OF AUTHORIZATION/OBLIGATION: a. INITIAL FY 79; b. FINAL FY 81

11. PROPOSED BUDGET AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. Grant	PRIMARY TECH. CODE D. Loan	E. FIRST FY 79 F. Grant	E. FIRST FY 79 G. Loan	LIFE OF PROJECT H. Grant	LIFE OF PROJECT I. Loan
(1) FN	111	080	-	450	-	1,520	-
(2)							
(3)							
(4)							
			TOTAL	450	-	1,520	-

12. SECONDARY TECHNICAL CODES (maximum six codes of three positions each): 023 | 075 | 968

13. SPECIAL CONCERNS CODES (maximum six codes of four positions each): BS | R/AG

14. SECONDARY PURPOSE CODE: 121

15. PROJECT GOAL (maximum 240 characters)

Increased food production and income for small farmers.

16. PROJECT PURPOSE (maximum 480 characters)

To expand and strengthen the GOS DOA's capability to (a) conduct applied and adaptive research, (b) extend select proven results to small farmers and (c) protect Seychelles' agriculture from the introduction of exotic pests and diseases from abroad.

17. PLANNING RESOURCE REQUIREMENTS (staff/funds)

N.A. Completed March 1979.

18. ORIGINATING OFFICE CLEARANCE

Signature: Alexander R. Love

Title: Director, REDSO/EA, Nairobi

Date Signed (MM DD YY): 02 14 79

19. Date Document Received in AID/W, or for AID/W Documents, Date of Distribution

N.A.

MM DD YY

AID 1330-2 (3-76)

SEYCHELLES - FOOD CROPS RESEARCH
662-0001

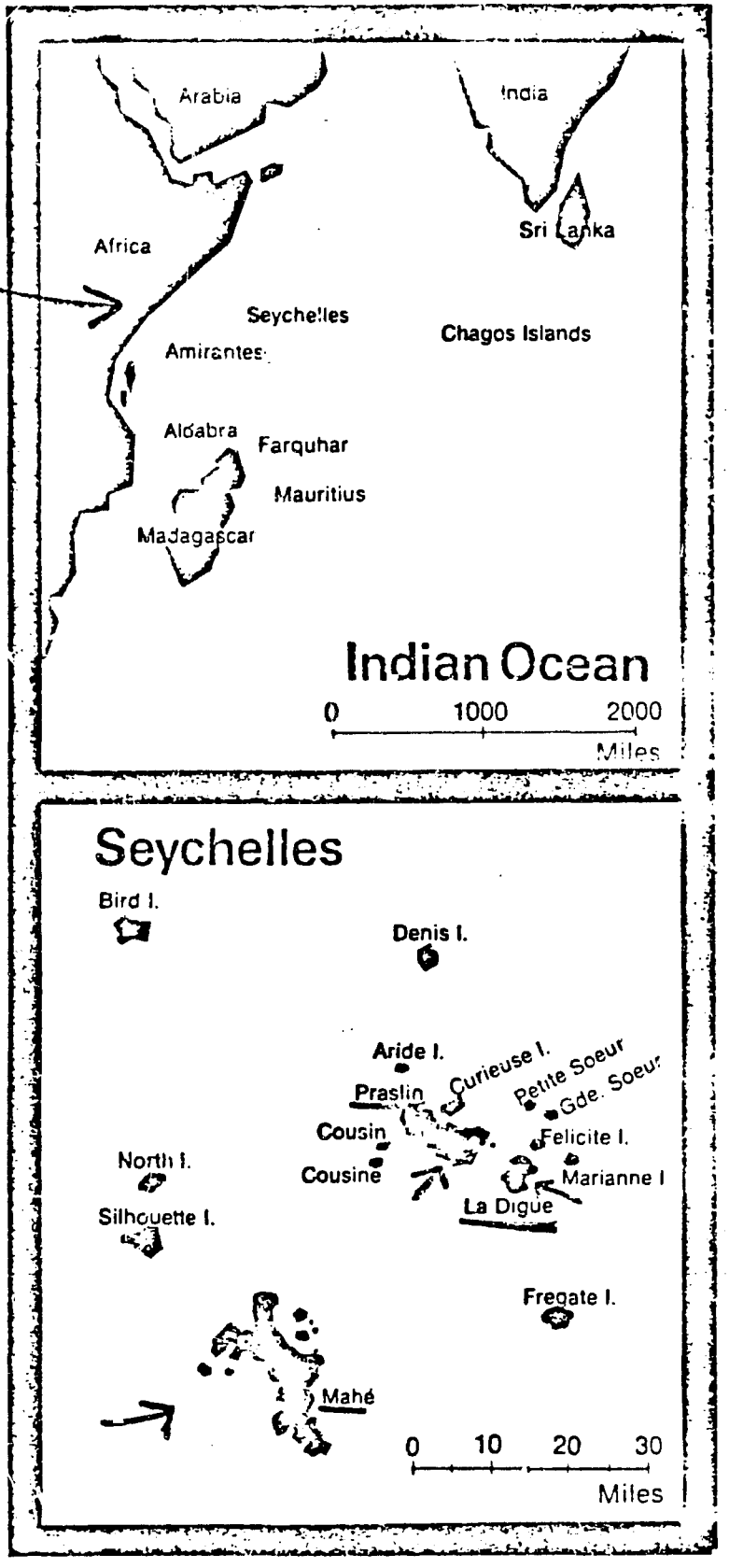
VI. ANNEXES

A. GOS Official Request for Assistance
B. PID Approval Cable, State 021326 dated 1/26/79
C. Other Donor Assistance in the Agricultural Sector
D. Logical Framework
E. Position Description - Horticulturalist
F. Position Description - Plant Pathologist and Entomologist
G. Position Description - Soil Scientist (long-term and short-term)
H. Combined Equipment List
I. Vehicle Source and Origin Waiver
J. Peace Corps Project Summary Sheet
K. Additional Economic Data
L. Checklists
M. Initial Environmental Examination
N. Detailed Budgets and Cost Analyses

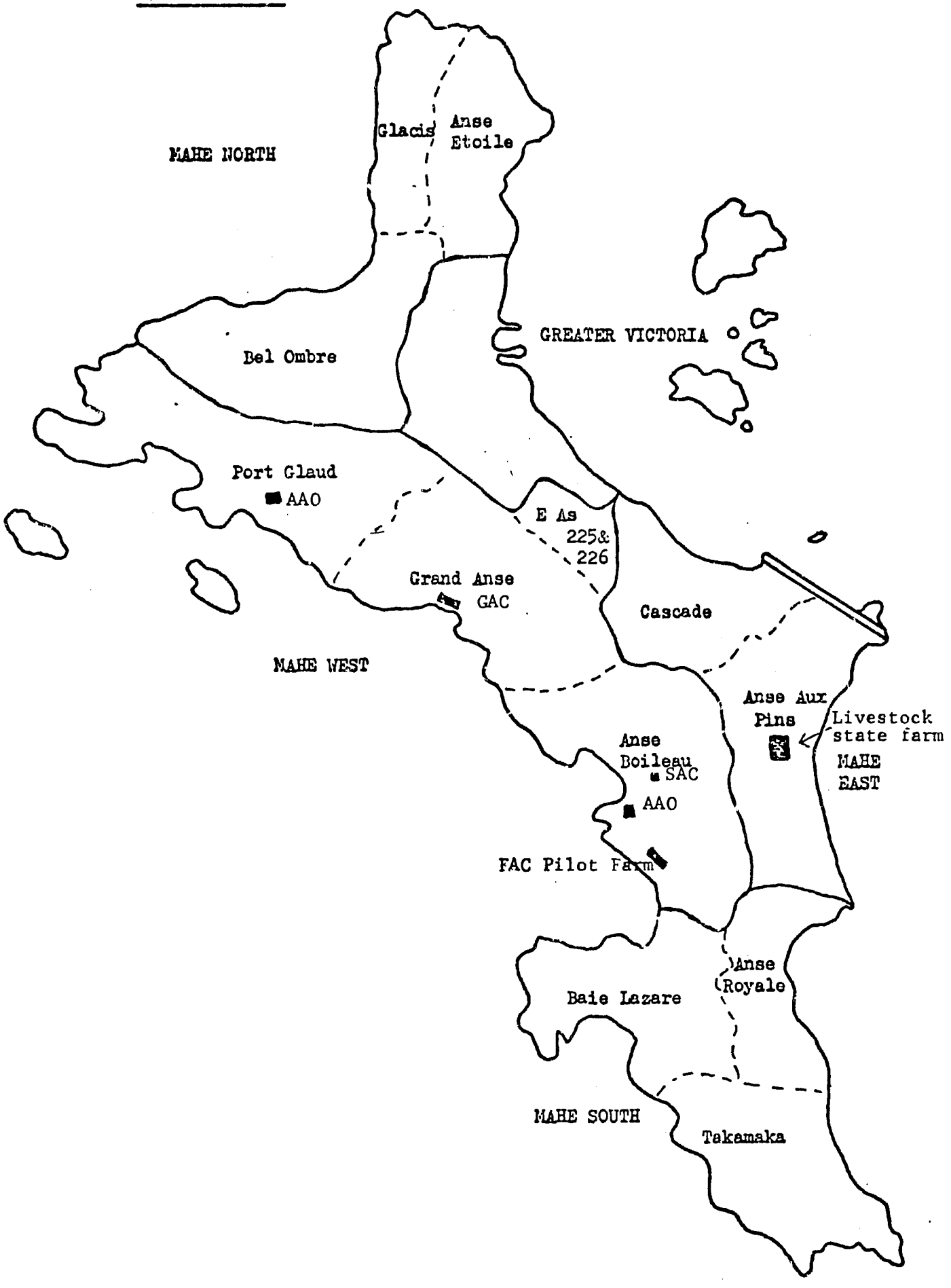
B. Abbreviations

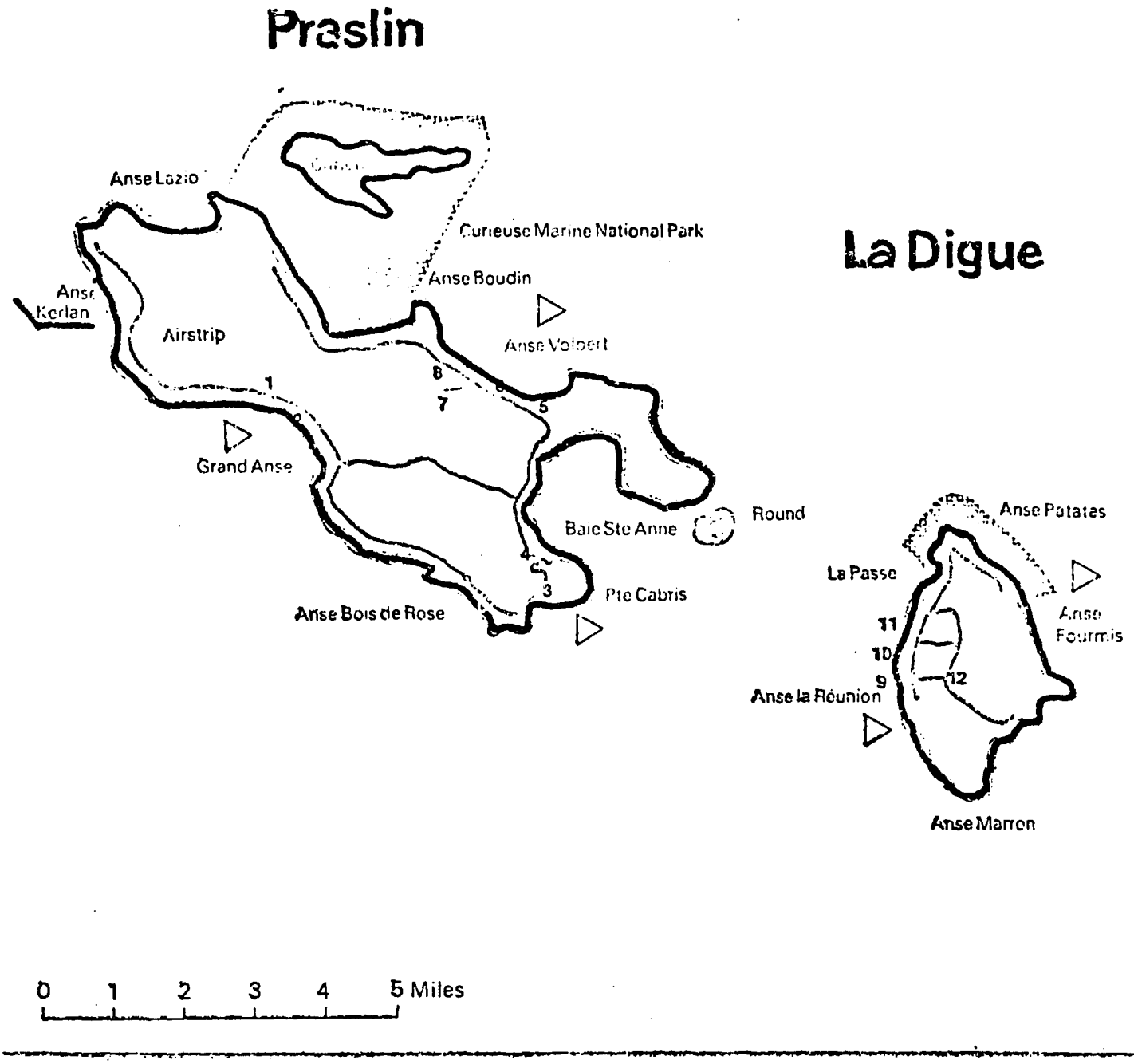
AAO	Area Advisory Officer
AVRDC	Asian Vegetable Research and Development Center (Taiwan)
DOA	Department of Agriculture and Land Use
EA	Environmental Assessment
FAC	Fonds d'aide et de Cooperation (French Government assistance agency)
FTC	Farmer Training Center
FY	Fiscal Year
GAC	Grand Anse Experimental and Food Production Center
GDP	Gross Domestic Product
GNP	Gross National Product
GOS	Government of the Republic of Seychelles
IEE	Initial Environmental Examination
IITA	International Institute of Tropical Agriculture (Ibadan, Nigeria)
OAU	Organization of African Unity
PID	Project Identification Document
PP	Project Paper
RS	Seychelles Rupees
SFM	Seychelles Farmers Marketing Cooperative Society Ltd.
SNIC	State National Investment Corporation

C. MAPS OF SEYCHELLES, INCLUDING THE MAIN ISLANDS OF MAHE, PRASLIN AND LA DIGUE



MAHE DISTRICTS




Praslin
Anse Lazio
Curieuse Marine National Park
Anse Boudin
Anse Kerlan
Airstrip
Anse Volbert
1
8
7
5
Grand Anse
Round
Baie Ste Anne
4
3
Pte Cabris
Anse Bois de Rose
La Digue
Anse Patates
La Passe
Anse Fourmis
11
10
9
12
Anse la Réunion
Anse Marron
0 1 2 3 4 5 Miles

Source: 1977 Census Report, Republic of Seychelles, April 1978.

D. BASIC DATA

CENSUS DATE	1st AUGUST 1977	
LAND AREA	171.4 sq mls (444 sq kms)	
MAHE GROUP	59.3 sq mls (154 sq kms)	
PRASLIN GROUP	17.3 sq mls (45 sq kms)	
LA DIGUE GROUP	5.6 sq mls (15 sq kms)	
OTHER ISLANDS	89.2 sq mls (230 sq kms)	
NUMBER OF ISLANDS	Over 100 1/	
GRANITIC ISLANDS	40 (excluding rocks)	
CORALLINE ISLANDS	Over 60 1/	
POPULATION	61,900	
MAHE GROUP	54,600	(88%)
PRASLIN GROUP	4,300	(7%)
LA DIGUE GROUP	1,900	(3%)
OTHER ISLANDS	1,100	(2%)
URBAN POPULATION (those living in Victoria and its suburbs)	23,000	(37%)
FERTILITY, MORTALITY AND POPULATION GROWTH	Fertility: the average number of children borne in the lifetime of a woman is 4.1 Infant mortality rate: 32.3 per 1,000 live births (1976) Life expectation at birth: males 62.5 females 69.9 (1971-75 data) Crude birth rate: 27.7 per 1,000 (1976) Crude death rate: 7.9 per 1,000 (1976) Rate of natural increase: 19.8 per 1,000 (1976) Population growth rate: 2.1%	
SEX AND AGE	99 females per 100 males. 40% of the population is under 15 years old. 6% of the population is 65 or over.	
NATIONALITY	4% of the population is Non-Seychellois.	

1/ Due to the lack of a definition on "an island", it would be improper to quote an exact number; it is generally recognized that the group consists of around 100 named islands.

EDUCATION	95% of the population eligible for primary education is attending school. 44% of the population eligible for basic secondary education is attending school.
ECONOMIC ACTIVITY	42,400 people aged 12 years or over. 23,400 actively employed 2,600 seeking work 5,900 students 10,500 inactive Activity rates of population aged 15-64; males 89%; females 57%.
HOUSING	11,650 houses. 39% stone or concrete blocks. 57% wood and corrugated iron. 4% palm leaves and lattice.
HOUSEHOLDS	12,660 households. Average household size-5 persons.
TRANSPORT	15% of the households have their own motorised transport.
MEDIA	86% of the households have a radio.
AGRICULTURE	2,300 cattle. 10,600 pigs. 340 Small holders 4,029 working population in agriculture 2,900 long tons of copra exported in 1977. 800 long tons of cinnamon bark exported in 1977. 800 fishermen.

E. PROJECT DESIGN TEAM

Rural Development Specialist	Madison Broadnax, Ph.D.,Agriculture Pacific Consultants
Plant Pathologist	Walter Kaiser, Ph.D.,Plant Pathology U.S. Department of Agriculture (Washington State University,Pullman WA)
Soil Scientist	Tung-Ming Lai, Ph.D., Soil Science Pacific Consultants
Agricultural Economist	Helen Soos REDSO/EA, Nairobi
Project Officer	Dianne Blane REDSO/EA, Nairobi
Agricultural Research Officer	Cliff Adam, B.Sc., Agriculture Chief Research Officer Grand Anse Experimental and Food Production Center GOS Department of Agriculture and Land Use
Agricultural Extension Officer	Antoine Young, B.Sc.,Agriculture Area Advisory Officer, North Mahe GOS Department of Agriculture and Land Use

SITE VISITS

Grand Anse Experimental and Food Production Center, Grand Anse

FAC-supported pilot farm, Anse à la Mouche

State farm, Anse aux Pins

Settlements at Rose Belle

Port Glaud

Anse Boileau

L'Amitie (Praslin)

Farmer Training Center, Anse Boileau

Seychelles Agricultural Corporation, Anse Boileau

Airport , Pest and Disease Control Office

Area Advisory Offices, Anse Boileau and Port Glaud

Seychelles Farmers Marketing Cooperative, Port Victoria Market

F. Summary Description of the Project

In response to an informal request by the Government of the Republic of Seychelles (GOS) for AID assistance in the agricultural sector, a project to extend the results of applied and adaptive agricultural research to small farmers and to protect agriculture from the introduction of pests and diseases from abroad has been jointly identified and designed. The formal request for assistance has been received from the GOS (Annex A), concurrent with its review and clearance of this Project Paper, which represents the product of a collaborative design effort. A Project Identification Document (PID) was approved by AID/W in January 1979; guidance contained in the PID approval cable (Annex B) has been followed in the design of the project.

This four-year project focuses on minimizing the risks now taken by small farmers in producing food crops (primarily vegetables and fruits) on infertile soil, with unpredictable rainfall, and involving imported or local seed varieties which are not always adaptable to the tropical climate and which are susceptible to various pests and diseases. Although the project has been designed with specific outputs after four years, it must also be recognized that the elimination of risks to small farmers of growing food crops may, and more than likely will, take longer than four years. For this reason, consideration should be given to extending the project or designing a follow-on project dependent upon an evaluation of the success achieved within an initial four years.

Potential beneficiaries of the project are those Seychellois and their families who are currently engaged in agricultural activities, either full-time or part-time. This group represents about 5% of the population of Seychelles and can be classed in the lowest income level. A sub-group, and the primary beneficiaries of the project, are the "poorest of the poor" - the small farmer and his family who depend entirely on food crop production for their livelihood.

Applied and adaptive research activities in horticulture, plant pathology and soil science will be conducted at the Grand Anse Experimental and Food Production Center on the main island of Mahe. Efforts will also be concentrated on extending the research results to the small farmers through the extension service. Collaboration with the Peace Corps will reinforce this outreach. Project inputs are summarized below:

AID

Technical Services		$959,400
Long-Term		
Horticulturalist for 3 years		
Plant Pathologist for 3 years		
Soil Scientist for 1 year		
Short-Term		
Entomologist for a total of 6 months		
Soil Scientist for a total of 2 months		
Evaluation		
Participant Training, all short-term		53,900
U.S.		
Plant Protection - 3 months		
Plant Pathology - 6 months		
Soil Science - 3 months		
Plant Quarantine - 3 months		
Third Country		
Horticulture (AVRDC/Taiwan, Hawaii)	- 1 month	
Research Methodology (IITA/Nigeria)	- 1 month	
Orientation (Indian Ocean)	- 1 month	
Plant Quarantine	- 3 months	
Commodities		106,000
Laboratory equipment and supplies		
Vehicles		
Technical literature, subscriptions		
Other Costs		38,500
In-country travel		
Conference (hosted)		
International travel to conferences		
Memberships in professional organizations		
Travel for contractor selection		
Miscellaneous operating expenses		
Contingencies		115,780
Inflation		244,570
	Total	$1,520,000 (rounded) (71%

PEACE CORPS — Total — $75,000 (rounded) (3%)

Technical Services
- Horticulturalist for 4 years
- Extension Agriculturalist for 4 years

Other Costs

GOVERNMENT OF SEYCHELLES		2 ,8 .	
Technical Services Full-time Part-time		238,300	
Construction/Renovation		5,010	
Commodities		20,600	
Other Costs		155,200	
Contingencies and Inflation		137,100	
	Total	$560,000 (rounded) (26%)	
	GRAND TOTAL	$ 2,155,000	

II. PROJECT BACKGROUND

A. General Setting

The Seychelles archipelago, situated 4 to 10 degrees south of the equator, covers an area of 400,000 square miles in the Indian Ocean. Its estimated 100 granitic and coralline islands have a land area of 171 square miles and are inhabited by an integrated population of about 64,000 people, of which about 88% reside on the principal island of Mahe with the capital city of Victoria. The terrain of the granitic islands is mountainous, eroded and strewn with boulders. The total estimated amount of arable land on the granitic islands is 2,000 acres. Mahe, also the largest island, is 27 kilometers long and 5-8 kilometers wide and rises to an altitude of more than 900 meters above sea-level.

The present government of President Albert France Renee was established on Liberation Day, 1977. On the first anniversary of Liberation Day (June 1978), the first of annual rolling National Development Plans was published, outlining a development strategy for the five-year period of 1978-1982. The guiding principles for economic and social development include increasing economic self-reliance, mobilizing domestic savings, encouraging foreign assistance, accelerating agricultural and industrial development, controlling the measured growth of tourism, promoting the regional development of the outer islands and improving family welfare and education and training opportunities.

B. The Agricultural Sector

The Seychelles' agricultural sector is not as clearly defined as it is in many other less developed countries. Presently it is part of the informal sector within which many Seychellois gain a family income from a variety of activities, including farming, fisheries and tourism. Although there is an ability for farming, there is no strong agricultural tradition and few, if any, subsistence producers. Most of the population, including small farmers, is in the cash economy.

Traditionally and historically, from an economic viewpoint the most important crops have been coconut and cinnamon. Both crops grow abundantly and are nonlabor-intensive. In 1976, the two represented about 85% of exports, with values totalling Seychelles Rupees (Rs) 7.3 and 3.6 million respectively. The primary sources of food, however, are both the local production and importation of vegetables and fruits. Both sources have increased with the development of tourism and the opening of the Mahe international airport in 1971. Tea is also grown

for domestic and export markets.

The GOS considers that a viable, intensive and widespread agricultural sector is essential if a sustainable and steady rate of economic growth is to be achieved. As stated in the National Development Plan (1978-1982), the goals of the GOS agricultural policy are:

"(a) to make the most efficient use of Seychelles' existing and potential farm land, including that on the outer islands;

(b) to produce from the country's own resources as much as possible of the food required by its resident and tourist populations; and

(c) to increase the production of crops for export, where that is compatible with (b) above."

The market potential for most agricultural produce is good because the population is increasing rapidly, the tourism industry is expanding, and the GOS policy aims to substitute as much locally grown produce as possible for foodstuffs now imported. The economic importance of import substitution is obvious; in 1977 food imports represented 19% of total imports to Seychelles. And of 1977 food imports, fruits and vegetables represented 17% at a cost to consumers and at a loss of foreign exchange of $1.7 million.

Implementation of the GOS agricultural policy is based on two government-supported schemes: land settlements and state farms. There are presently several settlements on Mahe (Anse Boileau, Rose Belle, Port Glaud and Val Endore, etc.) and one on neighboring Praslin (L'Amitie). Land settlements are subdivided into farm plots which average between three and a half and five acres of arable land. Plots are assigned to and leased by promising farm families. A government-built and-maintained house is included on the plot. The GOS also provides access road maintenance and educational, health and community services for each land settlement area. On Mahe there are presently an estimated 150 settlement farmers, 100 private farmers and 350 part-time farmers (primary employment being off-farm). There are 68 settlement farmers on Praslin and La Digue. On-farm vegetable and fruit production in excess of home consumption requirements is sold by the farmer to local markets, to the quasi-governmental cooperative society, in the Victoria city market or to middlemen for resale to the island hotels. Ownership of livestock (primarily cattle and pigs) brings the agricultural advantage of an on-farm source of manure for fertilizer and composting.

Fertilizer applications on farm plots are a necessity, at least for commercial farming, because of the poor quality of the sandy or lateritic soils. The same is true for the application of pesticides against plant diseases, blights and pests.

The state farm scheme, initiated only in January 1979, is the GOS solution to the problem of trying to increase local production of vegetables, fruits and livestock as rapidly and efficiently as possible. With an emphasis on production outputs, the state farms will be run as commercial enterprises under the management of the proposed State National Investment Corporation (SNIC)[1/]. A total of five state farms are planned at various locations on Mahe and Praslin. The first state farm on Mahe is now in operation at Anse aux Pins, at the site of the former Livestock Improvement Center. The focus of operations at Anse aux Pins will be the production and breeding of livestock for meat and milk. The total area of the farm is 500 acres, although only 150 are arable. Farming activities will be concentrated on raising crops (sugar cane, banana, leucaena and sweet potatoes) for forage and cattle feed. A second state farm on Mahe is proposed at Hangard; because of its higher altitude, the emphasis will be on fruit production, although vegetables will also be grown. On Praslin a third state farm is planned at Anse Kerlan for the production of both vegetables and fruits. The French Government (FAC) is now supporting the establishment and operation of a model farm at Anse à la Mouche which may also become the site of a state farm for vegetable and fruit production. France is, in fact, the only other donor providing practical assistance in the agricultural sector. Summaries of other donor interventions in the sector are presented in Annex C.

Although the primary purpose of the state farms is production, an equally important function will be the demonstration to small farmers of improved farming practices and the benefit of using improved and locally adaptable varieties of vegetables and fruits. Total employment generated by the establishment of state farms is expected to be only 200, or about 40 laborers on each farm. Should the experiment prove successful, the state farm operations may be expanded and evolve into collectivized farming. GOS officials are realistic, however, in predicting a time-frame of 10-20 years for this evolution. It must also be noted that the GOS intention is that the state farms will not be in direct competition with the small farmers in the production of vegetables and fruits. Given the growing demand, both sources of supply have a ready market.

1/ SNIC will also manage other GOS-supported operations, such as fisheries and public transportation.

C. GOS Agricultural Infrastructure

The Depar ment of Agriculture and Land Use (DOA) is responsible for implementing government interventions in the agricultural sector including the land settlement and state farm schemes, marketing and cooperatives, environmental management (marine and land resources), fisheries, livestock, the tea industry, agricultural research, pest and disease control and agricultural extension. An organization chart is presented on the following page. Of prime interest for this project are agricultural research, extension activities, including training, and pest and disease control. The complimentary functions of marketing and cooperatives and government price controls (handled by the Ministry of Finance) are discussed in the Economic Analysis section (IV.B.).

1. Agricultural Research

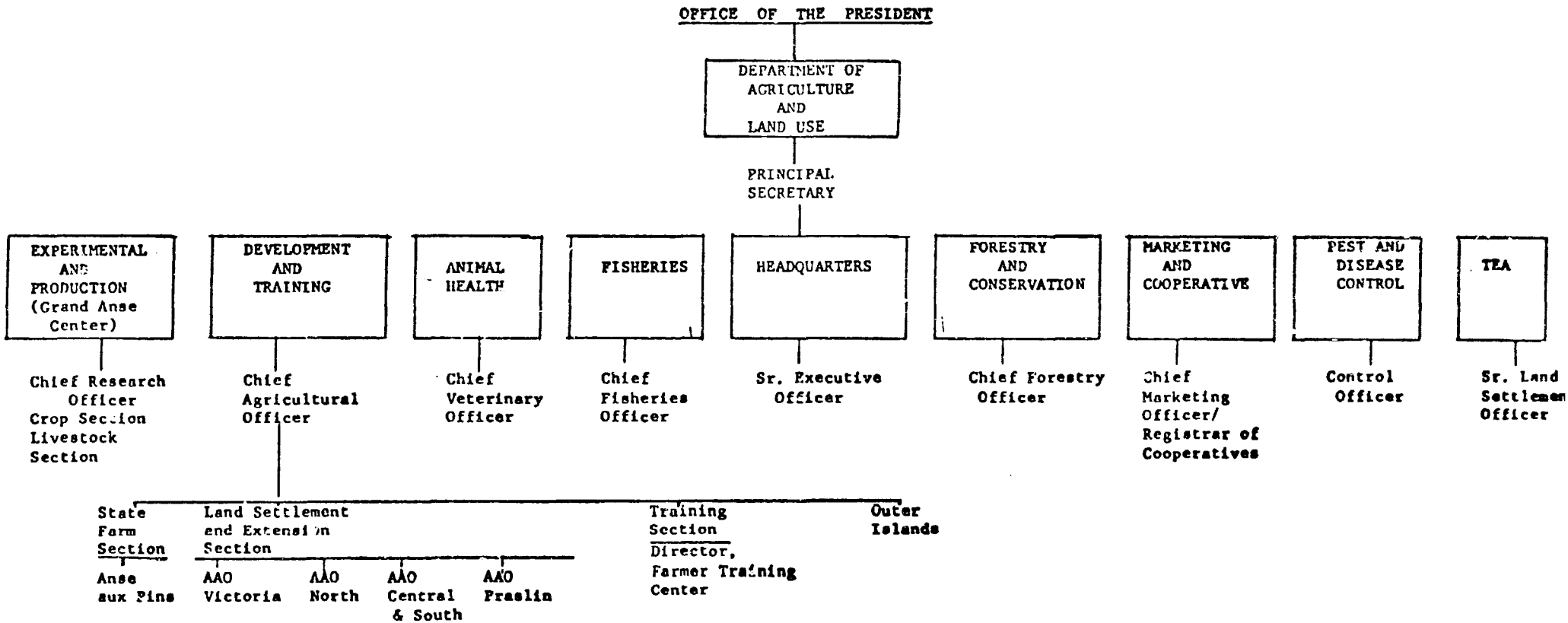
Applied and adaptive food crops research is undertaken at the Grand Anse Experimental and Food Production Center (GAC), which has been in operation since 1964. The GAC conducts trials with vegetable and fruit cultivars, mostly adapted to the Seychelles' tropical climate. Research is focused on varieties with high-yield potential, of supe ior nutritional value and which are resistant to pests and diseases. Vegetable research includes seed production with open-pollinated cultivars, thus reducing reliance on and risk with imported seeds. The principal vegetables grown at GAC are tomatoes, cabbage, Chinese cabbage, beans, cucumbers and eggplant. Production trials are also performed on varieties of lettuce, potatoes, yams and cassava. Research on fruits is concentrated on papaya, bananas and citrus.

There are an estimated 25-30 acres of arable land at GAC, both at Grand Anse and at a sub-station at Souvenir. Total staffing is illustrated in the chart below:

Chief Research Officer

Crop Section	Livestock Section
Agricultural Officer - Vacant	Sr. Animal Husbandry Officer
Farm Manager	Cattle-Keeper in Charge
Field Officer for recording trials-Vacant	Cattle-Keeper
Field Officer/Nursery Supervisor	Cattle-Keeper
Laboratory Attendant (weather data)	
Clerical Officer	
Clerical Officer for accounting	

A Peace Corps Volunteer (PCV) agronomist has been working at GAC since August 1978. Pending the assignment of a Seychellois, the


OFFICE OF THE PRESIDENT
DEPARTMENT OF AGRICULTURE AND LAND USE
PRINCIPAL SECRETARY
EXPERIMENTAL AND PRODUCTION (Grand Anse Center)
DEVELOPMENT AND TRAINING
ANIMAL HEALTH
FISHERIES
HEADQUARTERS
FORESTRY AND CONSERVATION
MARKETING AND COOPERATIVE
PEST AND DISEASE CONTROL
TEA
Chief Research Officer
Crop Section
Livestock Section
Chief Agricultural Officer
Chief Veterinary Officer
Chief Fisheries Officer
Sr. Executive Officer
Chief Forestry Officer
Chief Marketing Officer/ Registrar of Cooperatives
Control Officer
Sr. Land Settlemen Officer
State Farm Section
Anse aux Pins
Land Settlement and Extension Section
AAO Victoria
AAO North
AAO Central & South
AAO Praslin
Training Section
Director, Farmer Training Center
Outer Islands

PCV is essentially filling the position of the Agricultural Officer, or deputy to the Chief Research Officer. A recent graduate of the Farmer Training Center (see below) will probably fill the vacant position of Field Officer for recording trials.

The Chief Research Officer ha a B.Sc. in agriculture, but has not been able to undertake graduate studies since there is no one to replace him in his absence. He has, however, attended a short course at the International Institute of Tropical Agriculture (IITA) in Nigeria. Most important, however, is his technical competence gained on-the-job at GAC since 1964 and his understanding of the value of research and the necessity for its extension to small farmers. He is also keenly aware of the social and economic issues associated with the Seychelles farming system.

Given the lack of trained personnel to assist the Chief Research Officer and the workload of applied and adaptive research which must be done on a continual basis, it is impossible for GAC to operate efficiently and effectively. Research results based on field trials using different seed varieties are recorded and analyzed, but the dissemination of those results to the small farmers is weak. Of equal importance is the lack of any research in pest management and soils analysis. Again, it is a question of the lack of trained personnel who can devote time and energy in these areas on a full-time basis.

2. Agricultural Extension Services

The required linkage between applied and adaptive research at GAC and improved agricultural practices and increased production on small farms is provided through the Land Settlement and Extension Section within the DOA Development and Training Division (see chart). The service/section operates under the supervision of the Chief Agricultural Officer who reports directly to the DOA Principal Secretary. His staff includes four Area Advisory Officers (AAOs), one for each of the land settlement districts - Mahe/Victoria, Mahe/North, Mahe/Central and South and Praslin. An AAO's staff includes two or more field assistants, a "requisite" store manager/bookkeeper and a number of disease control agents to treat tree crop diseases, especially for coconut. The requisite store is the extension service's outlet for the provision and sale at subsidized prices of farm tools, seed varieties, fertilizers, animal feeds and pesticides. The store manager/bookkeeper is also responsible for collecting the rent for the farm plots from the settlements farmers (averaging Rs. 23, or $3.50 per month). The AAO and his field assistants personally conduct all extension activities within the districts, offering advice

and services to both settlement and private farmers. Outreach is also supported by weekly radio broadcasts in Creole, which are prepared and presented by the AAOs on a rotating basis.

Although the total number of farmers in Seychelles is modest, the DOA extension service is clearly understaffed to provide an effective outreach program. At best the AAOs on Mahe are able to visit farmers personally only every 4-6 months. An additional constraint is the proposed reassignment of the AAOs as farm managers of the state farms. The timeframe for such reassignments is not fixed and dependent upon other factors, such as the government's purchase of land and the construction of access roads. (The manager of the livestock state farm at Anse aux Pins was not an AAO, but rather was the director of the former Livestock Improvement Center.)

GOS solutions to the lack of trained agricultural manpower are threefold:

(a) Extension services will henceforth be redirected to farmers on a group, rather than individual, basis. Although Seychellois small farmers are traditionally individualistic, their participation as a group for extension programs on a neighboring farm and at "field days" at the Farmer Training Center (see below) and at GAC will be encouraged. Transportation to and from field days will be provided by the DOA. Improved farming practices will be demonstrated and practical advice offered on the use of improved seed varieties and pest and soil management. AAOs will also use audio-visual materials and aids in extension activities. This effort is being supported through an AID Accelerated Impact Program activity (Seychelles Audio-Visual Aids to Extension, 698-0410.19) which was initiated in May 1979 and will be implemented over a period of fifteen months. Extension programs on food crops, livestock, conservation, forestry and fisheries will be produced on videocassettes and 35 mm slides. Videotapes will be shown to groups of farmers at district extension offices and social centers on Mahe, Praslin and La Digue. Group discussions with the farmers and AAOs will be held after the showing to explain further the improved farming techniques.

(b) Replacements for the AAOs who may eventually be reassigned to the state farms may have to be recruited who are not as highly trained. This will effectively enlarge the field of candidates - from the ranks of the field assistants, for example - but will require perhaps a greater degree of high-level supervision than has been necessary to date. This should not be difficult to provide on an almost daily basis given the smallness of the island of Mahe and the proximity of Praslin and La Digue.

(c) External donors will be requested to provide extension agents to fill the AAO positions until Seychellois with maximum possible

qualifications are identified and employed. To date, the French government has provided several "cooperants" to work within the extension service. The provision of a PCV in conjuction with this project will further assure the continuation of extension activities for small farmers.

Experience over the next several years will prove the adequacy of these three solutions and/or suggest others which may be more effective.

3. Agricultural Training

The Training Section within the DOA Development and Training Division (see chart) is responsible for maintaining a modest stream of young Seychellois who are specially trained in agriculture. This is done (a) through scholarships for overseas short- and long-term training and (b) in-country at the Farmer Training Center (FTC). At the FTC a one-year course in basic farming and livestock techniques and farm management is offered to young secondary school-leavers who are attracted to farming. The use of the AID-provided audio-visual aids will be incorporated into the curricula. Now in only its second year of operation, the FTC graduated the first class of 18 students in December 1978. Although the teaching staff and facilities can accommodate 20 day-students, only 12 have been accepted for the 1979 school year. From the number of applicants, it was felt that only 12 were qualified to handle the coursework and complete the course successfully. Upon completion of the training program, students are not automatically employed by the DOA. One graduate is now working at GAC, another at the livestock state farm and two at the FAC-supported farming operation at Anse à la Mouche. Depending on their work performance, they may be offered permanent employment as DOA field assistants to the AAOs. If arrangements can be made, other FTC graduates are offered apprenticeships with experienced farmers, after which they may apply for a settlement plot of their own.

FTC will also increasingly sponsor short-term courses on specialized topics for groups of farmers. The first such course, on dairy farming with visiting instructors from Kenya, was successfully held in Fall 1978. Courses will be offered to farmers on a half-day basis with transportation provided by the DOA. This will permit farmer participation without absence from or neglect of on-farm work. Farming demonstrations will also be presented at FTC in support of on-going extension programs.

More advanced agricultural training may become available with the proposed establishment of an agricultural "college" to be financed

by FAC. A FAC delegation visited Seychelles in March 1979 to discuss the project further, although it is not expected that the college could open in less than two years from now. Entrants will have completed the equivalent of 12th grade. The proposed site is on land available at the FAC-supported farm. The college would not replace the FTC; rather, the best graduates of FTC would be sent to the college for more advanced training. The college offers, therefore, the best, and perhaps only, prospect for recruiting well-qualified extension agents.

There are two constraints to increasing in the short-term the number of low- , mid- and high-level agriculturalists in Seychelles. At the present time, the GOS supports a liberal arts education system for all school-age children. Recruitment for the FTC is made at the Seychelles College, the public secondary school. Only those students who are unable to pass examinations at the O-level, and are consequently school-leavers, are attracted by the opportunity for further education. Added to this is the basic fact that agriculture in general, and farming specifically, is not an attractive profession for young Seychellois. More attractive are professions in construction, government service and tourism.

The second constraint is the understandable GOS policy to minimize advanced, degree training abroad. The GOS is beseiged with offers of long-term scholarships from all donors but does not accept them on a general basis. With the extremely thin ranks of professionals now working, long-term absences without replacements cannot be afforded. The DOA therefore will release staff members only for short-term training, preferring instead to accept long-term, in-country technical assistance with the emphasis on on-the-job training. This project has been designed with both manpower constraints in mind.

4. Pest and Disease Control

Although Seychelles' isolation from neighboring countries by the Indian Ocean is an effective barrier to the natural dissemination of plant pathogens (the causative agents of disease) and pests, some important diseases and pests of vegetables, fruits and tuber crops have been introduced accidentally through human contacts. Measures to prevent the further introduction and establishment of pests and diseases is the reponsibility of the DOA Pest and Disease Control Division under the direction of a Control Officer. Plant quarantine officials now monitor the ports of entry (airports and harbors) to prevent the indiscriminate importation of plant materials for consumption, research and/or agricultural purposes.

The damage has been done however. Plant diseases appear to be one of the major factors that limit and contribute to seasonal fluctuations in vegetable and fruit production. Difficulties encountered in growing some food crops in certain soils can also often be attributed to different diseases. Aside from basic identification of various plant pathogens (viruses, bacteria and fungi), relatively little information is available. Little is known about he identity, distribution, losses and/or control of plant pests and diseases. This present situation is due to three constraints:

(a) the lack of research personnel who are trained not only in identification but also treatment of plant diseases and the control and/or elimination of plant pests;

(b) the lack of laboratory facilities for the diagnosis of diseased plant specimens and for their isolation, culture, identification and storage; and

(c) a lack of current literature on plant pathology and entomology, with specific reference to a tropical agricultural system such as Seychelles'

Establishment of an integrated pest management system using combinations of different methods of control - pesticide application, plant resistance, plant quarantine, biological control and farming practices - is needed to increase food crop production.

III. THE PROJECT

A. Description of the Project

1. Rationale and Scope of the Project

On-farm food crop yields from tomatoes, cabbage, beans, cucumbers, eggplant, other legumes and fruits are low compared to yields from these crops under similar tropical climates and conditions in other countries. Limited yields are the result of both natural and technical constraints. Natural constraints are low soil fertility and water-retention capacity and unpredictable rainfall, especially heavy during seasonal monsoons. Technical constraints include poor seed quality, varieties unsuited for the tropical climate and/or for off-season production, and plant diseases and pests. Although farms are relatively small, averaging about five acres of arable land, farm size is not a constraint. On-farm labor is fully occupied on this area given the labor-intensive nature of food crop production.

The key to helping the Seychellois small farmer in overcoming the technical constraints and minimizing the natural constraints is to provide him with technical advice and guidance required in horticulture, plant pathology and soil science, with an emphasis on practical problem-solving. The first step is necessarily adaptive research which can be undertaken at GAC. This involves taking proven results of research efforts attained at other sites, such as at the international agricultural research stations, and adapting them to the specific agricultural conditions in Seychelles. The second step is applied research, which can also be undertaken at GAC. This involves taking the results of adaptive research and testing them in Seychelles until there are predictable, positive results. The final step is to deliver the results of applied research to the small farmer and to assure that their successful extension actually results in improved food crop yields. With an increasing demand for food crops from both the local population and the expanding tourist industry, the small farmer should concurrently be able to increase his real income.

The approach of this project, then , is to fill two resource gaps: a lack of information and knowledge about the natural and technical constraints to food crop production and a lack of trained personnel in research and, to a lesser extent, extension. The focus of AID assistance provided through this project is on the research aspect, with a secondary focus on extension. Collaboration with the Peace Corps, however, will assure that attention is given to extension. The secondary focus of Peace Corps assistance will be research. In this way, equally important interventions in both research and extension will be mutually reinforcing.

The implementing agency for the project (both AID's and Peace Corps) will be the DOA. Fortunately the infrastructure necessary to undertake an integrated research-extension project is already in place. All the DOA programs and facilities will be available to project personnel: the research facilities and staff at GAC, the teaching facilities and staff of the FTC, the staff of the extension service (AAOs and field assistants), the staff of the DOA Pest and Disease Control Division, and the staff and facilities of the proposed state farms.

Outreach of the results of applied and adaptive research in horticulture, plant pathology and soil science will stretch in two directions: from GAC to the Seychellois farmer and from GAC to other countries in the Indian Ocean, to other international agricultural research centers dealing in in tropical agricultural, and to a U.S. university with experience in tropical horticulture.

The project will be implemented over a period of four years. By the end of that period:

(a) improved plant cultivars will have been introduced to small farmers following field trials at GAC;

(b) the GAC will have the capability to determine nutrient requirements for various food crops grown on different soils;

(c) a pest management/plant protection system will have been introduced;

(d) research linkages with international research centers, U.S.D.A. and U.S. land grant universities will have been broadened, and

(e) extension services will be reinforced by increased technical knowledge and capability generated under this project and demonstrated under the AIP Audio-Visual Aids to Extension project.

Outputs which will lead to the above conditions, indicative of achievement of the project purpose, have been geared to accomplishment within four years. It must recognized, however, that a longer period of inputs would have two advantages - the numbers of outputs could be increased and the quality of outputs could possible be strengthened. Nevertheless, pending both a formative and summative evaluation, the project as presently designed is valid and internally consistent if implemented in a four-year timeframe. Another factor supporting this position is that the area of activity, although countrywide for beneficiaries, is basically small. Such a project proposed in Sudan, for example, would take a minimum of 5-8 years to implement given the complexity of geographic regions, manpower resources and constraints and numbers of beneficiaries. The situation in Seychelles is not comparable. Distances are minimal with good access to even the most isolated areas; the GOS bureaucratic structure is so compact and uncomplicated that working relationships at all levels are easily established; and the target beneficiaries, although potentially representing about one-third of the total population, can be spoken of in terms of tens of thousands rather than hundreds of thousands.

2. AID Project Functional Elements

(a) On-the-Job Technical Training and Supervision

Given the lack of GAC staff who are available for long-term technical training in the U.S., the focus of AID assistance must necessarily be on on-the-job training and supervision. Technical training, including practical field work at GAC, the FTC, on the state farms and on farmers' settlement plots, will be provided on a long-term basis in horticulture, plant pathology and soil science. This is essential to assure a

continuing capability in these technical fields following completion of the project. Counterparts to the technical advisors as well as supporting staff will be assigned to work on a full-time basis. On-the-job training will also be supplemented with short-term training in specific courses related to plant protection, plant pathology, soil science and plant quarantine.

(b) Laboratory Supplies and Equipment

The provision of laboratory equipment and supplies is necessary to support the technical work of the advisors and Seychellois counterparts. A basic component of on-the-job training will be the instruction of the GAC staff in the proper use of laboratory equipment, such as microscopes, as research tools. Sophisticated equipment which is now on the market, especially for soil and plant analyses, will not be provided. Instead standard equipment will be provided which is easy to maintain in tropical climates and which can be locally repaired, if necessary. The GAC has the necessary space for the establishment of a joint plant pathology-soils analysis laboratory and will undertake the necessary renovation of facilities to accomodate equipment, storage, work counters, water supply and air-conditioning.

(c) Extension Outreach

As previously mentioned, an emphasis of on-the-job training will be on practical field work. All the staff of GAC will be involved in more frequent contacts with extension personnel and small farmers both at GAC and, to the maximum extent possible, off GAC than has been true in the past. This will assure that GAC does not operate in a vacuum and that the problems encountered with on-farm food crop production are uppermost in the planning and execution of applied and adaptive research at GAC.

(d) Research Outreach

The problem of working in a research vacuum in relation to the outside world will also be addressed within the framework of the project. To date opportunities have been limited for DOA officers to attend international conferences on tropical agriculture, research and specialized topics which are relevant to the agricultural system in Seychelles. The primary reason for the lack of participation has been budgetary. For this same reason and also because the research work at GAC has not advanced particularly quickly in the past ten years, the GOS has also never been in a position to sponsor a conference of its own to share its research findings. Such an information exchange will be especially valuable for the other countries in or on the Indian Ocean -

Mauritius, Malagasy Republic, Reunion, Comoros, Tanzania and Kenya. By the fourth year of the project, sufficient applied and adaptive research in horticulture, plant pathology and soil science will have been conducted at GAC that the DOA will be in a strong position to host a conference to share the results with participants from those countries. In the same way, DOA officers will be given the opportunity to attend other international conferences.

GAC already has a basic network of contacts with the international agricultural research centers, especially IITA and AVRDC, and research resources in the U.S. and Great Britain. Some technical services, such as specialized laboratory analyses of soil and plant specimens, are available only with membership to an organization or society. Such relationships will be either reactivated or initiated. Subscriptions to technical periodicals will also bring GAC up to date on the research which is being undertaken elsewhere and which could be applicable and adaptable to Seychelles.

Another, and very important, aspect of research outreach will be a working relationship over the period of the project with a U.S. land grant university. The DOA is most eager to initiate such collaboration which will be established for the provision of the technical services and participant training.

3. Peace Corps Project Functional Elements

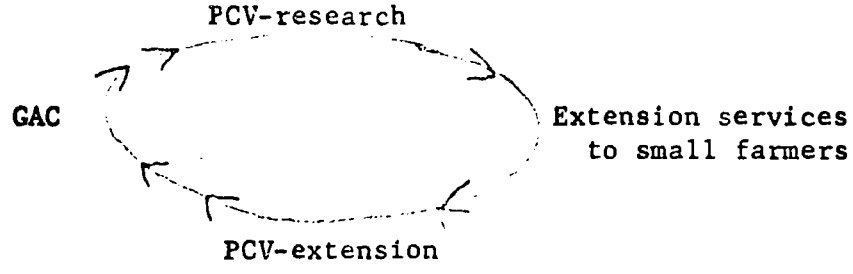
The Peace Corps program in Seychelles was initiated in 1977. The program has been kept purposely small (9 PCVs working now), concentrating on responding to GOS requests for specific and specialized services. Based on the positive experience of the PCV now working at GAC, the DOA sees the value of having two additional PCVs to reinforce this project, particularly in extension support services. See Section III C., Peace Corps Inputs to the Project.

(a) Extension Outreach

One PCV will be assigned to the DOA Development and Training Division. The PCV will work with the AAOs and field assistants in relaying information to the small farmers on improved farming practices, seed varieties, plant protection and pest management which have been researched and proven at GAC. A basic requirement is that the PCV have formal training in agriculture with practical farming experience. GOS officials have also requested that he/she have some training and/or experience in farm management. Placed within the extension service on a full-time basis, the PCV will serve as a bridge to research.

(b) Research Support Outreach

Another supporting link between the small farmer and GAC will be the assignment of a PCV to GAC. He/she will function primarily as a research resource person to the extension service and small farmer. Again, the PCV must be highly skilled and qualified, specifically in horticulture. This PCV will serve as a bridge to extension.



Based on the above discussion, a logical framework on the goal, purpose and output levels of the project is presented. A detailed discussion of the AID, Peace Corps and GOS inputs to the project then follows. The complete logical framework is attached as Annex D.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	IMPORTANT ASSUMPTIONS
Program Goal:	Measure of Goal Achievement:	Assumptions: long-term value:
Increased food production and income for small farmers.	- Increased food crop yields (perennial and annual) on 40% of small farmer plots. - Significant crop yields on two state farms comprising 250 acres of arable land.	- GOS will effectively implement policy of import substitution, thus providing production incentive. - GOS will rethink/reevaluate price policies to support increased on-farm food crop production.
Project Purpose:	EOP Status:	Affecting purpose-to-goal link:
To expand and strengthen the GOS DOA's capability to (a) conduct applied and adaptive research, (b) extend select, proven results to small farmers and (c) protect Seychelles' agriculture from the introduction of exotic pests and diseases from abroad.	- Improved plant cultivars will have been introduced to small farmers following field trials at GAC. - The DOA will have the capability to determine nutrient requirements for various food crops grown on different soils. - A pest management system will have been established. - Research linkages with international research centers, U.S.D.A. and U.S. land grant universities will have been broadened. - extension services will be reinforced by increased technical knowledge and capability generated under this project and demonstrated under the AID Audio-Visual Aids to Extension project.	- GOS will not decrease but rather increase budget allocations for agriculture. - Extension services are not neglected in favor of production on state farms. - Farmers are responsive to to extension advice. - Farmers are willing to participate in extension activities on a group basis. - Research institutions will see the value in establishing long-term contacts with and supporting DOA programs in research, pest management and plant quarantine.

Outputs:	Magnitude of Outputs:	Affecting output-to-purpose link:
1. (a) Food crop varieties, which are high-yielding and disease and pest resistant, tested at the Grand Anse Center and introduced to small farmers for on-farm production through the extension service, the state farm system and to student-farmers at the Farmer Training Center (FTC). (b) Refresher training provided in applied and adaptive research techniques.	1. (a) Approximately 200 food crop varieties introduced and tested at the Grand Anse Center, of which approximately 40 varieties tested on selected small farms, the state farms and at the FTC, of which approximately 10 varieties then made available to all farmers in Seychelles. (b) Chief Research Officer (Grand Anse Center) trained for total of 3 months at AVRDC/Taiwan and Hawaii (1 month), IITA in soils and tubers (1 month) and research station in Mauritius/Indian Ocean (1 month).	- Counterparts are employed and/or assigned to additional staff positions identified in the project. - DOA will not decrease its present staff employment. - GOS, as a policy, continues to support/approve of short-term training programs overseas.
2. Improved farming practices, using improved food crop varieties, demonstrated to small farmers at the FTC, on state farms and on small farm plots and then extended to small farmers for on-farm production.	2. At least five improved practices demonstrated and extended to small farmers on soil management (erosion control, intercropping, irrigation, etc.) and improved methods of organic and chemical fertilization (composting, mulching, etc.)	
3. (a) A modest plant pathology laboratory established to identify plant pathogens and to develop methods for their control. (b) Short-term training provided in plant protection and plant pathology.	3. (a) One plant pathology laboratory established at the Grand Anse Center. (b) One DOA agriculturalist trained in plant pathology and protection (OJT and 3 months) and 2 DOA technicians trained in plant pathology lab techniques and operation (OJT and 3 months each).	

B. AID Inputs to the Project

In collaboration with DOA officials, the PP design team has identified the following inputs for the project which will be provided over a period of four years.

1. Technical Services

AID will provide a total of eight person-years of technical advisory services over three years. Of this total, seven person-years will be provided on a long-term basis and 12 person-months on a short-term basis. Both long- and short-term technical advisors must have prior working experience in a tropical agricultural system with a practical, rather than academic, orientation. They will be based at GAC.

Long-Term

- Horticulturalist for three years. This advisor will assist the Chief Research Officer in planning and directing the applied and adaptive research activities at GAC. Primary tasks will be (a) designing and conducting variety trials on an estimated 200 cultivars, using seeds either of local varieties or imported from research stations abroad; (b) providing on-the-job training to GAC staff in applied and adaptive research design and methodology; (c) establishing an indexing system for recording all food crop variety trials and introductions; (d) arranging field days to acquaint farmers, FTC students and DOA extension staff in the importance and benefits of applied and adaptive research and the potential for improving food crop production; and (e) actually participating in demonstrations of improved farming practices, using approximately 40 tested seed varieties at the FTC, state farms and on selected small farmers' plots. An ancillary important responsibility will be continuing the on-the-job training and supervision of the Seychellois technician who has been trained in soil and plant analysis. A complete position description, including required academic qualifications, is attached as Annex E.

- Plant Pathologist for three years: This advisor will work on a one-to-one basis with a full-time counterpart, already identified, in establishing a plant pathology laboratory and undertaking an applied research program on the diseases affecting food crops in Seychelles. There is an immediate need for a plant disease survey which must be undertaken over the course of a full climatic cycle in various locations and on various soils types on Mahe, Praslin and La Digue. This survey(s) will provide the necessary information on the

distribution, prevalence and relative importance of different diseases of various food crops. With this baseline information, the advisor will then decide which diseases are of utmost importance and require additional study and control. Following from the survey and applied research based on field trials at GAC, the state farms and selected farmers' plots, the advisor will plan, and most importantly, work closely with the extension service in applying an integrated approach to plant disease control. Additional tasks will include (a) actively participating in field days to demonstrate different methods of plant disease control and plant protection, (c) lecturing on crop protection at the FTC and area advisory offices and (d) preparing extension bulletins on the identification and control of the most important diseases and pests. The advisor will also train two Seychellois technicians in the management and operation of the plant pathology laboratory. A complete position description, including required academic qualifications, is attached as Annex F.

- Soil Scientist for one year (first year of the project): This advisor will provide on-the-job training and supervision of a full-time counterpart-technician in researching options for maximizing soil fertility to increase on-farm production. The first step will be to establish a soil analysis laboratory and to train the technician in all laboratory procedures. A laboratory is essential for diagnosing nutrient levels in soils and plant tissues and for determining the physical and chemical properties relating to soil fertility. The next step will be to undertake a general survey of soil fertility levels in different locations on Mahe, Praslin and La Digue. An adjunct of this will be the development of a classification system for the soils. Working closely with the GAC Chief Research Officer and the horticultural advisor, the soil scientist will select and calibrate soil testing and undertake plant testing for various food crops growing in different soils. Based on field trials to increase soil productivity through the proper use of chemical and organic fertilizers, a "package" of improved farming practices as related to soil management will be extended to small farmers. In cooperation with the other advisors, the soil scientist will also lecture at the FTC, participate in demonstrations at FTC and on the state farms and farmers' plots, and prepare extension bulletins on methods of increasing soil fertility. A complete position description, including required academic qualifications, is attached as Annex G.

Short-term

- Soil Scientist for a total of two person-months (one month per year in the second and third years of the project): This advisor will assure continuity of soil and plant testing research and extension

following the departure of the long-term soil scientist. Advice will be provided on the laboratory operation and on the methodology for experimentation. Ideally the consultant will be the same soil scientist who had worked on a full-time basis in the first year. Annex G also includes a position description for this advisor.

- Entomologist for a total of six months (two months per year for three years): Little information is currently available on insect and mite pests of food crops in Seychelles, much less on their control to minimize or eliminate damage to crops. Therefore consultant services in entomology will be provided to identify the economically important pests and to develop integrated methods for their control. Working with the plant pathology staff, the consultant will perform field trials to test the transmission of important food crop viruses by different insect or mite vectors. Most importantly, by the third year he will have designed and applied an integrated pest management system, first at GAC and then on the state farms and selected farmers' plots. When satisfied with the results of this applied research, guidance to all farmers in pest management will be provided through the extension service. Annex F also includes a position description for this consultant in entomology.

- Evaluators for a total of 4 person-months (two consultants for one month each for two evaluations): Consultant services will be required for both a formative and summative evaluation. It is recommended that a horticulturalist with a strong background in soil science and a plant pathologist provide the technical input to the evaluations. The REDSO/EA evaluation officer and/or project officer should also participate on the teams. Evaluation is discussed fully in Section V.E., Evaluation Plan.

2. Participant Training

Both U.S. and third country short-term participant training will be provided for a total of 21 months. The U.S. university contractor will be responsible for planning all training programs. An illustrative combination of U.S. and third country training is indicated below. Training opportunities at the international agricultural research centers may be more attractive and more easily arranged than those offered on-campus.

Short-term U.S. (total 15 months)

- The DOA agriculturalist/counterpart to the Plant Pathologist for three months in plant pathology and plant protection;
- The two DOA technicians in the plant pathology laboratory for

three months each in plant pathology laboratory techniques and operation;

- The DOA technician in the soil analysis laboratory for three months in soil science;

- The DOA Pest and Disease Control Officer for three months in advanced plant quarantine at the USDA Plant Protection and Training Center, Animal and Plant Health Inspection Service, Battle Creek, Michigan.

Short-term Third Country (total 6 months)

- The Chief Research Officer for one month in horticulture at AVRDC (Taiwan) and/or the University of Hawaii, one month in research methodology at IITA(Nigeria) and one month for orientation/familiarization at research stations in countries in or on the Indian Ocean, such as the Kenya Agriculture Research Institute (Muguga) and the research stations in Mauritius and/or Malagasy Republic; and

- One DOA plant quarantine assistant for three months in plant quarantine at the course for junior officers which is offered periodically by the Organization for African Unity at Ibadan, Nigeria or Cairo, Egypt.

3. Commodities

The following commodity support is required to implement the project and to assure continuation of project activities after four years:

- equipment and supplies for the plant pathology and soil analysis laboratories. Basic items include compound and dissecting microscopes, refrigerators, portable hot plates, laboratory carts, soil testing kits and glassware and plasticware. A combined equipment and supply list is attached as Annex H. All equipment will be of U.S. manufacture. As required, transformers will be purchased for the use of the U.S. electrical equipment in Seychelles.

- two vehicles, including one pick-up and one 12-passenger mini-bus. The pick-up will be used primarily at GAC for transporting farm equipment, fertilizer and seedlings around the station. It will also be used for transporting equipment and supplies from GAC to demonstration locations at the FTC and on state farms and farmers' plots. The mini-bus will be used for transporting farmers to and from field days, short courses and demonstrations at GAC, FTC, the state farms and farmers' plots in different land settlements. Since there are no U.S. vehicle manufacturers represented in Seychelles, a procurement source and origin waiver for the vehicles is attached as Annex I.

- technical literature and books. Funds will be provided for purchasing books and subscribing to periodicals necessary to establish a technical library at GAC in horticulture, plant pathology, soil science, entomology and plant quarantine. A preliminary listing is included in

the technical report of the Rural Development Specialist member of the PP team.

4. Other Costs

Funds will be provided for in-country travel for the U.S. advisors, the costs of hosting one conference/symposium for information exchange with countries in or near the Indian Ocean, international travel for Seychellois project personnel to attend an estimated three conferences in tropical agriculture, travel to the U.S. (AID/W) for the Chief Research Officer and the Chief Agricultural Officer to participate in the selection of the university contractor and miscellaneous operating expenses.

C. Peace Corps Inputs to the Project

Based on discussions with DOA officials and the PP team, the Peace Corps Director has submitted documentation to Peace Corps/Washington for the placement of two PCVs within the framework of the project (see Annex J). The GOS will submit an official request for the PCVs by July.

1. Technical Services (Living and Leave)

- Assistant Research Officer for four years: As previously discussed, given critical personnel shortages, GAC is not able to function at full capacity or especially efficiently. Pending the identification and training of a Seychellois as the Agricultural Officer, or deputy to the Chief Research Officer, the continuing services of a PCV to fill this position is highly desirable. The PCV presently assigned to GAC will complete her tour in July 1980 and may or may not extend her tour for another six months. The PCV Assistant Research Officer may therefore either be a replacement for the incumbent PCV or serve to strengthen further the limited GAC staff. PC/Washington has been requested to recruit a PCV with a M.S. in Horticulture as well as farming experience. In addition to conducting field trials, the PCV will also work closely with the extension service to assure the outreach of the results of applied and adaptive research to the small farmers.

- Extension Advisor for four years: Within the next four-six years, mid-level extension advisors can be recruited and employed from the stream of graduates from the Farmer Training Center and from the proposed FAC-supported agricultural college. To assist in filling the interim manpower shortage, however, one PCV will be assigned to the extension service. The PCV will provide in-service training to Seychellois field assistants so that they can function more effectively in their jobs

and will also work closely with the staff at GAC to ensure that research results are extended to the small farmers. Technical qualifications for the PCV include a farming background, a B.S. in Agriculture with training in farm management and some field experience.

2. Other Costs

In supporting the assignment of the two PCVs, Peace Corps will provide program support, plus medical and administrative support, in-country training (language, cross-cultural orientation, etc.) and readjustment allowances.

A time-flow chart for AID and Peace Corps technical services and AID participant training inputs is included on page 44.

D. Government of Seychelles' Inputs to the Project

Demonstrating the priority and importance it attaches to successful implementation of the project and to continuation of the applied and adaptive research activities following completion of AID inputs, the GOS is prepared to commit the following resources to the project:

1. Technical Services

Full-Time

- Chief Research Officer for three years (counterpart to the Horticulturalist)
- DOA agriculturalist to specialize in plant pathology and plant protection (counterpart to the Plant Pathologist)
- two DOA technicians to operate the plant pathology laboratory (new hire)

Part-time (estimated percentage of time or work effort attributed to the project)

- DOA Chief Agricultural Officer (1/4)
- Farm Manager, GAC (3/4)
- Farm Manager, Anse aux Pins state farm (livestock) (1/3)
- Farm Manager, proposed Anse Kerlan state farm (Praslin) (1/3)
- Farm Manager, proposed Hangard state farm (1/3)
- Pest and Disease Control Officer (1/3)
- two Assistant Control Officers (1/3 each)
- two Area Advisory Officers (1/4 each)
- six field assistants (1/4 each)
- Director, Farmer Training Center (1/4)
- Three FTC staff (1/4 each)

2. Construction/Renovation

Suitable space at GAC is available for establishing the joint laboratory. GAC will be responsible for undertaking structural modifications and renovations necessary to accommodate all the lab equipment and supplies, including sinks, work counters, storage, electrical outlets and airconditioning. The basic foundation for a screen house is presently in place next to the GAC offices. Additional construction of an enclosing frame and installation of fine-mesh screening will be provided for conducting special experiments with plant specimens in isolation. The GAC has its own skilled labor force to perform the work.

3. Commodities

Supplementary laboratory equipment and supplies which can be purchased locally will be provided as well as farming tools, fertilizers and pesticides which are used for crop production trials at GAC. Four 12,000 BTU airconditioners will also be purchased and installed for the laboratory.

4. Other Costs

The GOS will also support the costs of an estimated 12 field days (4 per year), operation and maintenance of the project vehicles and miscellaneous operating expenses. Given the preplanning required for each field day, the maximum which can effectively be sponsored is one every three months. The use of land at GAC is included as a valid contribution since the horticulturalist, plant pathologist and soil scientist, in collaboration with the Chief Research Officer, will designate certain areas and fields for specific field trials and experimentation which otherwise may not be used for this purpose. This may involve clearing additional acreage at GAC and the research sub-station at Souvenir. Office space and secretarial services, requiring the employment of an additional full-time staff person, will also be provided.

IV. RESULTS OF SPECIFIC PROJECT ANALYSES

A. Financial Analysis

The GOS budget allocation for the Department of Agriculture and Land Use was $2.060 million in 1978, or 6% of the total budget, and in 1979 will increase to $3.052 million, or 7% of the total budget. In terms of total government resources flows, the DOA ranks seventh in both years, with higher priority being given to public works, education, health,

transportation and internal affairs (military and police). These statistics are indicated in the following table:

GOS Recurrent Expenditure
(Rs 000)

GOS Ministry/Department	1978 Approved Est.	1978 Percent	1978 Rank	1979 Estimated	1979 Percent	1979 Rank
President's Office	2,813	1	14	5,286	2	13
Admin.& Information	4,459	2	12	8,900	3	11
Agriculture & Land Use	13,310 ($2,060,000)	6	7	19,719 ($3,052,000)	7	7
Finance	12,343	6	8	13,510	4	10
Internal Affairs	24,592	12	3	32,590	11	3
Legal Affairs	1,193	1	16	1,463	1	16
Youth & Community Dev.	-	-	17	896	-	17
Judiciary	1,387	1	15	1,502	1	15
Audit	512	-	18	633	-	18
Education & Culture	26,629	13	2	32,936	11	2
Foreign Affairs & Tourism	13,638	7	6	15,036	5	9
Labor,Health & Welfare						
- Labor & Welfare	4,791	2	11	3,613	1	14
- Health	18,644	9	4	22,544	8	6
Planning and Development						
- Ec. Dev.,Planning	7,497	4	10	6,222	2	12
- Works	45,502	22	1	62,065	21	1
Transport	14,511	7	5	24,521	8	4
Sub-Total	191,821	93		251,436	86	
Pensions & Gratuities	9,386	5	9	23,922	8	5
Public Debt	4,037	2	13	18,692	6	8
GRAND TOTAL	205,244 ($31,771,000)	100		294,050 ($45,518,000)	100	

$1.00 = 6.46 Rs

Source: Approved Estimates of Revenue and Recurrent Expenditure for the year ending December 31, 1979 (GOS, January 1979)

Within the DOA, the budget allocation for the Experimental and Production Division was $295,216 in 1978, or 14% of the total operating budget of $2,060,000. In 1979 it is estimated that the division will receive a 20% increase, to $355,340, representing 12% of the total estimated operating budget of $3,052,000.

Recurrent costs for 1978 and estimated for 1979 are indicated below:

Division	DOA Recurrent Costs (Rs) Approved 1978	1979 Estimated	Net Increase/ Decrease	Percent over 1978
Administration	957,200	720,200	- 237,000	- 24
Experimental & Production	1,907,100 ($295,216)	2,295,500 ($355,340)	+ 388,400 ($60,124)	+ 20
Development & Training	2,111,900 ($326,919)	3,552,400 ($549,907)	+1,440,500 ($222,987)	+ 68
Animal Health	1,185,700	1,405,200	+ 219,500	+ 19
Fisheries	687,100	2,973,600	+2,286,500	+333
Forestry & Conservation	1,717,500	3,082,300	+1,364,800	+ 79
Marketing & Cooperative	1,236,100	1,552,000	+ 315,900	+ 26
Pest Disease Control	607,300	675,600	+ 68,300	+ 11
Tea	640,300	693,600	+ 53,300	+ 8
Parks, Gardens & Cemeteries	2,259,800	2,768,700	+ 508,900	+ 23
Total	13,310,000 ($2,060,000)	19,719,100 ($3,052,000)	+6,409,100 ($992,000)	+ 48

Source: Approved Estimates of Revenue and Recurrent Expenditures for the year ending December 31, 1979 (GOS, January 1979)

The estimated recurrent costs for 1979 are further broken down into personal emoluments (salaries, wages and allowances), which represent 61% ($1,859,000), and "other charges" (administration, supplies and equipment, transportation and personnel), which represent 39% ($1,193,000).

The recurrent cost burden of this project involves only the continuing salaries of the three DOA laboratory technicians and one secretary (new hires), vehicle operation and maintenance through the life of the vehicles, the costs of continuing the sponsorship of field days and miscellaneous operating expenses which may be over and above the present and projected expenses at GAC. Based on the dollar equivalent of this GOS contribution to the project, the recurrent costs can be summarized:

3 DOA lab technicians	$8,205
Vehicle O & M	3,720
Field days	320
Secretarial services	3,015
Misc. operating expenses	3,000
	$18,260 per year = 117,959 Rs.

Assuming that th budget allocation for the Experimental and Production Division continues to increase about 20% per year and that an inflation factor of 10% will increase the value of the recurrent cost burden, this burden will amount to no more than 4% over the next five years.

	1979	1980	1981	1982	1983
Division budget	2,295,500	2,754,600	3,305,520	3,966,625	4,759,950
Project-related recurrent costs	-	117,959	129,754	142,729	157,001
Percent of total	-	4	4	4	3

Representing such a small percentage of the Division's projected operating budget, it can be assumed that the GOS will be able easily to bear the recurrent costs of this project.

B. Economic Analysis

1. Overview of Agricultural Production

According to recent IMF estimates, the contribution of agriculture to Seychelles' GDP in 1976 was about Rs 38 million, or $5,850,000. This represents approximately 13% of GDP, down from 22% in 1971. Approximately 33% of the value of agricultural production was exported in the form of copra and cinnamon bark; 40% was in the form of livestock products; and 27% was in the form of fruit and vegetables. The level of improved inputs in Seychelles agriculture appears to be low, with only 72 tons of fertilizer being imported in 1976 and about 130 tons in 1978.

Imports of food products have increased rapidly since 1971, owing in large part to demand generated by the growing tourist industry. Between 1971 and 1977, food imports rose from Rs 15.3 m. to Rs 67.2 m., or an average of 57% per annum. Imports of fruits and vegetables rose from Rs. 1.8 m. to Rs. 11.5 m., or an average of 90% per annum. (See Annex K, Exhibit 1.) By contrast, the value of local production of fruit and vegetables is estimated at about Rs 3.5 m. in 1978, according to a recent survey. Although import figures for 1978 are not yet available, it is estimated that imports account for about 80% of fruit and vegetable consumption in Seychelles, and only 20% are produced locally.

According to preliminary results of the on-going Survey of Rural and Agricultural Households, small farmers produce about 70% of all vegetables and 72% of all fruit, deriving about 90% of their crop income from these activities. (Livestock accounts for about half of small farmer income. See Annex K, Exhibit 2). Thus the project addresses an area of

of fundamental concern not only to the food import situation of Seychelles in general but also to the small farm sector specifically.

2. Economic Constraints to Increased Agricultural Production

Marketing appears to constitute a major constraint to agricultural production. Within marketing, the price policy of the government is the most fundamental single constraint. Even if all aspects of the project succeed, e.g., the technical constraints to production are alleviated so that yields and quality improve and the results are effectively extended to farmers, the project could fail to achieve its goal if prices are kept so low that farmers cannot adopt innovations.

The marketing constraint is a difficult one. Clearly the demand for fruit and vegetables in Seychelles exists, since over 80% of total consumption is imported annually. The marketing system consists of 50 to 60 middlemen who deal in fruit and vegetables, the quasi-governmental Seychelles Farmers Marketing Cooperative Society Ltd. (SFM) and a few private cooperatives.

Government-established price controls are believed to serve as a disincentive for expanding production in many areas. Some products are no longer grown by some farmers because they cannot cover costs. The GOS has no set producer price, so middlemen and the cooperatives set their own prices vis-a-vis the farmer. SFM offers half the retail price set by the government. Large farmers with their own transportation can avoid middlemen altogether and consequently receive the full benefit of the government price. It is already evident from survey data that large farmers make more income from a given level of production, especially for fruit. Even so, one large farm visited by the PP team could not make a profit on several of its products and was subsidized by other non-farm activities. Clearly, this large farm will not stay in business if prices are kept down. The established retail price is not consistently observed. Many producers and middlemen avoid price controls by dealing directly with buyers such as hotels. Even in the central market, produce is openly sold at 50% to 100% over the government price.

Prices for imported goods are now not subject to GOS price control as are domestically produced fruit and vegetables. Thus imported produce often sells for twice as much as local produce. The overall price situation is consequently a mixed one, with government prices being observed primarily by the small producer, Typically he has neither the time nor the resources to transport and market his produce. Yet middlemen and the SFM use price controls as the reason for offering the farmer a low price.

SFM operates under strong governmental influence. The coop has an office in Victoria and a branch on Praslin. As previously mentioned, SFM fixes producer prices at half the government-fixed price. Farmers are paid by check at the end of the month and are paid only for produce sold by the coop in good condition. Thus tomatoes which spoil because the coop is inefficient result in no income for the farmer. Farmers who can afford to, or who need cash immediately, market their own produce. The cooperative is reportedly making large profits and does not appear inclined to reduce its margins to give the small producer the benefit.

In conclusion, to the alleviate the marketing/price constraints, it is recommended that a covenant be included in the Project Agreement stating that the government should re-assess its current price control policies and consider the elimination of price controls or changes in price structure to assure a fair return to the producer, especially the small farmer. This in turn will serve as an incentive to increase domestic agricultural production. The on-going Survey of Rural and Agricultural Households is expected to provide some insights with respect to the gravity of this problem for small farmers. During a time of increasing government controls, it would be unfortunate if the GOS's goal of increased agricultural production were to be checked by price policies based on inadequate analysis of the actual conditions faced by farmers in Seychelles.

3. Economic Analysis of Project

The economic benefits of the project are expected to accrue from technical improvements in the production of fruit and vegetables, resulting in increased production. The per unit cost of production may shift owing to higher quality inputs, such as seed, fertilizer, organic matter and treatment against pests and diseases.

The benefits of the project will accrue at various levels. The small farmer is expected to benefit from increased production and income; the consumer is expected to benefit from increased availability and better quality of fresh produce at lower prices, compared to imported prices; and the national economy is expected to benefit from increased agricultural production and reduced import requirements. However, it is important to avoid an assessment of the impact of the project against the sole measure of imports of fruits and vegetables; demand in Seychelles has been highly erratic in recent years as evidenced by import trends. If the tourist industry continues to grow, demand for fresh produce will increase, and import statistics will bear little relation to increases in domestic production.

The value of estimated economic benefits is summarized in Annex K, Exhibit 3

The values are estimated on the basis of technical information provided by the PP team. The analysis is based on the assumption that no new land will be brought under cultivation and that all benefits will derive from improved yields and quality on existing land.

Improvements in the control of plant pathogens and pests have been known to increase yields by as much as 100% in certain cases. An overall range of 20% to 50% is quite acceptable to estimate. This analysis has taken a conservative figure of 20% increases in yield attributable to plant disease and pest control. Given the high incidence of viruses and other plant pathogens observed by the PP Team, this figure represents a conservative minimum rather than a target.

The control of plant pests and pathogens will also improve the quality of fresh produce, particularly leafy vegetables. Improved quality is expected to increase the value of produce by at least 5%.

Improved analysis of required soil nutrients and actions to maximize soil conditions are expected to result in additional improvements in yield and quality. Improvements of a magnitude of up to 100% have been known to occur. A reasonable overall rate of 20% has been chosen for this analysis as related to yield and 5% as related to quality.

Technical improvements in yield and quality are therefore projected to increase the value of agricultural produce by 50%. However, technical improvements without acceptance and adoption by farmers have little economic value. Given the limitations of the extension service, a low acceptance/adoption rate is assumed: it is assumed that 60% of small farmers will adopt innovations at a rate of 15% per year for 4 years, beginning in the second year of the project. This means that about 50 small farmers will be reached annually, either through the extension service or the Farmer Training Center.

The adoption rate among larger farmer and commercial farmers is expected to be considerably higher: it is assumed that 80% will adopt innovations over a 4-year period since most are aware of problems and actively seek solutions. Larger farmers will also continue to adopt improved technology as it develops after the life of the project.

The project will also benefit the national economy by reducing foreign exchange costs for imported produce. This has been calculated at 40% of the value of local production.

As shown in Exhibit 3, the project has a benefit/cost ratio of 1.10. Total benefits are estimated at Rs. 31.67 million, or a present value of Rs. 13.03 million. This sum represents foreign exchange savings

in the government's balance of payments as well as increased income to Seychellois farmers.

C. Social Analysis

1. Profile of the Small Seychellois Farmer

According to the 1977 Census, 4,029 persons, or 17% of the labor force of 23,339 persons, were employed in agriculture as of August 1977. Of these persons, 30% were female, 12% were teenagers, 19% were part-time or casual laborers, and only 3% had received vocational training in agriculture. In addition, 753 (almost 19%) worked for the government, 2,536 (63%) were employed by others and 637 (16%) worked on their "own account." The remainder (3%) were classified as under-employed. The educational level of the agricultural labor force was described as follows: 30% had no education; 58% had primary education; 11.5% had some secondary schooling; and 0.5% had higher education.

The "own account" category of 637 of the farmers includes about 40 to 50 large farmers (other large farms are operated as corporations) and nearly 600 small farmers. About 250 small farmers live on the government land settlements. Of the 637 farmers who worked on their own account, only 339 depended on agriculture as their main source of income (defined as more than 50% of all income). "Full-time" farmers tend to be located in south-west Mahe and on Praslin. Farmers on government land settlements are not necessily "full-time" farmers. The agricultural activities of the 339 "full-time" farmers included:

Product	Proportion of Farmers
Fruit/Vegetables	84%
Coconuts	57%
Cinnamon	29%
Cattle	60%
Pigs	73%

These 339 farmers (both large and small) accounted for 70% of all fruits and vegetables produced; in other words, other agricultural households produced small amounts primarily for their own consumption. The pattern of livestock holders was even more diverse: some 1,500 households in Seychelles hold livestock. Seventy-eight percent of pigs and 61% of chickens were held by non-agricultural households. It may therefore be concluded from census data that many households practice some agriculture or livestock in addition to their primary source of income.

The income of the small holder has been estimated at Rs. 10,000, or about $1,500 per annum. This figure is roughly confirmed by extrapolation from survey data, assuming that about 15% of income is derived from non-agricultural sources. Thus small farm per capita incomes range from $100 to about $250 per annum, assuming an average of six persons in a family. The PP team visited one rural household with 11 persons and an estimated income of Rs. 7,200 per year, or about $100 per capita. Although small farm incomes vary, they are on the low side in Seychelles, with farmers falling into the lowest 20% to 40% income brackets.

2. Project Beneficiaries

The primary beneficiaries of the project are the 600 small farm families in Seychelles. Of this group about 60% are expected to be reached within 5 years after the initiation of the project, and the vast majority are expected to be reached within 10 years as field trials continue and extension services expand to reach all farmers. The project could impact on small farm income by 20% to 100% depending on research findings and rates of adoption by small farmers.

Women will benefit from the project both directly and indirectly. About 30% of persons employed in agriculture are women, and there are women in every farm family. These women will benefit from improved production technology and increased income and family consumption. Extension workers will continue to work with women as well as men. Finally, increased productivity in agriculture will generate employment opportunities for women as well as men.

Indirect beneficiaries of the project are the Seychellois consumers of fruits and vegetables. These include most if not all of Seychelles' population of about 64,000 in 1979. Seychelles' population will benefit from the increased availability of higher quality fruits and vegetables, resulting in improved nutrition and health.

D. Technical Analysis

The following analysis summarizes the technical findings of the specialists on the PP design team. The individual reports are available for reference in AID/W (AFR/EA, AFR/DR) and REDSO/EA.

1. Horticulture

GAC has been conducting applied and adaptive research on fruits and vegetables common to Seychelles since 1971. Initial research focussed on collecting data on the response of various crops (bananas, pineapples, sweet potatoes, maize, etc.) to manurial and chemical fertilizers.

In recent years, however, the focus has shifted to research on basic food crops which have high-yield potential and resistance to pests and diseases, without depending unnecessarily on chemical fertilizers and pesticides. A serious constraint to increasing food crop production is poor farming practices, such as thick plant populations, lack of adequate spacing between rows, lack of intercropping with compatible crops and lack of eradication of diseased plants which allows infection of other crops. Crop rotation is another important practice which will lessen the incidence of insects, diseases and weeds. Production trials using improved food crop varieties and farming practices, and taking into account methods to maximize soil fertility and plant resistance, must be the basic research methodology at CAC for the next 5-10 years.

2. Plant Pathology

A great deal can be done to increase food crop production in Seychelles simply by reducing the presently significant losses from infection by plant pathogens. Plant diseases also appear to be one of the majors factors contributing to seasonal fluctuations in growing some food crops in certain soils. The distribution and severity of plant diseases is widespread, especially on cucurbits (cucumber, melon and squash), tomatoes, sweet and chili peppers, cassava and sweet potatoes. The most important diseases, prevalent in either one or both monsoon seasons, are virus or virus-like agents, soil-borne wilt-inducing bacteria, foliar leaf-spotting bacteria and fungi, and aphid-borne viruses. Methods of plant protection which will be thoroughly researched under the project include (a) disease-resistant varieties, (b) foliar protection, such as light oil sprays, (c) use of reflective polyethylene strips, (d) different dates of planting and (e) roguing, or the weeding out of inferior, diseased or otherwise nontypical individuals from a specific crop or field. Another important measure, addressed within the project, is the importation of only pathogen-free plant materials from reliable stations. One source is the Kenya Agriculture Research Institute in Muguga, Kenya. An integrated plant/crop protection program will be designed using different control methods --- use of clean planting material and plant quarantine, use of disease- and pest-resistant varieties, biological control, different cultural practices and use of chemical pesticides. Various approaches and combinations of methods may be required in different locations on the islands and/or even on adjacent farmers' plots.

3. Soil Science

Observing the lush natural vegetation on Mahe and Praslin easily leads to the incorrect impression that the arable land is fertile. With a tropical climate, including high temperatures and rainfall, the natural

plant growth is vigorous. However farming practices have interrupted the natural balance between the soil and natural vegetation. The soil condition has been changed. As the original soil organic matter has been decomposed by improper or negligent farming practices, the soil today has little or no water- and nutrient-holding capacity. Soluble nutrients have been and are leached away by heavy rains. In addition, the original soil parent material of the granitic islands of Seychelles is not very rich in nutrients. Lacking proper soil management, the result is poor soil fertility. The two main groups of soil found in Seychelles, the "Red Earth" and the "Shioya Series,"are both basically lacking in natural nutrients. Another important aspect of the research effort to be undertaken under this project, then, is the study of all possible methods to maintain and increase soil fertility. Attention will be focussed on minimizing the use of chemical fertilizers. If misjudged or mishandled, their use damages plant growth, causes the disappearance of some nutrients and damages soil biological activities. Increasing the level of soil organic matter by using organic manure, green manure and composting will decrease reliance on chemical fertilizers and will be a major component of the applied and adaptive research program at GAC.

E. Environmental Analysis

An Initial Environmental Examination (IEE) was submitted with the PID which made a Threshold Decision of a Negative Determination. The IEE is attached to this PP as Annex M. The PID approval cable (Annex B) confirmed this decision, stating that "AID Regulation 16, Section 216.2 (b) appears to be appropriate and exclusive basis for exempting subject project from the requirements of an EA." AID/W further requested, however, that the PP team review the research activities which will be conducted during the project to assure applicability of Section 216.3(b)(2)(iii). Under this section, exceptions to pesticide procedures can be made when pesticides are used "for usual or limited field evaluation purposes." The PP team has confirmed this to be the case for this project. In discussions with the GAC Research Officer and staff, the PP team learned that only short-lived chemicals which are non-toxic are used in research activities. The Research Officer is furthermore very sensitive to the problem of toxicity of chemicals and refers to the Farm Chemical Handbook for guidance on the application of any pesticides.

In addition, and most importantly, by the end of the project an integrated pest management system will have been introduced, based on the use of different methods to control insects and diseases, thereby decreasing reliance on pesticides. Such different methods of pest management include:

- limited and/or minimal pesticide application (including insecticides, fungicides and herbicides)
- plant resistance
- plant quarantine
- biological control
- cultural practices (planting dates, crop rotations, composting, etc.)

All of these methods will be thoroughly researched during the life of the project.

Based on the applicability of Section 216.3(b)(2)(iii), AID will assure that its requirements regarding the use of pesticides will be complied with and carefully applied. These requirements include:

(1) that the manufacturers of the pesticides provide toxicological and environmental data necessary to safeguard the health of research personnel and the quality of the local environment in which the pesticides will be used:

(2) that treated crops will not be used for human or animal consumption unless tolerances have been established by EPA or recommended by FAO/WHO; and

(3) that rates and frequency of application do not exceed such tolerances. Treated crops can be fed to animals for research purposes.

The above will be reflected in a covenant to the Project Agreement.

F. Administrative Analysis

Various factors, both directly and indirectly related to implementation of the project, reinforce its feasibility from an administrative viewpoint. Carrying considerable weight is the commitment of the GOS/DOA as evidenced by its contribution, primarily and most critically in terms of personnel. Given the limited DOA staff resources, the assignment of personnel on both a full-time and part-time basis represents the most substantive commitment. President Renee has also personally expressed his commitment to improving and increasing small farmer agricultural production, which he recognizes is only possible through a concentrated effort on applied and adaptive research and its extension to the small farmer. Another important factor is the infrastructure already in place and operating to support the project. The GAC has the necessary land area and facilities for expanded research activities. The FTC has land, staff, facilities and students to participate actively in demonstrations, field days, short courses and classroom teaching. In addition, the proposed establishment of the FAC-supported agricultural college will provide additional staff, facilities and students, as well as a future source of well-trained agriculturalists to strengthen the DOA staff

capability. Peace Corps involvement will further reinforce the DOA commitment and assure the success of AID involvement. A final factor is the relationship of this project to the on-going AIP project, Audio-Visual Aids to Extension. Improved farming practices, based on the research undertaken during this project, will be demonstrated visually on videocassettes and 35 mm slides and supplemented with radio programs, face-to-face teaching and printed pamphlets. Extension coverage, even with minimum professional personnel, will be more comprehensive and efficiently presented than is presently possible. It should also be noted that GOS/DOA support and commitment to ensuring the success of this modest effort to date instills additional confidence that the GOS will provide the full measure of its contribution to this project.

V. SPECIFIC PROJECT PLANS

A. Financial Plan

1. Project Funding Summary

As indicated in the summary table below, the estimated total cost of the project is $2,155,000. It is proposed that AID will finance $1,520,000. The Peace Corps contribution will be $75,000. The GOS will contribute the equivalent of $560,000.

PROJECT FUNDING SUMMARY

Source	Foreign Exchange (FX)	Local Currency (LC)	Total	Percent of Total
AID	1,463,000	57,000	1,520,000	71
Peace Corps	13,000	62,000	75,000	3
GOS	-	560,000	560,000	26
TOTAL	$1,476,000	679,000	$2,155,000	100

2. Summary Cost Estimate and Financial Plan

The project costs and financial plan are summarized in the following table. Of the AID contribution, 96 percent represents dollar costs, and the equivalent of 4 percent represents local costs. Of the Peace Corps contribution, 17 percent represents dollar costs, and the equivalent of 83 percent represents local costs.

SUMMARY COST ESTIMATE AND FINANCIAL PLAN
(Source and Application of Funds)

SOURCE	AID FX	AID LC	PEACE CORPS FX	PEACE CORPS LC	GOS FX	GOS LC	TOTAL FX	TOTAL LC	GRAND TOTAL (Rounded)	Perce
USE										
Technical services	959,400	-	-	25,720	-	238,255	959,400	263,975	1,225,000	57
Participant Training	53,900	-	-	-	-	-	53,900	-	54,000	3
Construction/ Renovation	-	-	-	-	-	5,010	-	5,010	5,000	-
Commodities	103,000	3,000	-	-	-	20,600	103,000	23,600	130,000	6
Other Costs	-	38,500	12,000	33,040	-	155,220	12,000	226,760	240,000	11
Sub-Total	1,116,300	41,500	12,000	58,760	-	419,085	1,128,300	519,345	1,554,000	77
Contingency	111,120	4,630	708	2,830	-	41,910	111,828	49,370	161,000	7
Inflation (10% Compounded)	234,790	9,780	-	-	-	95,190	234,790	104,970	340,000	16
GRAND TOTAL	1,462,210	55,910	12,708	61,590	-	556,185	1,474,918	673,683	2,155,000	100
	1,518,120		74,298		556,185		2,148,601			
Rounded	1,520,000		75,000		560,000		2,155,000			

3. AID Obligations

The following table indicates that the project will be financed incrementally from FY 1979-FY 1981.

AID OBLIGATION SUMMARY

Component	FY 1979	FY 1980	FY 1981	Total
Technical Services	304,700	343,700	311,000	959,400
Participant Training	-	38,600	15,300	53,900
Commodities	57,500	39,000	9,500	106,000
Other Costs	10,500	13,500	14,500	38,500
Sub-Total	372,700	434,800	350,300	1,157,800
Contingencies (10%)	37,270	43,480	35,000	115,750
Inflation (10% compounded)	37,270	91,300	116,000	244,570
GRAND TOTAL (Rounded)	450,000	570,000	500,000	1,520,000

Detailed budgets for the AID, Peace Corps and GOS inputs to the project are provided in Annex N. Supporting costs analyses are also included in the Annex.

B. Administrative Plan

1. A.I.D.

Following authorization of the project, a Project Agreement will be negotiated and signed with President Renee for the obligation of FY 1979 funds. REDSO/EA will be responsible for substantive aspects of project monitoring since there is no resident AID officer in Seychelles. Administrative backstopping, as required, will be provided by the Administrative Officer in the American Embassy in Victoria.

2. Government of Seychelles

The Department of Agriculture and Land Use will be the GOS implementing agency. The U.S. technical advisors will work under the general direction of the DOA Principal Secretary and under the daily

supervision of the GAC Chief Research Officer. The DOA will be responsible for providing the full-time services of the counterparts and laboratory technicians as well as the part-time services of the Chief Agricultural Officer, farm managers, plant quarantine officers and their staffs and the staff of the FTC.

3. Peace Corps

The assignment of the two PCVs will be handled administratively by both the Peace Corps Director in Victoria and the DOA. Agreement regarding the PCV's specific duties at GAC and with the extension service will be reached jointly with the DOA, GAC, Peace Corps and U.S. technical advisors.

C. Procurement Plan

As previously mentioned, a contract will be let with a U.S. university or international agricultural research center for implementation of the project. Based on discussions with the DOA Principal Secretary, the Chief Agricultural Officer and the GAC Chief Research Officer and also on the experience and judgement of the technical members of the PP team, the following institutions should be considered for the contract on the basis of their ongoing research and work in horticulture, plant pathology and soil science.

1. University of Florida (Gainsville): especially strong in applied and adaptive research on vegetables and citrus and in plant pathology; experienced in all aspects of horticultural production, from production to marketing; extensive research program on sandy soils; a strong network of experimental stations in Florida; and worked/implemented similar projects in Bolivia and El Salvador.

2. Asian Vegetable Research and Development Center (Taiwan): extensive applied and adaptive research on vegetables and fruits common to Seychelles; good capability to provide specialized, short-term training programs in plant pathology, plant protection and soil science.

3. University of Hawaii: strong applied and adaptive research on tropical vegetables and fruits; center also for the Consortium for Tropical Soils; climate and ecology similar to Seychelles.

4. U.S. Department of Agriculture: excellent linkages with both the universities of Florida and Hawaii and the international agricultural research centers; good in-house staff of scientists.

5. International Institute of Tropical Agriculture (IITA, Ibadan, Nigeria): although specialized in previous years in tuber crops, is now

expanding applied and adaptive research on vegetables grown in tropical farming systems; has established good contacts with GAC to date.

Upon approval of the project, a PIO/T will be issued by REDSO/EA authorizing AID/W to enter into a contract with one of the above-recommended universities or international agricultural research centers. The contractor will be responsible for providing all long-term and short-term technical services, arranging all participant training programs and handling all project arrangements and expenses included under "Other Costs" in the project budget.

Using the detailed equipment list (Annex H), REDSO/EA will issue a PIO/C for the procurement in the U.S. of the equipment and supplies for the plant pathology and soil laboratory. This procurement, which will be carried out by a procurement services agent, such as AAPC, must be initiated early enough so that the equipment and supplies will arrive in Seychelles about the same time as the long-term advisors.

The GOS/DOA will procure the two project vehicles through dealerships in Victoria in accordance with instructions which will be included in the first Project Implementation Letter. Since there are no U.S. manufacturers of vehicles represented in Seychelles, a procurement source waiver for the vehicles is included as Annex I. The GOS/DOA will also procure the technical books, publications and subscriptions being financed under the project.

D. Implementation Plan

CY	Month	Action	Responsibility
1979	June	Draft PP submitted to GOS for clearance	REDSO/EA - GOS
	June-July	PP finalized	REDSO/EA
	July	PP approved	REDSO/EA
	August	Project Agreement signed with GOS	REDSO/EA-Embassy-GOS
	Sept.	PIO/T issued for contract with U.S. university/ international center	AID/W
	Sept.	PIO/C issued for lab equipment and supplies	REDSO/EA
	Sept.	GOS/DOA orders 2 project vehicles	REDSO/EA-EAAC-GOS

	Nov.	Proposals received	AID/W
	Nov.	AID-GOS selection of contractor	AID/W-GOS-REDSO/EA
	December	Contract signed	AID/W
1980	January thru February	U.S. long-term advisors arrive: horticulturalist, plant pathologist, soil scientist	Contractor-GOS
	Feb.	Project vehicles arrive	GOS
	Feb.	Lab space renovated; screen house completed	GOS-contractor
	Feb.	Lab equipment and supplies arrive	REDSO/EA-AID/W
	April	PCVs arrive: Assistant research officer and extension advisor	Peace Corps - GOS
	July	U.S. entomologist arrives for 2 months	GOS-Contractor
	July	PCV agronomist may depart	Peace Corps-GOS
	August	GAC Research Officer visits AVRDC and/or U.of Hawaii for 1 month	Contractor-GOS-AVRDC
	Sept.	Sr. Plant quarantine officer departs for 3-month training program in U.S.	Contractor-GOS
	Dec.	U.S. soil scientist departs	Contractor-GOS
1981	January	DOA/GAC agriculturalist departs for 3-month training in U.S.	Contractor-GOS
	April	U.S. entomologist arrives for 2 month program	Contractor-GOS
	April	DOA plant quarantine assistant departs for 3-month OAU training program in Nigeria or Egypt	Contractor-GOS -OAU
	June	U.S. soil scientist arrives 1 month	Contractor-GOS
	July	Formative evaluation (one month)	Contractor-GOS-REDSO/EA

	July	**First DOA/GAC plant pathology technician departs for 3-month training program in U.S.**	**Contractor-GOS**
	August.	**GAC Research Officer departs for orientation trip in Indian Ocean**	**Contractor-GOS**
1982	**January**	**U.S. entomologist arrives for 2 months**	**Contractor-GOS**
	January	**DOA/GAC soil technician departs for 3-month training program in U.S.**	**Contractor-GOS**
	February	**GAC Research Officer visits IITA 1 month**	**Contractor-GOS-IITA**
	April	**Second DOA/GAC plant pathology technician departs for 3-month training program in U.S.**	**Contractor-GOS**
	June	**U.S. soil scientist arrives for 1 month**	**Contractor-GOS**
	July	**Summative evaluation (one month)**	**Contractor-GOS-REDSO/EA**
	Oct.	**DOA hosts conference**	**Contractor-GOS**
	Dec.	**U.S. horticulturalist and plant pathologist depart**	**Contractor-GOS**
	Dec.	**Project completed**	**AID/W-REDSO/EA-GOS**
1984	**March**	**PCV assistant research officer and extension advisor depart**	**Peace Corps-GOS**

The implementation plan above and the schedule on the last page indicates an illustrative time-flow for the AID and Peace Corps inputs in technical services and participant training over the four-year period of the project.

E. Evaluation Plan

Two evaluations have been scheduled and budgeted for the project. The DOA staff will be invited to participate actively in both evaluations. The first evaluation, a formative evaluation, is scheduled for July 1981, or approximately at mid-term in implementation. One to two person-months of outside consultant services in horticulture, plant pathology and soil science will be required. It is recommended that the plant pathologist member of the PP design team return for this consultancy given his knowledge of the Seychelles agricultural system and his prior considerable experience

and contacts with the DOA. Additional members of the team should be the REDSO/EA evaluation and/or project officers. The focus of the formative evaluation will be to validate the DOA, Peace Corps and AID inputs to the project as being sufficient in quality and quantity to achieve the project outputs. If there are deficiencies, in collaboration with the DOA, the team will then recommend remedial action which can be undertaken within the remaining life of the project. The formative evaluation will take approximately three-four weeks, including discussions with the DOA, site visits (GAC, FTC, state farms, area advisory offices and settlement and private farms) and preparation of the evaluation report. The report will be distributed to the DOA, Peace Corps, the AID contractor and to AID/W-REDSO/EA.

The summative evaluation is scheduled for July 1982, approximately six months prior to completion of the project. There will be two important components of the final evaluation. One component will be an evaluation of the extent to which the project has impacted on agricultural production and income in Seychelles. Baseline data on production and income for both large and small farmers will be provided by the extension service and from the on-going GOS Survey of Rural and Agricultural Households, an extension of the research effort initiated following the 1977 census. The survey is currently funded through 1980; however the DOA has indicated that it will be continued beyond that time. The analysis should be carried out to a detailed level, including types, quantities and qualities of crops grown. This information can then be compared against the technical findings and related yield increases reported at GAC and in the contractor's quarterly and annual reports. The other component of the summative evaluation will be to measure the extent to which the project outputs have been achieved leading to conditions to indicate achievement of the project purpose. Based on the judgement of the evaluation team, a recommendation should then be made on the necessity of an extension of the project over a longer timeframe and/or the advisability of considering a follow-on project. Timing is sufficient to permit follow-on design prior to the departure of the long-term advisors and to minimize a hiatus between interventions. Technical members of the summative evaluation team should also be a horticulturalist and a plant pathologist, with one or both having a strong background in soil science. The REDSO/EA evaluation and/or project officers should also participate. Approximately one month of field work will be required.

F. Special Conditions and Covenants and Negotiating Status

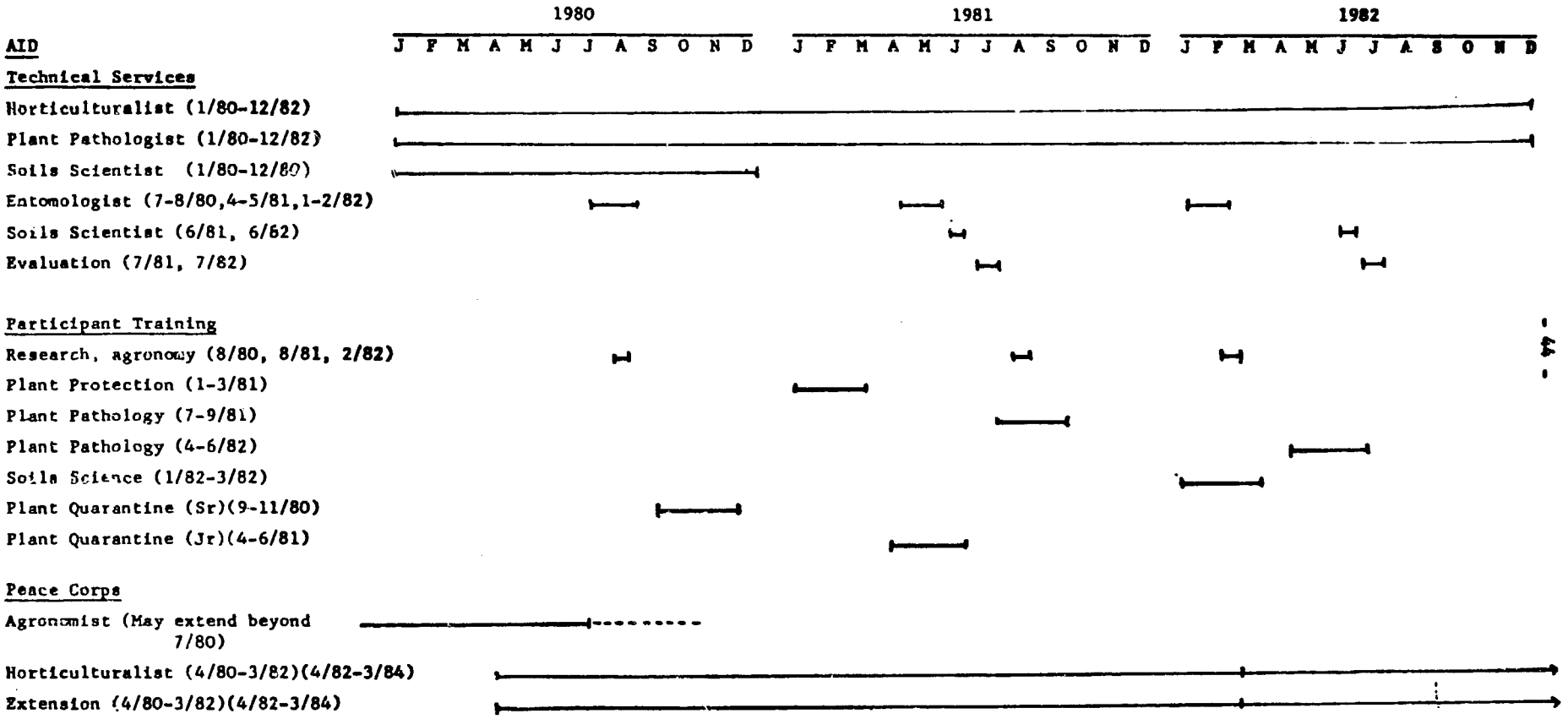
The GOS has reviewed and cleared this Project Paper and, in particular, the covenants listed below, and has found these to be acceptable. The covenants to be included in the Project Agreement are as follows:

1. In recognition of the importance that market prices have on the ability and receptivity of on-farm improvements by the small farmer, the Government of the Seychelles (the "Government") is undertaking a reassessment of its existing price policy for fruits and vegetables. The Government agrees that it will keep A.I.D. advised of any changes in this policy and, to this end, the Parties may consult, at such times as may be mutually agreeable, concerning this policy and its impact on the project.

2. The Government will covenant to provide, on a timely basis, all necessary counterpart personnel and candidates for participant training, as these are identified in the project description of the Project Agreement; and will recruit and employ technicians for the plant pathology and soils analysis laboratory , as well as such other persons as may be required for the successful implementation of the project.

3. The Government will take such steps as may be necessary to assure that the use of pesticides is in conformity with A.I.D.'s environmental regulations on the procurement and use of pesticides.

IMPLEMENTATION SCHEDULE - TECHNICAL SERVICES AND PARTICIPANT TRAINING



VI. ANNEXES — Not attached

A. GOS Official Request for Assistance

B. PID Approval Cable, State 021326 dated 1/26/79

C. Other Donor Assistance in the Agricultural Sector

D. Logical Framework

E. Position Description - Horticulturalist

F. Position Description - Plant Pathologist and Entomologist

G. Position Description - Soil Scientist (long-term and short-term)

H. Combined Equipment List

I. Vehicle Source and Origin Waiver

J. Peace Corps Project Summary Sheet

K. Additional Economic Data

L. Checklists

M. Initial Environmental Examination

N. Detailed Budgets and Cost Analyses