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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE (X APPROPRIATE BOX)
[ ] ORIGINAL [ ] CHANGE
[X] ADD [ ] DELETE

PP

DOCUMENT CODE 3

2. COUNTRY/REGIONAL ENTITY/GRANTEE
Yemen Arab Republic

3. DOCUMENT REVISION NUMBER

4. PROJECT NUMBER
279-0052

5. BUREAU
A. SYMBOL: NE
B. CODE: 03

6. ESTIMATED FY OF PROJECT COMPLETION
FY 90

7. PROJECT TITLE - SHORT (STAY WITHIN BRACKETS)
Agriculture Dev. Support
Horticulture Improvement & Trng.

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION
A. INITIAL MO. YR. 8 3 B. FINAL FY 8 9

9. SECONDARY TECHNICAL CODES (MAXIMUM SIX CODES OF THREE POSITIONS EACH)

10. ESTIMATED TOTAL COST ($000 OR EQUIVALENT, $1 = ____)

A. PROGRAM FINANCING	FIRST YEAR B. FX	C. L/C	D. TOTAL	ALL YEARS E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL	2,003	1,465	3,468	10,378	4,007	14,385
(GRANT)	(2,003)	(1,465)	(3,468)	(10,378)	(4,007)	(14,385)
(LOAN)	(-)	(-)	( )	(-)	(-)	(-)
OTHER U.S. 1.				-	-	-
OTHER U.S. 2.						
HOST GOVERNMENT	-	1,685	1,685	-	4,430	4,430
OTHER DONOR(S)						
TOTALS	2,003	3,150	5,153	10,378	8,437	18,815

11. ESTIMATED COSTS/AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION LINE CODE	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE	FY 83 D. GRANT	E. LOAN	FY 84 F. GRANT	G. LOAN	FY 85 H. GRANT	I. LOAN	ALL YEARS J. GRANT	K. LOAN
ENT	B 115	070	3,468		2,249		1,999		14,385	
TOTALS			3,468		2,249		1,999		14,385	
ESTIMATED EXPENDITURES										

12. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS) [X] CHECK IF DIFFERENT FROM PID/PRP

To institutionalize within the MAF an expanded capacity to support increased fruit production through extension, plant protection and the delivery of disease free planting stock of improved fruit varieties to the fruit subsector which comprises large numbers of small farmers.

13. WERE CHANGES MADE IN THE PID/PRP FACESHEET DATA NOT INCLUDED ABOVE? IF YES, ATTACH CHANGED PID AND/OR PRP FACESHEET.

[ ] YES [X] NO

15. ORIGINATING OFFICE CLEARANCE

SIGNATURE
Charles D. Ward

TITLE
Mission Director
USAID/Yemen

DATE SIGNED
MO. 0 8 DAY 2 4 YR. 8 2

16. DATE RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
MO. 0 9 DAY 1 4 YR. 8 2

AID 1330-4 (5-75)

HITS
SPP

SUBPROJECT PAPER

/

HORTICULTURE IMPROVEMENT AND TRAINING
AGRICULTURE DEVELOPMENT SUPPORT
279-0052
YEMEN

U.S. Agency for International Development
and
Consortium for International Development

anaa Yemen

September 1982

Circ

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: A (A. ADD, C. CHANGE, D. DELETE)

2. DOCUMENT CODE: 3

3. COUNTRY/ENTITY: YEMEN ARAB REPUBLIC

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 279-0052

6. BUREAU/OFFICE: A. SYMBOL: NE; B. CODE: 03

7. PROJECT TITLE (Maximum 40 characters): Agricultural Development Support

8. ESTIMATED FY OF PROJECT COMPLETION: FY 90

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 79; B. QUARTER 4 (Enter 1, 2, 3, or 4); C. FINAL FY 89

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

A. FUNDING SOURCE	FIRST FY 79 B. FX	C. L/C	D. TOTAL	LIFE OF PROJECT E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL	-		1,200	52,746		52,746
(GRANT)	(1,200)	(-)	(1,200)	(52,746)	( )	(52,746)
(LOAN)	(-)	( )	(-)	(-)	( )	( )
OTHER U.S. 1.	-		-	-		
OTHER U.S. 2.	-		-	-		
HOST COUNTRY	-		-		10,027	10,027
OTHER DONOR(S)	-			-		
TOTALS	1,200	-	1,200	52,746	10,027	62,773

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	D. LOAN	E. 1ST FY 79 F. GRANT	G. LOAN	H. 2ND FY 80 GRANT	J. LOAN	K. 3RD FY 81 L. GRANT	M. LOAN
(1) FN	000	-	-	1,200	-	4,032	-	6,855	-
(2)				-		-		-	
(3)				-		-		-	
(4)				-		-		-	
TOTALS				1,200	-	4,032	-	6,855	-

A. APPROPRIATION	N. 4TH FY 82 O. GRANT	P. LOAN	Q. 5TH FY 83 R. GRANT	S. LOAN	T. LIFE OF PROJECT GRANT	U. LOAN
(1) FN	10,109	-	11,423	-	52,746	-
(2)	-		-		-	
(3)	-		-		-	
(4)	-		-		-	
TOTALS	10,109	-	11,423	-	52,746	-

12. IN-DEPTH EVALUATION SCHEDULED: MM 08 YY 83

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PROJECT FACESHEET DATA BLOCKS 12, 13, 14 OR 15 OR IN PRP FACESHEET DATA BLOCK 10? YES. ATTACH CHANGED PROJECT FACESHEET.

1/ Included Core, Ibb, Poultry and Horticulture Subprojects.

1

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE

C. F. Weden

TITLE: Acting Mission Director USAID/Yemen

DATE SIGNED: MM 08 DD 24 YY 82

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

AID 1330-4 (10-77)

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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: A (A ADD, C CHANGE, D DELETE)

2. DOCUMENT CODE: 3

3. COUNTRY/ENTITY: YEMEN ARAB REPUBLIC

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 279-0052

6. BUREAU/OFFICE: A. SYMBOL: NE; B. CODE: 03

7. PROJECT TITLE (Maximum 40 characters): AG.DEV.SUPPORT - HORTICULTURE IMPR. & TRG.

8. ESTIMATED FY OF PROJECT COMPLETION: FY 90

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 82; B. QUARTER 4 (Enter 1, 2, 3, or 4); C. FINAL FY 89

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	250	250	500	10,000	4,000	14,000
(GRANT)	(250)	(250)	(500)	(10,000)	(4,000)	(14,000)
(LOAN)	(-)	(-)	(-)	(-)	(-)	(-)
OTHER U.S. 1.	-	-	-	-	-	-
OTHER U.S. 2.	-	-	-	-	-	-
HOST COUNTRY	-	1,000	1,000	-	4,000	4,000
OTHER DONOR(S)	-	-	-	-	-	
TOTALS	250	1,250	1,500	10,000	8,000	18,000

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 82 F. GRANT	E. 1ST FY 82 G. LOAN	H. 2ND FY 83 I. GRANT	H. 2ND FY 83 J. LOAN	K. 3RD FY 84 L. GRANT	K. 3RD FY 84 M. LOAN
(1) FN	B115	070	-	500	-	4,000	-	2,500	-
(2)				-		-		-	
(3)				-		-		-	
(4)				-		-		-	
			TOTALS	500	-	4,000		2,500	-

A. APPROPRIATION	N. 4TH FY 85 O. GRANT	N. 4TH FY 85 P. LOAN	O. 5TH FY 86 R. GRANT	O. 5TH FY 86 S. LOAN	T. LIFE OF PROJECT GRANT	T. LIFE OF PROJECT U. LOAN
(1) FN	2,500	-	1,600	-	14,000	
(2)	-		-		-	
(3)	-		-		-	
(4)	-		-		-	
TOTALS	2,500	-	1,600	-	14,000	

12. IN-DEPTH EVALUATION SCHEDULE: MM 08 YY 84

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

2 (NO / YES)

14. ORIGINATING OFFICE CLEARANCE

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TITLE: Acting Mission Director USAID/Yemen

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

AID 1330-4 (9-78)

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SUBPROJECT PAPER

for the

HORTICULTURE IMPROVEMENT AND TRAINING SUBPROJECT

(HITS)

in the

YEMEN ARAB REPUBLIC

Prepared by:

Consortium for International Development (CID)

For:

The U.S. Agency for International Development

ugust 1982

Filed

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PROJECT DEVELOPMENT TEAM

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OTHER DONORS

German Group--Mr. Eberhard Schuppius, Deputy Chief of Mission, Embassy of Federal Republic of Germany

ACRONYMS

ADO	Agriculture Development Officer
AID	Agency for International Development
CID	Consortium for International Development
COP	Chief of Party
CPO	Central Planning Organization
CSPU	California State Polytechnic University, Pomona
DHS	Deciduous Horticulture Station
FFYP	First Five Year Plan
GSD	General Services Division (MAF)
HITS	Horticulture Improvement and Training Subproject
LDA	Local Development Authority
MAF	Ministry of Agriculture and Fisheries
MST	Ministry of Supply and Trade
PP	Project Paper
PPD	Plant Protection Department
PPP	Plant Protection Program
SFYP	Second Five Year Plan
SPID	Subproject Identification Document
SPP	Subproject Paper
TDY	Temporary Duty
T-SHS	Tropical-Subtropical Horticulture Station
YAR	Yemen Arab Republic
YARG	Yemen Arab Republic Government
YR	Yemeni Rial

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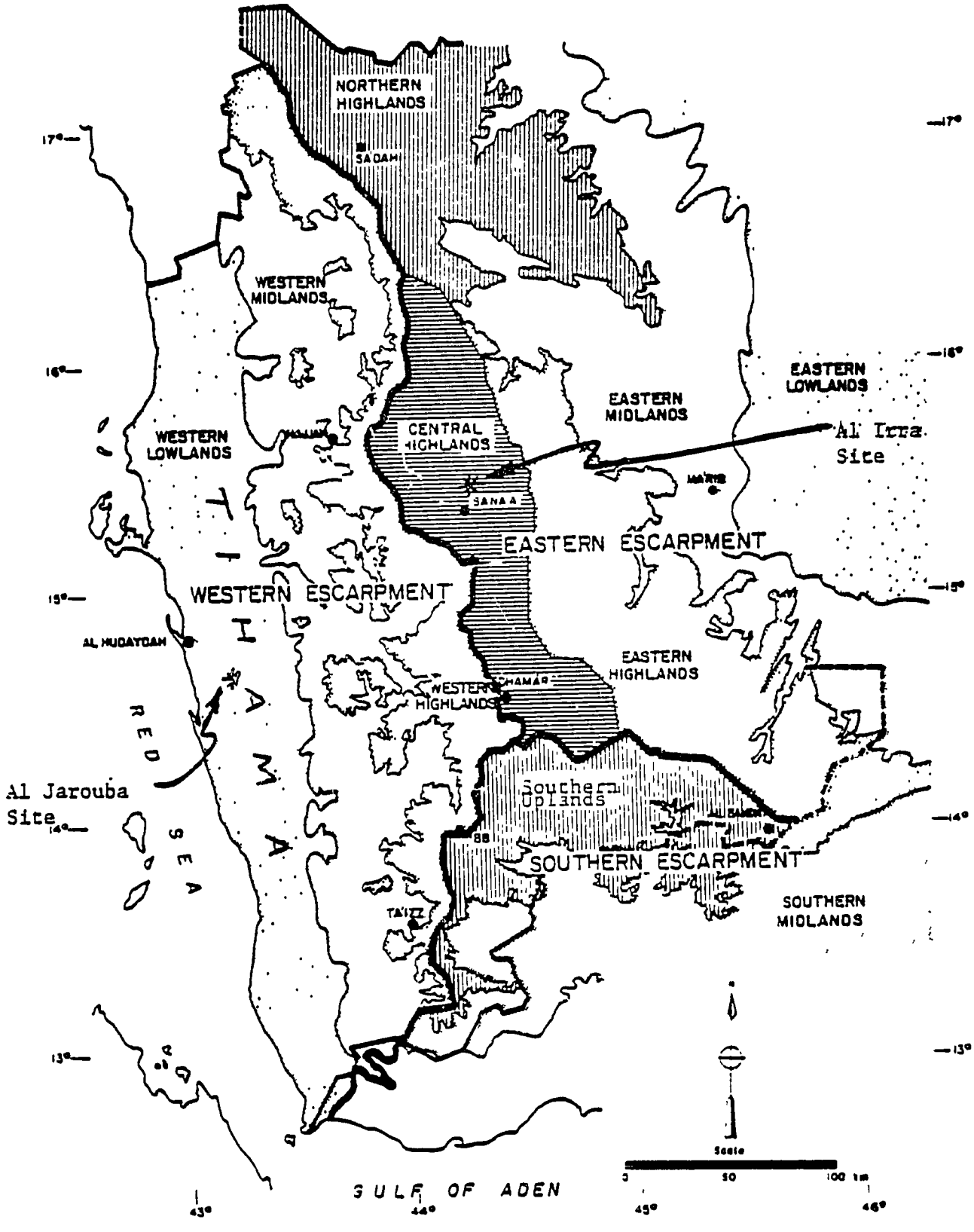

Yemen Arab Republic
Showing Physiographic Regions

GLOSSARY OF HORTICULTURAL TERMS

Agricultural technician. A field support technician working under the extension agent.

Asexual reproduction. Reproduction without union of male or female sex cells to form a seed. Propagation of plants by cuttings or other vegetative parts.

Citrus. The several genera of trees and shrubs of the family Rutaceae, generaly grown in subtropical regions for their fruit, which includes oranges, grapefruit, lemons, citron, mandarin, lime, and kumquat.

Deciduous fruit. A general term used to describe most of the fruit trees which exhibit a dormant period accompanied by loss of leaves.

Extension agent. MAF employee responsible for the transfer of agricultural technical knowledge from MAF to the farmer. In Yemen, extension agents have a secondary school or B.S. degree.

Extension specialist. A person with a B.S. degree or higher who is responsible for staff or farmer training programs and organizing, preparing, and disseminating agricultural information for use by field extension agent.

Graft. A shoot or part of a plant (scion) inserted in a slit or groove in another plant (stock) so that the growing layers are united.

Hermaphrodite. A plant having both male and female reproductive organs.

Horticulture specialist. A person with a B.S. or higher in horticulture. The horticulture specialist backstops extension agents and technicians on horticulture problems with which they cannot deal.

Horticulture technician. An MAF employee with secondary school training who specializes in horticulture.

Nurseryman. An MAF employee responsible for management and operation of regional nurseries.

Pomology. The science and practice of fruit growing. It is not necessarily limited to the study of the pome fruits.

Plant protection specialist. A person with a B.S. degree or higher in pathology, nemotology, entomology, or any discipline related to plant disease or insects.

Seedling. A young fruit tree which has grown from a seed.

Sexual reproduction. Formation of seeds capable of producing new plants from union of the male (pollen) and female (ovule) sex cells.

Subtropical fruit. Fruit such as citrus that are generally grown in the region between the tropics and about 40° latitude, characterized by greater temperature extremes and variation in humidity and daylength, although minimum temperatures will rarely fall below -4° C.

Temperate zone fruit. Fruit that are grown in the regions between the subtropics and about 55° latitude, characterized by extremes of temperature and variation in daylength. Most fruit grown in this region are deciduous, e.g., apples, pears, peaches, plums, etc.

Tropical fruit. Fruit grown in tropical regions, generally between 23° 27' north and south latitude, characterized by little variation from the average temperature of about 27° C., little variation in daylength, and generally high humidity. Examples are bananas and papayas.

I. SUMMARY

A. Overview

1. Recommendation

a. Authorization of a $14 million grant to the YAR for the Horticulture Improvement and Training Subproject (HITS) under the Title XII Agricultural Development and Support Program.

b. Approval of the following waiver: A waiver of source-origin from Code 000 to Code 941 countries for off-shelf procurement in YAR of equipment and supplies from European manufacturers. Amount of estimated procurement is $186,804. Probable sources are Italy, France, Germany, and the U.K. A detailed justification and a list of equipment and supplies are included in Annex F.

2. Duration

Seven (7) years (FY 1982-89).

3. Purpose

To institutionalize within the MAF an expanded capacity to support increased fruit production through extension, plant protection, and the delivery of disease free planting stock of improved fruit varieties to the fruit subsector.

4. Justification

Local production has not been sufficient to meet increasing demand for fresh fruit in the Yemen Arab Republic (YAR). As a result, imports of fruits have been increasing, contributing to the country's widening balance of trade problems. Fruit production is largely done by medium and small scale subsistence farmers who cultivate up to four hectares of land, usually in a mixed cropping pattern. Several major constraints exist to increasing production by these groups, including lack of an adequate institutional support base within the MAF (which provides extension services), stock for clean and improved fruit varieties, an appropriate country-wide plant protection program, and a package of improved cultural practices which will result in increased production at affordable costs and minimal risks. The HITS project will address these major constraints within an institution building framework.

5. Method of Implementation

The project will be implemented by the Consortium for International Development (CID) under its broad Title XII Agricultural Development and Support Program with AID in the YAR. California State Polytechnic University at Pomona (CSPU) has been selected as CID's lead university for project development and implementation. CID/CSPU has been undertaking limited preimplementation activities in conjunction with pre-subproject development since September 1981. Preimplementation activities were authorized by the AA/NE, using funding from the Core Subproject with CID

(279-0052). It is expected that, once approved, the HITS project will reimburse the Core Subproject in the amount of approximately $479,739 for approved preimplementation expenditures.

6. Life-of-Project Cost

Total project costs are proposed at about $18 million, of which AID will contribute about $14 million and the YARG will contribute about $4 million equivalent in local currency (Yemeni Rials). See Section IV.D.

7. Exchange Rate (8/82)

$1.00 = $4.58 YR 1.00 YR = $0.22

8. Environmental Recommendation

Negative Determination (see Annex D).

B. SPID and Other Design Issues

SPID and AID/W reviews of the SPID raised numerous issues which were to be addressed by the SPP design team. During project development, additional design issues were surfaced and discussed with AID/W. The following is a summary of the major issues and the responses presented in the SPP. They include: (1) Project focus and increase in AID contribution; (2) micro-macroeconomic and recurrent cost analyses; (3) water availability; (4) production versus importation of seedlings; (5) lessons learned from the previous project; (6) alternative approaches to extension; (7) identification of beneficiaries; (8) relationship to other donor projects; (9) financing of extension services from sales of seedlings; and (10) ultimate authority for HITS stations.

1. Project Focus and Increase in AID Contribution

The SPID proposed a 5-year project which would have as its principal foci (a) developing and supplying improved and expanded varieties of seedlings from project-funded nurseries and (b) strengthening the extension system in support of increased fruit production. The estimated cost of this project was about $7.5 million.

Subsequent to preparation of the SPID and in preparation for a more detailed project design effort, CID and USAID undertook more indepth surveys of the institutions supporting the fruit subsector, including other donor projects. These surveys, inter alia, identified the recent establishment of several new government nurseries that are beginning to provide seedlings in quantities that are expected to meet farmer demand. They identified the critical importance of initiating a comprehensive plant protection program to insure that (a) the introduction of new insects and diseases into the YAR would be minimized and (b) existing insects and diseases would be controlled or, if possible, eradicated. These surveys also identified an inadequate and untimely supply of clean budwood as a major constraint faced by the nurseries.

On the basis of this new information, USAID/Yemen, MAF, and CID decided to redirect the focus of the project to emphasize (a) establishing institutional facilities for producing clean and improved budwood for nurseries and sites for practical hands-on training and (b) establishing an appropriate program to enforce existing plant protection legislation. The parties agreed to maintain the strengthening program for the MAF Department of Extension and to parallel the effort with a more direct outreach program via publications and media. These changes resulted in the present proposal for a 7-year project, with a total AID contribution of $14 million.

The increase in proposed AID contribution from $7.5 million to $14 million thus results from (a) the addition of more long-term technical assistance, participant training, and other support elements; (b) the addition of a critically needed plant protection program; and (c) compounded inflation that accompanied the lengthening of the project.

2. Micro-macroeconomic Analyses

The SPID and AID/W reviews called for comprehensive economic and recurrent cost analysis of this institution building project. It should be kept in mind that the proposed project is not a production project, per se. The prime objective is to institutionalize within the MAF a capacity for supporting increased production by the fruit subsector. Production increases will be a result at the goal level--not at the purpose level--and will, therefore, be an indirect result of the project. This notwithstanding, the economic analysis attempts to estimate the indirect production results of this institutional development project. It recognizes the paucity of data on the fruit subsector and proposes that the project incorporate an appropriate data collection and analysis element to help the MAF address this need. In the absence of reliable data, several assumptions were made which are clearly spelled out in the analysis. This analysis is contained in Annex L, and is summarized in Section IV.C. It includes appropriate sensitivity analyses that test some alternative sets of assumptions.

3. Water Availability

Water is not a constraint in many areas, but it has been identified as being critical in other areas. In the areas where water is a problem, small farmers have pooled, and will continue to pool, resources for water development. As many as 10 to 12 small farmers have pooled their resources to drill wells, and have shared operating costs. This is a growing practice in all areas of Yemen, thereby giving some access to water.

The project will emphasize improved management practices for use of existing (largely rain water) water supplies. The improved practices might include constructing simple canals or catchments and exploring cost-sharing arrangements for well or borehole construction. Preliminary analyses suggest that much can be accomplished to improve water management through simple, affordable, low-risk modifications in traditional cultural practices (see Annex M).

4. Production Versus Importation of Seedlings

In its SPID version, the project would have concentrated on mass production of seedlings to meet growing farmer demand. The increase in production of seedlings through existing and relatively new nurseries makes this strategy no longer desirable. Thus, the question of AID-funded production versus importation of seedlings is no longer an issue. The project will include the development of model nurseries for training purposes at the horticultural improvement and training stations. The output of these nurseries will be sold to farmers in the region. However, the output will not be of such a magnitude as to meet a significant portion of farmer demand. (See Annex M.)

5. Lessons Learned from Previous Project

The previous AID-funded Tropical and Subtropical Horticulture Improvement Project (279-0024) suffered many shortcomings, including, but not limited to, lack of manpower for training, lack of commitment regarding sites for improvement stations, delays in recruiting qualified (including Arab speaking) personnel, pressure for visible progress prior to the establishment of a basic research program, substantial changes in the thrust of the project, limited qualifications of the contractor in carrying out the redirected thrusts of the project, and lack of periodic external evaluations. These are fully assessed in an evaluation of the project by Ronco Consulting Corporation. The HITS Project incorporates the recommendations made in the Ronco evaluation.

The proposed new project seeks to build on past experience in several ways. These include, but are not necessarily limited to, the following:

a. The proposed project will benefit from a very productive interim phase which began in September 1981. Since then, CID has been developing an effective working relationship with sections of the MAF concerned with fruit production. Progress during this period has included the conduct of several preliminary surveys on seedling production, plant pests and disease, availability of budwood, fruit quality, cultural practices, and training needs. Further, the MAF has been motivated to identify a new station site; initiate structural improvements on the old site at Jarouba; build an access road to the new site; appoint five agricultural inspectors to the Plant Protection Department who will be candidates for AID-funded training; initiate the process of identifying counterparts and other candidates for long-term training; and indicate its intent to enforce existing law regarding plant protection.

The MAF has recently recognized the need for a greater understanding of the socio-cultural make-up of rural Yemen and for an expanded communications outreach program in the MAF. The Ministry has therefore: (1) Elevated the rural development section to the directorate level, appointed a Director General for Rural Development, and requested an AID-funded counterpart, i.e., a rural sociologist funded under the CID Core Subproject, for this Director; and (2) requested an AID-funded counterpart for the Director of the Communications Division, who is responsible for information production and distribution. While these developments are not the sole result of interim

work on the proposed project, they did occur during this phase, were stimulated by CID's activities, and will have a key impact on implementation of the entire Title XII program in Yemen, including the proposed project.

b. The project will benefit from no less than three external evaluations (see Section IV.E., Evaluation Plan).

c. The contractor, CID, has broad-based experience in horticulture, and should be able to staff the project without significant delays. The interim phase has enabled CID to broaden its understanding of exactly what is required in Yemen, both program and staff-wide, which is a very positive factor.

6. Alternative Extension Approaches

In recognition of the relatively poor experience that the development community has had in strengthening traditional extension services to affect farmer education, AID/W recommended consideration of alternative extension approaches. The design team concluded that strengthening the traditional extension service is indeed a necessary, but clearly not a sufficient, condition for effective farmer training. The project, therefore, includes a four-pronged approach to improving the dissemination of information to farmers who are the primary beneficiary of this project. These include: (a) Formal and informal training of MAF extension agents, agricultural technicians, and agriculture inspectors so that they are more effective in their traditional roles; (b) improved technical backstopping in extension by horticultural extension specialists; and (c) informal training, through demonstrations and distribution of printed materials or through nurserymen and farm input suppliers who have direct contact with farmers at the point of sale; and (c) direct training of farmers through a media outreach program, using radio, television, and newspapers. Major emphasis will be given to those aspects of the program which are appropriate for illiterate farmers. Women who are playing increasing roles in farming will be given special attention. Because they involve expanded use of existing technologies, the institutional implications of the alternative approaches are minimal, if any. (See Sections III and IV and Annex M.)

7. Identification of Beneficiaries

AID/W reviews requested clarification of how small scale farmers will benefit from this project. As a broad-based institutional development activity, the project will, and should, benefit the entire fruit subsector in Yemen. Indirect beneficiaries include: (a) All fruit growers practicing sole fruit growing and mixed cropping (both subsistence and commerical growers) who benefit from the increased income associated with expanded and improved production; (b) farm wage workers who may benefit from marginal increases in employment opportunities; (c) private merchants of fruit produce; (d) private entrepreneurs who sell horticultural imputs; (e) farmer and farm worker families who benefit from the extra nutritional values from fruit consumption and extra family income; and (f) consumers who will benefit from an increased supply of quality fruits at reduced prices. Obvious direct beneficiaries include those individuals being trained in improved horticultural practices and plant protection.

Analysis of the indirect beneficiaries determined that they will initially consist of all levels of farmers, but will be concentrated among medium-scale farmers who generally grow some fruit on a mixed cropping or small orchard basis on up to four hectares. Through the spread effect of these "model growers" and through extension and direct training, smaller farmers will, over time, be the largest group of beneficiaries. This group cultivates an average of up to one hectare of land, and they constitute 60 percent of all farmers in Yemen.

The project is designed to increase the availability of clean stock to all farmers, but with special emphasis on small farmers, and also to increase the confidence level of small farmers regarding the profitability of fruit production. This should be a significant factor in insuring small farmer participation in the project.

8. Relationship to Other Projects

Annex O outlines the participation of other donors and agencies in the fruit subsector. AID coordination with these organizations will be through (a) the existing committee of donors in horticulture which advises the MAF on an informal basis and (b) through the counterparts in key positions who will be assigned to work with AID-funded, long-term personnel. CID technicians have been participating in the informal and unscheduled meetings of the advisory committee during the interim phase, and will continue to do so during project implementation. Through this participation, consideration will be given to recommending a more formal and organized advisory group, if it is deemed more appropriate and effective than the current approach.

Through close coordination with the Federal Republic of Germany's Plant Protection Project, the design team identified the need for a plant protection program suitable to fruit production. Further, the World Bank has recently initiated a program for coordinating all agricultural research in Yemen. Though the research aspect of HITS is very limited, it will be in collaboration with the World Bank's Agricultural Research Development Project which seeks to coordinate all agricultural research in-country.

9. Financing of Extension Services from Sale of Seedlings

The interim report recommended that extension services be partially financed from proceeds of seedling sales at nurseries. This recommendation was based on the earlier (SPID) version of the project in which a major emphasis was to be on seedling production and sales at the HITS stations. When it was concluded seedling production and sales at the HITS stations were not responsive to removing the major constraints faced in increasing production and improving quality of the product, the focus at these stations was shifted from seedlings to budded wood production. There will clearly be an insufficient revenue base with which to consider funding anything but the continued operation of the stations. The recommendation was, therefore, not considered further during project design.

In the longer-term, the anticipated volume of seedling sales at nurseries will not provide any secure long-range institutional arrangement or revenue base for employing extension agents in the YARG.

10. Ultimate Authority for HITS Stations

The interim report raised the issue of which agency should have ultimate authority for the HITS stations, i.e., the YARG/MAF or the respective local development authorities (e.g., the Tihama Development Authority). The SPP does not address this issue. USAID/Yemen and the design team conclude that, ultimately, the stations should be in the YARG agency which, at the termination of the project, has the best capability to operate them. The local development authorities are within the MAF structure. The issue, therefore, is largely an internal MAF decision. It is expected that the final external evaluation planned for Year 6 will address this issue and make an appropriate recommendation. The YARG does not have a predisposed position on this issue.

II. BACKGROUND AND SETTING

A. Background

Relative to its apparent potential, fruit production in the YAR has been small. Fruit crops such as grapes and limes, however, have been successfully produced in the YAR for thousands of years, with very little inputs other than irrigation. Figures from 1981 show that land devoted to fruit production amounted to 27,000 hectares (ha), of which 12,500 ha. were in grapes and 14,500 ha. in other fruits. These other fruits include: Tropicals such as mangos, papaya, banana, and dates; sub-tropical citrus such as lime; and deciduous, temperate-zone crops such as fig, peach, apricot, pomegranate, pear, quince, apple, walnut, and almond. These fruit crops accounted for about 3.6 percent of total land devoted to agriculture production (1.024 million ha.) in the YAR.

In terms of production quantities, statistics report annual production of grapes in 1981 as 64,300 tons. Production of other fruits show increases from 25,000 tons to 80,700 tons during the 1970-81 period. Over this period, land allocated to other fruit production increased from 4,500 ha. to 14,500 ha., or by 220 percent. Since 1976-77, however, this rate of growth has declined to less than 1,000 ha. annually. Furthermore, yields have actually declined slightly from their early 1970 level.

Production of this wide variety of fruits is a result of the wide range of climatic zones in the YAR. These zones range from the Tihama lowlands along the Red Sea, characterized by a warm, humid environment of relatively low rainfall; to the middle uplands in the Taiz region, characterized by moderate-to-high annual rainfall and fertile soils; to the high plateau in the Sana'a region, a temperate zone characterized by relatively cool winters. Given this wide climatic range, potential exists for production of most of the known fruits of the world, with the exception of certain deciduous fruits (e.g., certain varieties of apricots, apples, and peaches) which require relatively long cold winters.

The sigificant increases in fruit production during the 1970's were in response to sharp increases in demand resulting from three primary factors: (1) The rate of population growth, 2.7 percent annually; (2) the growth in disposable income; and (3) the relatively high income elasticity of demand for fruit products.

L. K. Mubashir[1] estimated per capita consumption of fruit products to be approximately 21.1 kg in 1974-76. Using data currently available on fresh fruit imports and domestic fruit production, total consumption in 1981 was approximately 290,000 tons. This yields a per capita consumption rate of approximately 40 kg or a doubling of per capita consumption since 1974-76.

Yemen's total disposable income increased substantially from 1970 to 1980, as measured both in current and constant rials. In constant rials, the average annual growth rate was about 6.6 percent. Combining the expected growth rates in population and total disposable income, per capita consumption of fruit is expected to grow at an annual rate of about 4.5 percent. (See Section IV.C., Economic Analysis for details.)

Available statistics suggest that foodstuff imports contribute to YAR's widening negative balance of trade. The sharp rise in fruit importation represents a key element in the increase of food imports. For example, from 1975-76 to 1978-79, the imported value of fresh fruit increased more than tenfold. In 1979-80, fruit imports accounted for about 7 percent of total imports. In response to this trend and realizing the potential that exists for expanded domestic production, the YARG has requested AID assistance in developing the country's fruit production potential.

B. Constraints to Increasing Fruit Production

Several constraints must be addressed before expanded fruit production can become a reality to the YAR. These can be briefly summarized as follows:

1. Most fruit crops are grown from seed and are subject to the genetic variation inherent in sexual reproduction.[2] Resulting trees (seedlings) for most species are not uniform, and, as a result, overall productivity is low and fruit quality is poor.

2. Current cultural practices (e.g., fertilization, pruning, pest/disease control) do not produce good yields or quality products. Further, there are severe shortages of horticulture specialists and technicians to guide producers in selecting practices which will solve their problems. Basic horticultural practices necessary to improve yields and fruit quality are, therefore, not being taught to local farmers (particularly small scale farmers) or nurserymen, and they are not likely to develop spontaneously.

3. Planting materials (trees, budwood, and seeds) have recently been introduced into the YAR from many countries without proper consultation,

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[1]Mubashir, L. K., "The Role of Agriculture in the Long-Term Economic and Social Development in the Yemen Arab Republic," U.N. Economic Commission for Western Asia, October 1979.

[2]Exceptions are grapes, figs, pomegranates, and quince, which are propagated by cuttings, an asexual process resulting in genetically identical offspring, e.g., clones.

resulting in the introduction of non-productive varieties which are often infested with pests and diseases not previously found in the YAR. Local farmers and nurserymen are not capable of identifying or controlling the pests and insects. As a result, the survival rate of newly planted trees is low.

4. To control importations and transportation of horticultural plant materials, there are presently ten nurseries producing fruit trees and vines in quantities necessary to meet effective demand. Only one nursery is producing budded trees in any quantity, and all nurseries are presently distributing insect/disease-laden trees to farmers. Although a plant quarantine law to control importations and transportation of horticultual plant materials exists, it has never been implemented. Similarly, the Bioregulants Act of 1981, a pesticide law, was formulated and submitted to YARG, but has not yet been ratified. Ratification and enforcement of these regulations is essential to prevent further introduction of foreign pests and diseases and to control and/or eradicate those already present in the YAR.

5. Water for irrigation is scarce in many locations, and lack of proper tree plantings and care, including watering, results in inefficient use of available water.

C. Previous AID Support in Horticulture

Initial AID support to the horticulture subsector was through the Tropical and Subtropical Fruit Improvement Project (279-0024), authorized in 1976. The goal of this project was to develop a foundation for the institutionalization of fruit production, and it was largely research oriented. The objectives were to develop horticulture technologies suitable to the YAR and, to a minor degree, provide limited training in horticulture skills.

The Tropical and Subtropical Fruit Improvement Project was implemented via a contract signed with the Tuskegee Institute in mid-1977. The contractor team did not fully arrive in country until late 1978, and the first tree plantings occurred in early 1979--several years following project authorization. The project was thus plagued by a litany of delays from the start. The MAF became increasingly anxious for immediate results. The contractor complied by importing a number of fruit trees for immediate distribution, thus adding a new dimension--tree importation and dissemination--to this research project. Following an extension of the contract, it expired in September 1981.

An end of project evaluation was conducted in July 1981 by the Ronco Consulting Corporation. (See Annex J for excerpts from the Ronco Report.) This report concluded that all parties were equally responsible for delays and lack of progress. The most serious consequence was the failure to secure appropriate research sites and to develop them properly. In fact, the report noted that trees were planted at the research station sites before an adequate infrastructure was in place. By the end of the first contract period, little had been accomplished: The station at Jarouba was still under construction; the station at Bir al Shaif closed to accommodate urban growth; and no effort had been made to meet the project's secondary purpose of training personnel or improving horticultural practices.

In September 1981, when the contract with the Tuskeegee Institute expired, the Consortium for International Development (CID) was granted interim approval to maintain and improve existing facilities until a new contract, based on a new project paper, could be signed. During this interim phase, progress has involved continued development of the Jarouba Horticulture Improvement Station; initiation of a citrus budding program; and initiation of construction of a new Deciduous Horticulture Improvement Station at Al Irra near Sana'a. Contractual relations have improved greatly. Paralleling progress during the interim phase and during the development of a new horticulture project, Ronco Consulting Corporation completed another report which documents the economic potential of fruit production in the YAR and which defines the anticipated beneficiaries of a proposed new project, i.e., the Horticulture Improvement and Training Subproject (HITS).[3] This report and numerous others have been duly considered in the development of this project.

HITS is proposed as an institution-building activity under the Title XII Agricultural Development Support Program (279-0052). The Title XII Program, authorized in 1979, establishes a collaborative assistance effort, joining USAID, YARG, and the contractor (CID) in a long-term relationship to achieve the goal set forth in the Core Subproject Paper (1979). HITS is an integral part of the overall Title XII strategy, and is designed to strengthen the institutional structure supporting the horticulture subsector of the YAR's agricultural sector.

D. Relationship to Development Strategy

Agriculture presently accounts for about 28 percent of GDP, down from 45 percent in 1977-78. As production levels have actually increased slightly during this period, this trend represents an accelerated growth in other economic sectors. Even with heavy labor out-migration to Saudi Arabia for higher wages, agriculture still employees 65 to 70 percent of the population on at least a part-time basis. Realizing that agriculture is the only sector that can be developed with existing resources (land, water, and labor), the YARG, in its Second Five-Year Plan, proposes to increase agricultural production by an ambitious 4.2 percent annual rate. To accomplish this, new lands will be brought into production using improved irrigation techniques.

One of the areas scheduled for immediate attention in the YARG Second Five-Year Plan is fruit and other horticulture crops. The MAF has strongly urged USAID and CID to assume responsibility for follow-up activities to the earlier horticulture project. The MAF has properly identified the constraints to increasing production and inititated action to relieve them.

USAID/Yemen policy for development has targeted agriculture, rural development, and education/training with a concern that all elements of rural Yemen, particularly rural small-scale farmers, should enjoy an improved quality of life as a result of AID projects. One of the foci of the AID Agricultural Development Program is institutional development and training of human resources. A key element of this strategy is the broad-based Title XII

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[3] Ronco Consulting Corporation, "Interim Report--Horticultural Project," June 1982.

program with CID. This program will include subprojects whose objectives are to support the establishment in the MAF of a strong institutional base for accelerated agricultural development. Other CID/Core projects under discussion include:

- Ibb Secondary Agricultural Institute
- Poultry Extension and Training
- Sana'a University Faculty of Agriculture (proposed)
- Documentation Learning Resource Center

The overall CID/Core strategy is to support the USAID/Yemen strategy by addressing a variety of constraints in the overall agricultural sector that will significantly impact on the Core subproject purpose of improving the MAF's capacity to implement a national development program. The purpose of HITS is to institutionalize such a capacity for the fruit subsector, thus fitting directly into and supporting the CID/Core strategy. On the other hand, through the Core Subproject, HITS will be strengthened through administrative, logistical, advisory, and long-range program planning.[4] Some examples follow: U.S. training is an integral element of HITS, thus the development of a Faculty of Agriculture at Sana'a University (a Core strategy) will serve (in future years) the formal training needs of agricultural personnel, including those who will specialize in horticulture. Similarly, the Ibb Secondary Agricultural Institute (an on-going subproject) will provide future trainees for fulfilling the personnel requirements of HITS as well as for other projects. Subsequently, through the HITS training program, the Department of Horticulture in the MAF will be strengthened, and, thus, the Core purpose of improved MAF capacity to plan and implement development programs will be fulfilled.

HITS is designed to have an impact on a large section of rural population, the majority of whom are subsistence and small commercial growers cultivating one to four hectares. The recent Census of Agriculture indicates the average size farm in the YAR is 2.17 ha. HITS is, therefore, totally consistent with USAID program goals.

Complementarity among USAID activities is strengthened by having one contractor design and implement the activities envisioned through Core. This will encourage, to the maximum extent possible, cross fertilization of design and complementary experiences to improve project and program management.

III. DETAILED PROJECT DESCRIPTION

A. Purpose

The purpose of the HITS Project is to institutionalize within the MAF an expanded and improved capacity to support increased fruit production through extension, plant protection, and delivery of disease-free plant stock for improved fruit varieties to selected parts of the fruit subsector which comprises large numbers of small farmers. (See Section IV.B., Social

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[4] See Core Subproject Work Plan, 1982-83.

Considerations for a detailed discussion of beneficiaries.) The project will deal with vine and fruit crops which are consumed in Yemen, and known to be adapted to the area. The term "horticulture" is used in the project title because it is identified with the Horticulture Department in the MAF. To accomplish the objective, the project will concentrate on four key project areas:

- Establishing horticulture training and improvement stations to serve as headquarters for an extensive and intensive program of varietal improvement testing, development of clean budwood and tree cuttings, demonstration programs, and extension training.

- Training of a cadre of fruit culture professionals, technicians, and specialists in the MAF and private sector in basic fruit culture skills and extension techniques;

- Expanding and improving the MAF's plant protection program to ensure the development, importation, and distribution of insect and disease-free tree and vine products to farmers and to identify and control/eradicate existing plant insects and diseases in the YAR; and

- Greatly expanding and upgrading the quality of the MAF's fruit culture information production and distribution program for farmers, nurserymen, and private sector input suppliers and fruit merchants through extensive use of radio, television, visual demonstration aids, illustrated newspaper spots, and pamphlets/leaflets.

B. Horticulture Improvement and Training Stations

The project will establish two horticulture improvement and training stations--a Tropical-Subtropical Horticulture Station (T-SHS) at Jarouba and a Deciduous Horticulture Station (DHS) at Al Irra. These multi-purpose stations will be part of the MAF and will provide:

- A source of clean budwood and tree cuttings that can be sold to the ten government nurseries throughout the country where they will be reproduced and sold to meet farmers' demand;

- Facilities for training of MAF extension agents, horticulture technicians and specialists, agricultural inspectors, and nurserymen in techniques of propagation, sanitation, planting, fertilization, irrigation, and plant protection.[5] (See Section III.C. for a description of the training program);

- Demonstration plots for training fruit culture personnel;

- Limited research facilities for varietal improvement tests;

[5]See GLOSSARY for complete definitions of the various horticulture personnel.

- Facilities for model nurseries which will be used as examples for existing and future fruit tree nurseries and for training nurserymen; and

- Limited fruit tree and vine production for direct sale to farmers in the vicinity of the stations.

Two small stations will be established because, given the diversity of climate and crop produced in the YAR, it is not possible to include varietal improvement and horticulture training for all important crops at any one location. T-SHS activities will focus on varieties suitable for tropical-subtropical regions, including papayas, mangoes, bananas, dates, citrus, and guavas. DHS activities will focus on varieties for temperate regions of the country, including grapes, figs, pomegranates, quince, peaches, apples, and apricots.

1. Tropical-Subtropical Horticulture Station

The T-SHS will be developed at an existing horticulture facility at Jarouba. The station, an 11 ha. site in the tropical Tihama Lowlands, was initiated under the previous AID Tropical-Subtropical Fruit Improvement Project (279-0024). Staffing will include:

Positi...[6]	Duration	Source
1 Tropical-Subtropical Horticulturist (station manager, fruit specialist)	7 years (see below)	AID
1 Horticulture Technician	3 years	AID
1 Farm Mechanic (part-time)	4 years	AID
1 Station Manager Counterpart	7 years	MAF
1 Horticulture Technician Counterpart	7 years	MAF
1 Farm Mechanic Trainee	7 years	MAF
2 Guards	7 years	MAF
6 Laborers	7 years	MAF

The tropical-subtropical horticulturist will, over a 3-year period, manage the station in consultation with his counterpart. He will work closely with regional extension specialists in designing and implementing

[6] See Annex N for detailed job descriptions for AID personnel. Counterpart professionals are potential candiates for long-term training in the U.S.

demonstration and improvement blocks, supervising the model nursery, and consulting with nurseries and other horticultural activities on tropical-subtropical fruit production issues. The horticulture technician will be responsible for daily activities involving planting, irrigation, spraying, maintaining demonstration and improvement plots, and conducting training sessions. The mechanic, based in Sana'a, will serve part-time between both T-SHS and DHS to maintain equipment and vehicles and to provide counterpart training.

Expatriate management of the station will be phased out over a 3-year period. Beginning in Year 4, the counterparts will be fully operational. The AID-funded horticulturist will move to Hodiedah and broaden his activities, operating throughout the Tihama and Taiz regions as a consultant to the overall tropical-subtropical fruit production program. The tour of duty for the horticulture technician will terminate at the end of Year 3. The mechanic will remain until the end of Year 4, servicing and providing training at both HITS stations.

Existing facilities at the T-SHS include a trailer house (suitable for TDY visits), two wells with pumps, an unlined reservoir, a shade house, a water storage tank, and a shop. The project will augment this with the following:

- Housing for two AID-funded technicians;
- Improved, gravel-access road (about 15 km) to the station (MAF);
- Shadehouse facility;
- Renovation of shop into classroom-office-boarding complex;
- Equipment storage facility;
- Workshop;
- Fumigation shed;
- Station equipment; and
- Improved irrigation systems.

2. Deciduous Horticulture Station

The DHS will be established from a zero base on an eight ha. site at Al Irra near Sana'a in the highland plateau. Staffing will include:

Position[7]	Duration	Source
1 Deciduous Fruit Hortculturist	7 years (see below)	AID

[7]See Annex N for Detailed Job Descriptions for AID technicians. Counterpart professionals are potential candidates for long-term training in the U.S.

Position	Duration	Source
1 Horticulture Technician	4 years	AID
1 Farm Mechanic (part-time)	4 years	AID
1 Station Manager Counterpart	7 years	MAF
1 Horticulture Technician Counterpart	7 years	MAF
1 Farm Mechanic Trainee	7 years	MAF
2 Guards	7 years	MAF
6 Laborers	7 years	MAF

The duties and responsibilities for the AID-funded technicians at the DHS will be similar to those for the T-SHS technicians, but will focus on temperate climate fruit production and training. Completion of the basic infrastructure at Al Irra will require 2 years. Once operational, expatriate management will be phased out over a 4-year period as opposed to a 3-year period at the T-SHS. An additional year is required because this will be a new station, whereas the station at Jarouba has been limited operational and requires less external aid. Beginning in Year 5 at the DHS, counterparts will be fully operational. While the input of other AID-funded technicians will terminate at this point, the deciduous horticulturist will move to Sana'a and broaden his activities throughout the highland plateau as a consultant to the overall deciduous fruit production program. He will work in close cooperation with the MAF in institutionalizing the horticulture extension program.

The project will equip the DHS as follows:

- Housing for one HITS technician;
- Two wells with pumps;
- One elevated water storage tank;
- Office-classroom-training complex;
- Workshop;
- Equipment storage shed;
- Lathe house;
- Greenhouse with heating, cooling, and humidifying capacity;
- Fumigation facility; and
- Generator.[8]

[8]See Annex H for Detailed Equipment List.

C. Plant Protection Program (PPP)

The HITS Project will develop and adapt a Plant Protection Program to the specific needs of the YAR. The key aspects of this program are developing a general plan for regulating movement of plant material in-country as well as importation of foreign material and training appropriate personnel to effectively administer this plan.

To implement this element of the project, HITS will strengthen a newly established plant protection department in the MAF. The YARG, in July 1982, appointed five agricultural inspectors whose responsibility it is to develop and initiate administration of appropriate plant protection procedures. It is expected that this department will grow over the next few years.

HITS support to the Plant Protection Department will include:

Position	Duration	Source
1 TDY Plant Protection Specialist	10 weeks	AID
2 Plant Protection Specialists	5 years	AID
1 Lab Technician	5 years	AID
2 Plant Protection Specialist Counterparts	7 years	MAF
2 Lab Technician Trainees	7 years	MAF
5 Agricultural Inspectors	7 years	MAF

The TDY plant protection specialist will assist in further refining a strategy for overall program development, including developing the training programs. The long-term plant protection specialists will work with the MAF in implementing the agreed upon strategy (see below) and in training counterparts. The lab technican will coordinate and organize lab procedures and train counterparts.

1. Training

The proposed training program in plant protection is outlined in Section III.C.2., Training Program.

2. Labeling

The project will assist in establishing MAF policy relative to the labeling of all materials used on plants and plant products. This will include simplified labels with warnings and clearly understandable dosages.

3. Legal Implications

HITS will encourage and work with MAF in enforcing existing plant protection legislation. The project will also encourage MAF action in seeking ratification of a recently formulated Bioregulants Act (a proposed pesticide law). Upon ratification, the project will assist the MAF in implementing the new legislation.

Enforcement of the existing legislation is critical to the success of the project, and will, therefore, be the subject of a covenant in the Project Agreement. The principal reason for lack of enforcement has been unavailability of trained personnel in the MAF. The recent appointment by the YARG of five agricultural inspectors in the Plant Protection Department signals the YARG'sintention to enforce regulations in anticipation of resources to be provided by HITS.

4. Administration

HITS will seek to clarify and improve the administrative organization for implementing the Plant Protection Program. An illustrative organizational structure is outlined and discussed in Annex M, Technical Analysis. Supporting an improved organizational structure will be a committee of plant protection experts consisting of donor personnel active in the YAR. This committee currently exists and functions informally, with a key representative from the MAF chairing meetings. During the interim period between termination of the previous AID Horticulture Project and initiation of the proposed HITS Project, AID, through CID technicians, has participated in meetings of this committee. Meetings are unscheduled, and are usually issue-oriented. AID participation in these meetings will continue, and will be strengthened by virtue of increased assistance to the horticulture subsector and the depth and breadth of technical backup provided.

5. Inspection and Quarantine

HITS will assist the MAF to establish appropriate procedures for carrying out inspection and quarantine. This will include in-country nursery inspection, movement of plant materials and chemicals, and port-of-entry inspection of plant material, fruits, and plant chemicals.

6. Pests and Diseases

HITS will follow through on previous surveys of plant pests and diseases that exist in the YAR and test procedures for diagnosis, eradication, and/or control of plant pathogens and arthropod pests. Technical and economic assessments will be made regarding the appropriateness of control versus eradication.

D. Training and Extension

The objective of HITS is to provide both formal and informal training in practical skills in order to institutionalize an effective horticulture improvement program in the MAF. Formal training will provide MAF a core staff of highly-skilled agriculture inspectors, horticulture and plant protection professionals. Informal training will provide basic skills to all

the YAR extension agents, horticulture technicians, and nurserymen. Demonstration workshops will be organized to provide farmers practical hands-on exposure to improved cultural practices. Tables 1 and 2 present a summary of the proposed training for the HITS project.

Development experience has clearly demonstrated the fallacy of relying on a strengthened traditional extension service to effectively reach small farmers. In recognition of this, the HITS Project is proposing an approach to extension which includes: (1) The necessary, but clearly not sufficient, condition of building an appropriate institutional base within the MAF which can support traditional extension efforts; and (2) mounting a special extensive mass media outreach to small-scale and women farmers in particular and the fruit subsector in general. This latter element of the project is discussed in Section III.D.1.

Much literature is now available on earlier efforts to make extension programs more effective in developing countries. A major reason for the failure of those programs was the inadequacy of technical backstopping. There was a depth of applicable applied research to extend, and there were few, if any, extension specialists to train agents or develop applicable programs.

To implement the institutional element of the project, AID will fund two long-term, fruit-culture extension specialists. They will work closely with a TDY extension specialist who will develop extension materials and demonstration programs suitable for large numbers of illiterate, small farmers and women who are not reached by other means. (See Section II.D. for a discussion of the information, production, and distribution element of the project.) The long-term extension specialists will be based at the regional agriculture offices at Hodiedah and Sana'a. They will develop materials for and teach extension agents, nurserymen, and agriculture technicians in a series of short courses dealing with the basics of fruit production and plant protection; conduct demonstrations at the Al Irra and Jarouba Improvement Stations and at local nurseries; and prepare extension materials for distribution. They will work in close collaboration with the long-term staff at the HITS Stations. As indicated elsewhere, the project will train, and have in position at the end of the project, ten provincial extension specialists. It is proposed that, at the end of the project, the Extension Department assign replacements for the two HITS Extension Specialists to ensure a continuation of propoer, national-level, technical backstopping of the extension program.

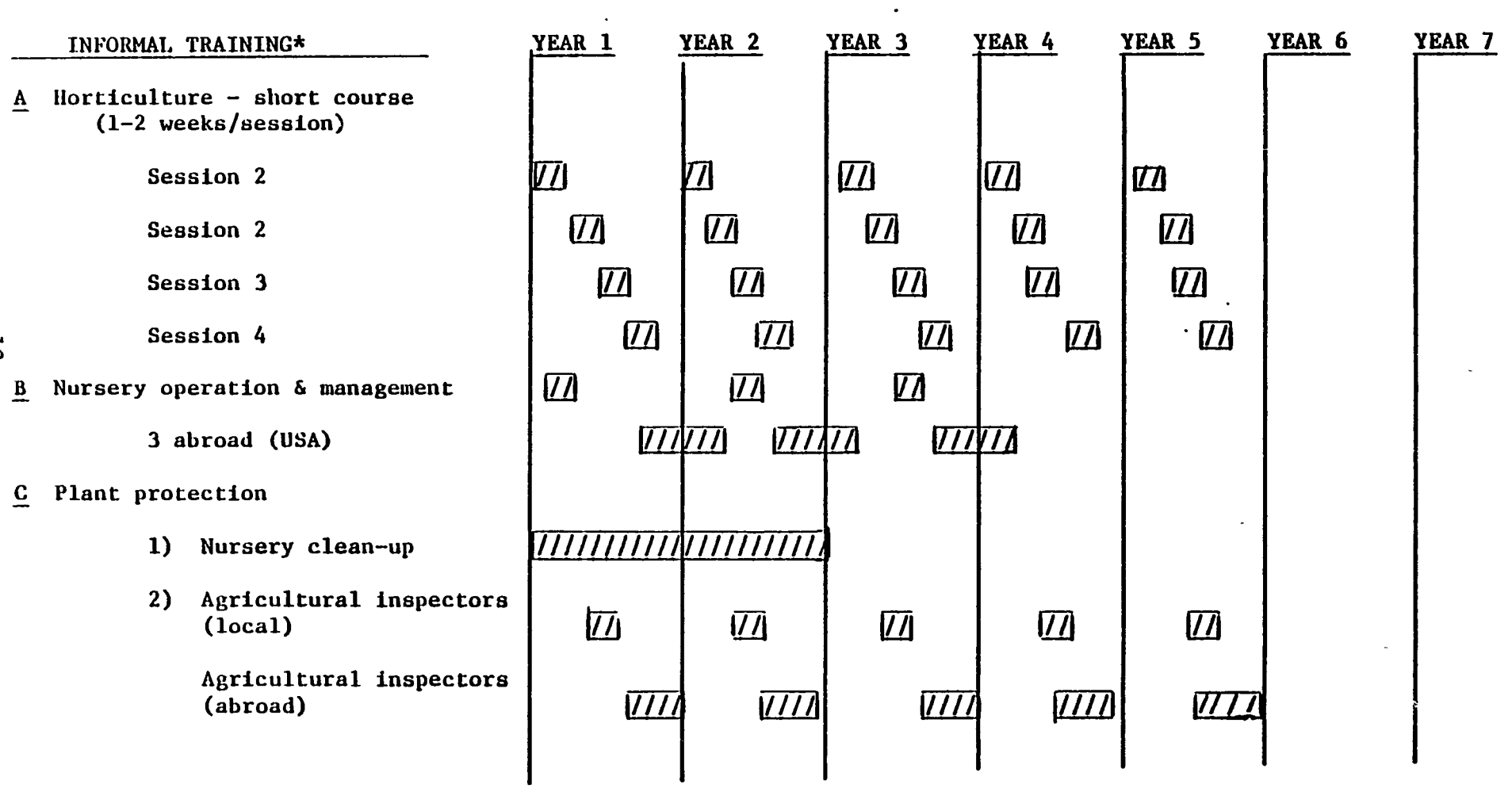
1. Informal Training

a. Extension Agents and Agriculture Technicians

HITS will initiate a series of seasonal short courses (1 to 2 weeks) designed to teach the basics of fruit production and plant protection to the country's 200 to 250 extension agents over the life of the project. These agents are already trained in the basics of agriculture, including animal husbandry, farm mechanics, agronomy, etc. They are not adequately trained, however, in the specifics of tree and vine fruit production or plant protection. In addition to training in fruit culture, the agents will be taught appropriate extension methods for reaching the project's target farmer clientele.

Table 1

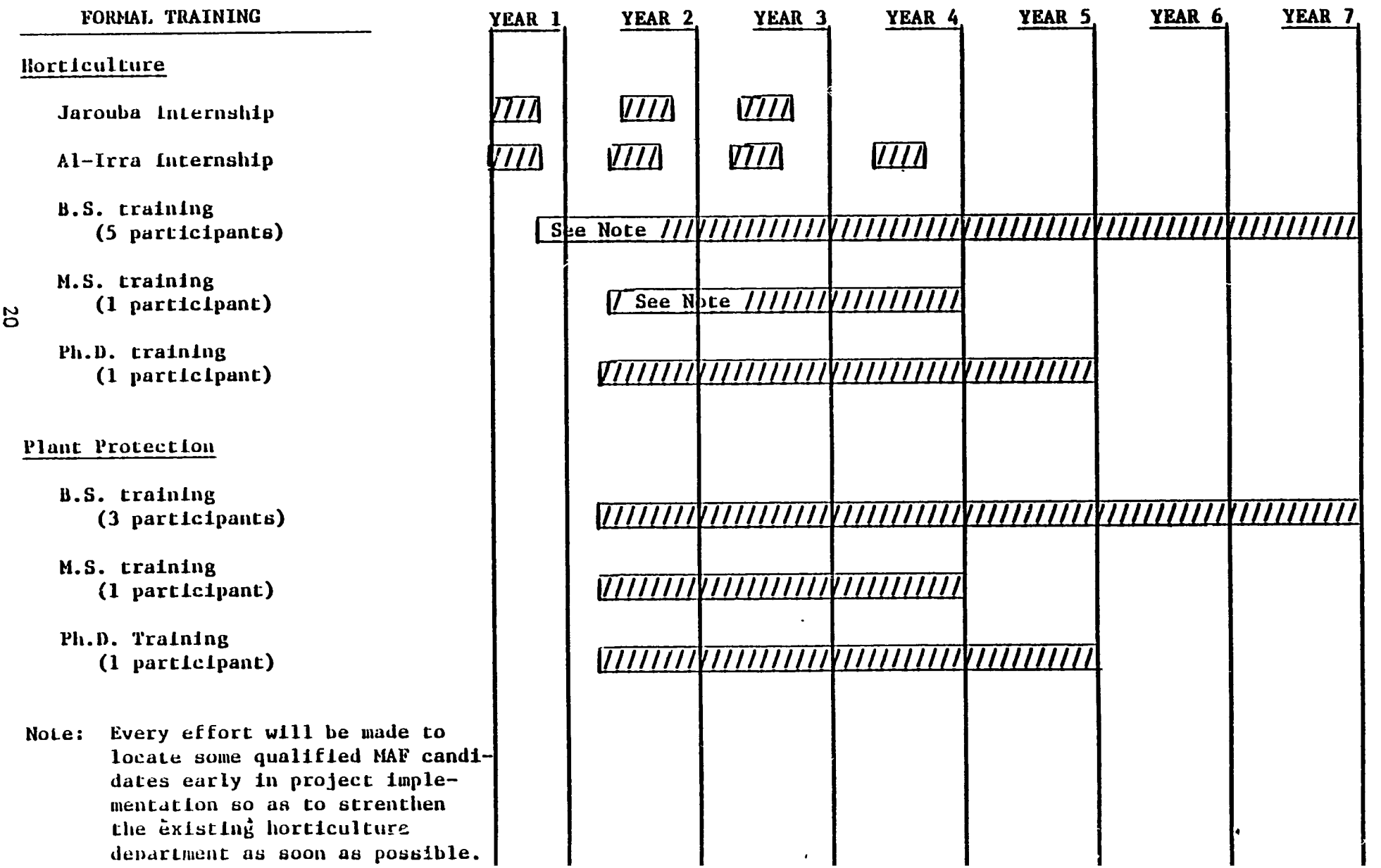
HITS Informal Training Timeframe



*Note: It is proposed by the HITS that informal training in basic Horticulture practices and plant protection will be provided to all YAR extension agents and agricultural technicians, graduates of Ibb agricultural and Surdud secondary schools, all nurserymen, and as many farmers as are willing to participate.

Table 2

HITS Formal Training Timeframe



Note: Every effort will be made to locate some qualified MAF candidates early in project implementation so as to strenthen the existing horticulture department as soon as possible.

In addition to extension agents, the project will train 200 agricultural technicians and 20 to 25 graduates of the Ibb Secondary Agricultural Institute and the Surdud Secondary School in practical horticulture skills. Initially, short courses will be set up at existing facilities (e.g., the Ibb Nursery, Taiz Experiment Station, the Ibb Institute, and the German Plant Protection Facility at Sana'a). When renovation and construction is completed at the Jarouba and Al Irra Stations, training will be conducted at these sites. Four seasonal short courses will be offered annually to 50 extension agents and agricultural technicians.

b. Nurserymen

The project will train ten nurserymen from the government nurseries throughout the country. They will be trained in the basic skills required for effective nursery production and management, including budding, grafting, sanitation, pest control, and records management. Trained extension agents will conduct demonstration-training classes in propagation and in pest identification and control at existing nurseries. The nurserymen will also be encouraged to attend the series of short courses at the HITS Stations.

c. Farmers

Farmers will be trained indirectly through the work of trained extension agents, agricultural technicians, and nurserymen from whom the farmers will purchase tree and vine stock. They will also be trained through distribution of simple, heavily visual, extension-like drawings and materials on tree planting and care. The type of information and materials and the strategy for their distribution will be developed by a TDY extension specialist in consultation with appropriate personnel in the MAF. (See Section II.D. for a discussion of the information, production, and distribution element of the project.) Additional training will be provided through the information, production, and distribution program discussed in Section III.E.

2. Formal Training

Formal training will be provided to horticultural plant specialists (generally non-degree personnel), horticultural and plant protection professionals (degreed personnel), and agricultural inspectors.

a. Horticultural and Plant Protection Extension Specialists

One reason the traditional approach to extension has failed in developing countries is because the agents have insufficient information to extend. To avoid this problem, HITS will have one horticultural extension specialist for each of the ten regions of the YAR trained and on the job at the end of the project. To accomplish this, HITS will train about 20 individuals (four over a 5-year period) from among the 200 agricultural generalists who take the short courses provided at the improvement and training stations. Those generalists who excel and show promise during the short course will be encouraged to pursue more indepth training. This additional training will consist of a 6 to 9-month internship at one or both of the improvement and training stations. Training will emphasize practical experience in fruit production, nursery management, and plant protection.

Furthermore, three specialists will be provided short-term (up to 6 months) additional training in the U.S. with an organization such as the USDA in various aspects of fruit culture.

b. Horticultural and Plant Protection Professionals

From the group of select specialists noted above, five highly motivated individuals will be selected for formal training at the B.S. level in the U.S., specializing in pomology, tropical fruit production, and/or plant protection (e.g., entomology, plant pathology, or virology). Two additional participants will be selected for training in the U.S. at the M.S. or Ph.D. levels in horticulture and plant protection--one in tropical-subtropical fruits, preferably at the University of Hawaii, and one in deciduous temperate-zone fruits at a CID university.

c. Agricultural Inspectors

A minimum of five individuals selected for training as agricultural inspectors will be included in the short courses with extension agents, agricultural generalists, and nurserymen offered at the horticultural improvement stations. In addition to the basic horticultural skills, they will be trained in the identification of diseases and pests on tropical, subtropical, and deciduous fruit; both on nursery stock and mature trees; the hazards of pesticide use to humans, honey bees, and other pollinators and the long-term effects on the environment; and the specific use of fungicides, insecticides, herbicides, and nematocides, including storage, container disposal, personal responsibility, effects on beneficial insects and mites, plant injury, temperature and compatibility warnings, and personal safety.

Five of these participants will be sent to the U.S. for more extensive short-term (6 to 9 months) training in agricultural inspection at an organization such as the USDA. Five additional participants will be selected for higher-level training in agriculture inspection--three at the B.A. level and one each at the M.S. and Ph.D. levels. Training of these participants will be in plant entomology or plant nematology.

E. Information Production and Distribution

Through HITS, the Communications Division in the MAF Extension Department will greatly expand its output of producing and distributing extension materials to the fruit subsector. This is a critical element of the overall project--that element which seeks to link effectively a broader and stronger institutional base in the MAF to the ultimate clientele of the project. Experience in AID has demonstrated that simply relying on strengthening a traditional extension service is not a sufficient approach for reaching large numbers of small-scale, illiterate, relatively isolated farmers such as are the norm in Yemen. The latter strategy is fraught with administrative, social, financial, and economic feasibility problems.

The HITS Project will build upon the experience of AID and CID in developing countries by assisting in the development of a more cost-effective and direct extension system which is suitable to the infrastructural base and social customs of rural Yemen. This system involves the use of an extensive media outreach program involving radio, television, newspaper spots, and

leaflets/pamphlets that will be heavily illustrated, simple, and based on applied findings from varietal tests and other work conducted at HITS Stations and research findings from elsewhere. Section IV.A discusses the strategy in more detail.

HITS will provide a TDY specialist in Year 1 to develop with the MAF the framework and strategy for an extensive media outreach program of information suitable to the YAR. If the specialist comes from extension, he must have extensive experience in mass media approaches. (It is recognized that a media specialist with extensive experience in extension might function equally well.) In accomplishing this objective, the specialist will assess the experience of other countries in reaching large numbers of small-scale, illiterate farmers such as those of the Plan Puebla in Mexico and of the French Cotton Production schemes in West Africa (CFDT). Once the framework and strategy is developed, the proposed long-term horticulture extension specialists assigned to the Regional Agriculture Offices in Sana'a and Hodiedah will coordinate closely with the Communications Division in the Extension Department (Sana'a) on production and distribution of materials. These extension specialists, as noted in Section III.D., will be active in training extension agents, agricultural technicians, and nurserymen in the use of the new materials. To be effective, the Communications Division must coordinate the inputs of several agencies to produce materials of quality and relevance. These include the HITS Stations, Extension Department, Plant Protection Department, Regional Agriculture Offices, all research stations, and various donor projects in the fruit subsector. The project will research and develop an appropriate mechanism to affect such coordination. This might, for example, consist of identifying in each of these agencies an appropriate person responsible for liaison with the director of the Communications Division on information production.

Long-term project personnel will not be assigned to the Communications Division. Instead, efforts of this element of the HITS Project will be supported by a proposed communications/project design advisor, funded under the CID Core Subproject. As an advisor in the MAF, this person will, inter alia, help to assess the MAF's needs and develop plans to improve and expand its capabilities in communications. He will focus particularly on improving the overall communications area for AID-funded projects in agriculture.

HITS will provide two, simple, portable, video/cassette recorders and cameras for use in training sessions and demonstration workshops both at and away from the HITS Stations. This very inexpensive, but highly useful, equipment will also be used in conjunction with limited MAF video equipment to produce short TV spots on improved fruit cultural practices.

Table 3 presents the proposed staffing timeframe for HITS.

Table 3

HITS Staffing Timeframe

POSITION	JOB DURATION						
	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7
TDY Plant Protection Spec.							
TDY Nursery Spec.							
TDY Extension Spec.							
Deciduous Horticulturist - Al Irra Manager					activities	expanded beyond A I*	
Horticulture Technician - Al Irra							
Tropical - Subtropical Horticulturist Jarouba Manager				activities	expanded beyond J**		
Horticulture Technician - Jarouba							
Farm Mechanic - Al Irra, Jarouba motorpool							
Plant Pathologist						activities	expanded
Entomologist							
Lab Technician							
Extension Spec. - Deciduous Horticulture							
Extension Spec. - Tropical - Subtropical Horticulture							

* Al Irra

** Jarouba

IV. PROJECT ANALYSES

A. Technical Analysis

1. Background

a. Climate

The climate in the YAR is best discussed in terms of elevation and location within an escarpment. There are five geographic zones that are somewhat similar in climate that are agricultually significant in terms of area. They are described as: (a) The Tihama; (b) the Southern Uplands; (c) the Central Highlands; (d) the Northern Highlands; and (e) the Eastern Slopes.

From March to September, the climate over the entire country is influenced by moist air masses of the monsoon circulation system in the Indian Ocean. This circulation produces upper air flow from the southwest toward the Southern Uplands and Central Highlands. This causes heavy precipitation on the mountain slopes exposed to the west or southwest. The precipitation amounts decrease as the air masses move to the northeast. The largest annual precipitation occurs near Ibb in the Southern Uplands (about 800 mm/year), while the smallest amounts occur in the northern reaches of the Northern Highlands (about 100 mm/year).

In general, two rainfall seasons can be distinguished, i.e., 2 months of moderate precipitation in March and April, with 2 months of relatively low precipitation in May and June, and the heaviest precipitation occurring from July to September.

b. Tree Fruits and Vitaculture

Land used for fruit production in 1981 amounted to 27,000 ha., 46 percent of which were in grapes. The remaining 50 percent were tropical and subtropical temperate zone crops. These fruit crops accounted for approximately 3.6 percent of the total cultivated area (1.024 million ha.). There has been a phenomenal increase in acreage in fruit production in recent years.

The climate and types of fruit grown and/or suitable for each of the climatic zones mentioned above is found in Annex M. Improved cultural practices and varieties for increasing production are known.

The areas that are presently used for producing fruit, i.e., the Tihama, Southern Uplands and Central Highlands, are most likely to be the areas where expansion of fruit production will occur under the proper technology and economic settings. The broad mountain valleys and the mild sloped wadis have great potential for irrigation fruit production. It seems unlikely that fruit production will occur in regions that are presently void of fruit trees except by the more literate population who understand the technology and are willing to take high risks. Expansion in fruit production through the use of improved cultural practices will take place within the largely illiterate subsistence farming population only when they can see the potential on their neighbors' farms or government-operated demonstration farms.

c. Constraints to Expansion of Fruit Culture

The expansion in fruit culture will be extremely slow under the present technical conditions in the areas mentioned above that are highly suitable for fruit production because of: (1) Low producing, poor fruit quality varieties; (2) disease-laden trees and vines at the time of purchase from nurseries; (3) little knowledge of proper cultural practices, including water application, for maximum production; and (4) inadequate water.

Fertilizers and pesticides are necessary inputs in order to maximize fruit production. Most of these inputs require cash outlays, some are available on an in-kind basis. The Agricultural Credit and Cooperative Bank (ACCB) is a prime factor in making these inputs available to farmers, and it is the intention of the government to make the needed funds available. Since funds are to be available, it is assumed that the above inputs do not constitute a problem that will limit production--that is, once the farmer learns how to use these resources effectively, supplies will be available, and the farmer will have sufficient capital to procure them or at least credit to secure loans for procurement. Agricultural policies do not appear to be constraining. (See Annex L.)

Water supplies in Yemen are largely the result of precipitation. Its availability as runoff, springs, groundwater, or simply precipitation has a significant effect upon fruit production, and is a constraining factor. Except for the Southern Uplands, most anticipated fruit producing areas will require supplemental water in the form of irrigation or some form of water harvesting. Supplies from the groundwater will be necessary in the Central and Northern Highlands, while in the Tihama, supplies can come from both ground water and runoff.

There are presently ten government (MAF) operated nurseries in YAR that produce seedlings or cuttings and distribute them to the following climate zones:

1 - Tihama--citrus and tropical
3 - Southern Uplands--citrus, subtropical, deciduous
5 - Central Highlands--deciduous, grapes
1 - Northern Highlands--deciduous

There are some very serious problems associated with the goal of increasing the production of good trees for distribution to the farmers. The key problem is some nurseries are unknowingly distributing insect and disease laden products to local farmers. Nursery presonnel are generally untrained in identification of diseases and in the art of grafting, budding, and making varietal selection for achieving increased fruit production.

The effectiveness of outreach programs is a constraint to increasing production. There is an extension program in the MAF, but it has had little impact. Farmers must become more knowledgeable concering new technology and cultural practices if production is to be increased.

2. The Project

The project proposes to focus on removing the constraints discussed above. All of the constraints exist because of institutional inadequacies. The Ministry of Agriculture and Fisheries has already made a rather significant move to try and increase the quantity, quality, and diversity of fruits produced in the YAR. This is evidenced by two recent decisions at the top level of administrative authority (the organizational structure of the MAF is shown in Figure 1) to: (1) Drastically increase (five fold in 1983) the production of nursery materials for sale at the ten MAF-supported nurseries, and (2) establish a Plant Protection Department by the assignment of five individuals to it.

The design team has focused upon the following project purpose which fits precisely into USAID and CID's long-range goals of agricultural development through institutionalization:

> TO INSTITUTIONALIZE WITHIN THE MAF AN EXPANDED CAPACITY TO SUPPORT INCREASED FRUIT PRODUCTION THROUGH EXTENSION, PLANT PROTECTION, AND THE DELIVERY OF DISEASE-FREE PLANTING STOCK OF IMPROVED FRUIT VARIETIES TO THE FRUIT SUBSECTOR.

The title of the project has been identified as the: Horticulture Improvement and Training Subproject (HITS).

HITS will accomplish its purpose through the following outputs:

- Establish two horticulture (fruit) training and improvement stations (one in the Tihama and the other in the Central Highlands);

- Expand the Plant Protection Department in the MAF and train in plant protecton methods;

- Train extension agents, horticultural (fruit) specialists, horticultural (fruit) technicians, agricultural inspectors, and nurserymen in both the public and private sector; and

- Expand the horticultural (fruit) information, production, and distribution program for farmers, nurserymen, and private sector horticulture (fruit) input suppliers.

Figure 2 shows the units in MAF that will be strengthened, and the major communication and coordination linkages among them.

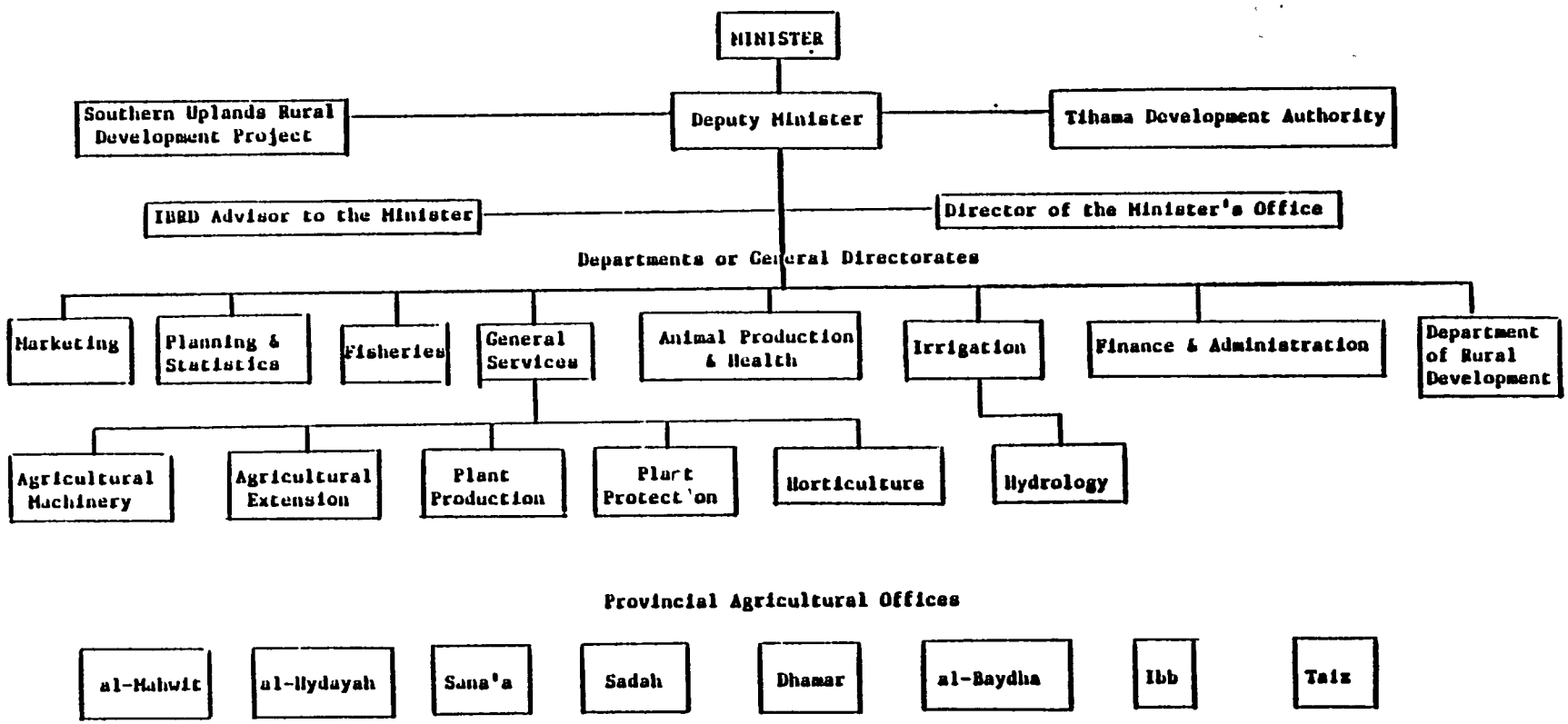
a. HITS Stations

Two horticulture stations are proposed. One is to be located in Tihama (Al Jarouba), and the second is to be located in the Central Highlands near Sana'a (Al Irra). The purposes of both stations are the same:

- To improve fruit varieties suitable to the region represented by the station;

FIGURE 1

Ministry of Agriculture--as of August 1982

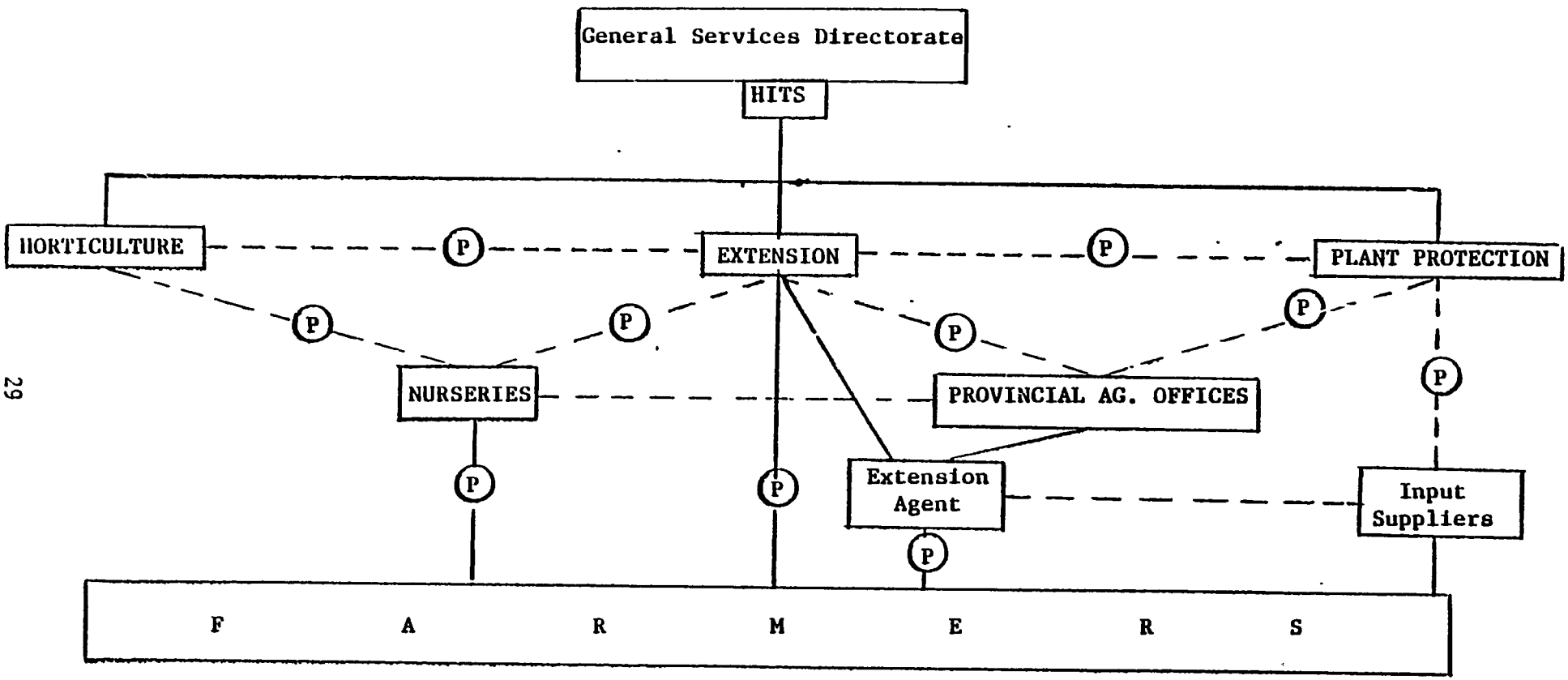


Not shown: provincial offices report to Deputy Minister

FIGURE 2

Major Coordination and Communication Linkages

Strengthened by HITS



1. - - - (indirect but coordinated lines of communications)
2. ——— (direct lines of responsibility and information/product flow)
3. -(P)- (major communication and coordination links strengthened by HITS project)

- To demonstrate effective and appropriate horticultural techniques of plant propagation, sanitation, planting, fertilization, irrigation, plant protection, and orchard or tree management suitable in the region of influence;

- To produce and distribute clean budwood, cuttings, and plants to the already existing nurseries and farmers in the region;

- To train extension agents, agricultural technicians, nurserymen, and, to a limited extent, farmers in techniques and methods targeted to their individual roles in bringing about fruit production.

The HITS Stations will be used as a controlled area for training and producing for the nurseries budwood and grafting stocks that are free from disease. Expansion in fruit production will only occur in an environment that is relatively free of disease and pests. A station where disease-free mother trees are available for budwood is essential. Importation of budwood is too risky with respect to timing, and imports may not be adapted to the Yemeni environment. Therefore, the facilities proposed below are essential for achieving the project purpose.

In order to meet the project purpose, one station is not sufficient due to the diverse climate and soil and water conditions. After a thorough analysis of the physical and climatic factors involved, the design team concluded two stations were needed in the regions that represent the major climate and fruit culture types of environment in the YAR. The Al Irra Station will be for the climate and region where deciduous fruits may be produced, and the Al Jarouba Station is for tropical fruits.

(1) Design and Improvement of Stations

(a) Al Jarouba (T-SHS)

(i) Proposd Facilities

The proposed facilities from AID funding are minimum requirements for sustaining the functions described above for this station:

- Permanent housing for a station manager and horticulture technican (two houses);

- Improved shade-house facilities;

- Renovation of existing bunkhouse facility for development into an office-classroom complex that is also suitable for overnight housing of trainees. Space is needed for management and classroom-type training. During short-term and long-term training, overnight quarters are needed to house trainees due to the remoteness of the Jarouba Station;

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RESEARCH AND DEVELOPMENT PROJECT SHOULD BE DESCRIBED. THE BANK PROJECT CALLS FOR A CENTRAL RESEARCH COORDINATING BODY, AND A RESEARCH EVALUATION UNIT AND PROVISION OF HORTICULTURE EXPERTISE. THE RESPECTIVE ROLES AND LINKAGES BETWEEN THESE TWO ACTIVITIES SHOULD BE EXPLORED AND DISCUSSED AS AN ELEMENT OF PROJECT DESIGN.

2. IT IS RECOMMENDED THAT FUTURE DESIGN WORK INCLUDE COMPLETE LOG FRAME. SHULTZ
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SEEDLING NURSERIES MENTIONED REFTEL AND THE LINKAGES THEY ALREADY HAVE WITH YEMENI RURAL ORGANIZATIONS AND FARMERS. FYI: THE ADMINISTRATOR HAS INDICATED THE GENERAL VIEWPOINT THAT TRADITIONAL APPROACHES TO EXTENSION HAVE NOT PROVEN EFFECTIVE AND THAT INNOVATIVE APPROACHES DEMONSTRATING IMPROVED COST-EFFECTIVENESS ARE REQUIRED TO INCREASE AGRICULTURAL OUTPUT AND PRODUCTIVITY IN DEVELOPING COUNTRIES. END FYI.

IN CALCULATING RETURNS ON ENTIRE PROJECT INVESTMENT, IT IS IMPORTANT TO IDENTIFY FOR EACH CROP, THE YIELD INCREASES THAT ARE EXPECTED TO RESULT FROM PROJECT. FURTHER, AN ANALYSIS SHOUD BE DONE TO TEST THE SENSITIVITY OF RATES OF RETURN TO ALTERNATIVE ASSUMPTIONS ABOUT ERRORS IN BOTH CURRENT AND PROJECTED YIELD ESTIMATES. THIS ANALYSIS WILL HELP IDENTIFY SPECIFIC PRODUCTION TARGETS UPON WHICH THE ECONOMIC AND TECHNICAL RATIONALE ARE BASED.

B. BENEFIGIARIES:

ALTHOUGH THE INTERIM REPORT PROVIDES INFORMATION ABOUT WHO IS PRESENTLY ENGAGED IN HORTICULTURE ACTIVITIES, IT DOES NOT PROVIDE DETAILS ABOUT WHO WOULD BE BENEFICIARIES OF PROPOSED PROJECT. REF. C. REQUESTED THAT "INTERIM REPORT SHOULD, INSOFAR AS POSSIBLE, EXPLAIN HOW PROJECT WILL BENEFIT SMALL FARMERS". AND THAT "DESIGN ELEMENTS THAT WILL INSURE THIS BENEFICIARY FOCUS BE IDENTIFIED." THIS ANALYSIS NEEDS TO BE PROVIDED. IN PARTICULAR, TARGET GROUP OF PROPOSED PROJECT SHOULD BE CLEARLY SPECIFIED, PRESEN BENEFICIARIES OF EXTENSION SERVICE ACTIVITIES SHOULD BE IDENTIFIED, AND ANY PROPOSED SHIFT IN FOCUS OF EXTENSION ACTIVITIES SHOULD BE IDENTIFIED.

C. INSTITUTIONAL ISSUES:

(1) THE INSTITUTIONAL IMPLICATIONS OF ALTERNATIVES APPROACHES TO ACHIEVING PROJECT OBJECTIVES SHOULD BE REVIEWED. THIS WOULD INCLUDE A DISCUSSION OF TRADITIONAL MOA EXTENSION SERVICES VS THE TYPE OF ECONOMICALLY SELF-SUPPORTING EXTENSION PROPOSED BY ASMON, VS THE OPTION OF INCORPORATING THE PROJECT INTO THE TDA EXTENSION FRAMEWORK.

(2) THE RELATIONSHIP BETWEEN THE AID PROJECT AND THE WORLD BANK PROPOSED DOLS. 32 MILLION AGRICULTURAL

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ANNEX A

PID Cables

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AIDAC

E.O. 12065: N/A
TAGS:
SUBJECT: PROJECT 279-0052 AGRICULTURE DEVELOPMENT SUPPORT - HORTICULTURE

REF: (A) ASMON INTERIM REPORT OF 6/82; (B) SANAA 4160; (C) STATE 124420

1. PRC MET ON JULY 12, 1982 TO REVIEW REF. DOCUMENTS. PRC IDENTIFIED A NUMBER OF SUBSTANTIVE ISSUES GENERATED BY THE INTERIM REPORT AND THE PROPOSED RE-SHAPING OF THE HORTICULTURE ENDEAVOR WHICH MUST BE ADDRESSED IN DETAIL AS AN INTEGRAL PART OF REMAINING DESIGN WORK.

A. ECONOMIC ANALYSIS:

(1) THE HIGH RATES OF RETURN SHOWN IN THE FARM BUDGETS DEPEND TO A LARGE EXTENT ON THE ASSUMPTIONS MADE WITH RESPECT TO PRICES AND YIELDS FOR FRESH FRUIT. AN ANALYSIS OF PRICE TRENDS AND PROJECTIONS SHOULD BE DONE TO TEST THE SENSITIVITY OF RATES OF RETURN TO ALTERNATIVE ASSUMPTIONS ABOUT FLUCTUATIONS IN CURRENT AND FUTURE PRICES. FURTHER EFFORTS SHOULD BE MADE TO MEASURE YIELDS BEING ACHIEVED BY FARMERS NOW USING PROPOSED TECHNOLOGIES. SIMILAR SENSITIVITY ANALYSIS SHOULD BE DONE WITH RESPECT TO ALTERNATIVE YIELD ESTIMATES.

2. WHILE THE FARM BUDGETS SHOW HIGH RATES OF RETURN TO INVESTMENT IN FRUIT TREES, FURTHER ANALYSIS SHOULD BE DONE BEFORE PROJECT DESIGN IS FIRMLY DETERMINED TO DEMONSTRATE ECONOMIC RETURNS OF THE AID INVESTMENT, AND FOR THE ENTIRE PROJECT. INCLUDED AS A CENTRAL PART OF THIS ANALYSIS SHOULD BE AN ASSESSMENT OF THE COST - EFFECTIVENESS OF THE APPROACHES CONSIDERED AND SELECTED FOR ACHIEVING THE EXTENSION AND OTHER INSTITUTIONAL OBJECTIVES OF THE PROJECT, INCLUDING THE OPTIONS MENTIONED IN PARA C (1) BELOW. IN UNDERTAKING THIS ASSESSMENT, MISSION SHOULD CONSIDER THE PRACTICAL ALTERNATIVES WHICH WOULD OFFER IMPROVED PERFORMANCE TOWARDS OBJECTIVES AND, POSSIBLY, AT REDUCED COST. FOR EXAMPLE, IF ASSUMPTION IS THAT EXTENSION SERVICES MUST BE STRENGTHENED TO STIMULATE YEMENI FARMERS TO PLANT FRUIT TREES AND TO ADOPT BASIC AND SIMPLE PLANTING PRACTICES, GIVEN FINDINGS OF INTERIM REPORT AND MISSION RESEARCH, QUESTION IS RAISED WHETHER THIS MIGHT BE MORE RAPIDLY AND EFFICIENTLY ACHIEVED THROUGH FOCUS ON THE

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ANNEX A

PID Cables

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BT
UNCLAS STATE 174849

ADM AID

E.O. 12065: N/A
TAGS:
SUBJ : PROJECT 279-0052 AGRICULTURAL DEVELOPMENT SUPPORT- HORTICULTURE PRODUCTION, EXTENSION AND TRAINING -UBPROJECT

REF : SANAA 3614

M-SSION AUTHORIZED TO INCURR PRE-PROJECT EXPENSES DOLS 453,708 FOR PRE-IMPLEMENTATION COSTS RELATED TO AL-IRRA STATION AS ITEMIZED PARA 5 REFTEL. HAIG
BT
#4849

4. AID/W WILL ASK CID TO FIELD DESIGN TEAM ASAP. IN ADDITION, WE WILL MEET WITH CID TO STRESS CRITICAL IMPORTANCE WE ATTACH TO SUBMISSION OF QUALITY DOCUMENTATION (I.E., INTERIM REPORT AND PP).

5. AID/W WILLING TO ASSIST MISSION AND CID WITH NECESSARY ANALYSIS THROUGH TDY IF DESIRED.

6. MISSION SHOULD BE ADVISED THAT WE AND PPC CONCUR THAT SATISFACTORY INTERIM REPORT IS A SINE QUA NON TO PROCEEDING WITH FINAL PROJECT PREPARATION. AFTER SUBMISSION OF INTERIM REPORT DESIGN TEAM CAN CONTINUE WORK ON PP UNLESS USAID ADVISED OTHERWISE BY AID/W. HAIG

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ANNEX A

PID Cables

ACTION AID-6

INFO ARA DCM POL ECO LEGM FCNS PAHO CPS TCO

A. 071047Z MAY 82 ZDK ZUI SANAA 0194
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TO AMEMBASSY SANAA 9467

UNCLAS STATE 124407

AIDAC - FOR DIRECTOR WARD FROM A. F. FORD

L.O. INVOS: N/A
TAGS:
SUBJECT: 79-3052 HORTICULTURE SPID APPROVAL

REF: (A) SANAA 2736 (B) SANAA 2345 (C) STATE 5
(D) [illegible]

1. IN [illegible] REFS (A) AND (B), WE HAVE REVIEWED INFO INVOLVI[illegible] [illegible]JECT SPID AND AGREE THAT MISSION SHOULD P[illegible] WITH PR[illegible]TION OF SUBPROJECT PAPER.

2. NOTWITHSTANDING AUTHORIZATION TO PROCEED, AID/W REMAINS CONCERNED ABOUT CRITICAL ISSUES CONCERNING PROJECT INCLUDING BASIC ECONOMIC RATIONALE AND BENEFICIARY QUESTIONS. IN THIS REGARD, AT AN EARLY STAGE IN PP PREPARATION MISSION IS REQUESTED TO CABLE AN INTERIM REPO WHICH ADDRESSES THE FOLLOWING ISSUES.

---A. ECONOMIC ANALYSIS: AS CALLED FOR IN REF (C), PP WILL CONTAIN STRONG AND COMPLETE MACRO AND MICRO ECONOMIC ANALYSIS. INTERIM REPORT SHOULD FOCUS ON ECONOMIC ANALYSI TO ESTABLISH PRELIMINARY CASE FOR ECONOMIC VIABILITY AND ATTRACTIVENESS OF PROJECT.

---B. BENEFICIARIES: REF (C) ALSO CALLS FOR SIGNIFICANT ATTENTION TO BENEFICIARY QUESTION. INTERIM REPORT SHOULD, INSOFAR AS POSSIBLE, EXPLAIN HOW PROJECT WILL BENEFIT SMALL FARMERS. DESIGN ELEMENTS THAT WILL INSURE THIS BENEFICIARY FOCUS SHOULD BE IDENTIFIED.

3. ON QUESTION OF TRANSITION PHASE EXPENSES, MISSION AUTHORIZED TO INCU[illegible] EXPENSES WHICH RELATE DIRECTLY TO MAINTENANCE OF JARQUBA ACTIVITY AND TO PARTICIPANT TRAINING. IN THIS REG[illegible], AID/W CONCERNED THAT EXPEN[illegible]TURES NOT BE IN[illegible]ED FOR OTHER LONG-TERM ACTIVITIES (E.G., AT AL-IB[illegible]) WHICH WILL NEED TO BE APPROVED AS PART OF PP. THOSE ACTIVITIES WHICH APPEAR TO US TO FIT WITHIN GUIDELINES FOR SPENDING ARE PERSONNEL AND OPERATIN[illegible] EXPENSES FOR JARQUBA (DOLS 92,457), CONSTRUCTION ACTIVITIES AT JARQUBA (DOLS 7[illegible],000), AND PARTICIPANT TRAINING (DOLS 101,600). THESE ACTIVITIES PLUS EXPENDITURES OF DOLS [illegible] ALREADY INCURRED WOULD BRING THE TOTAL OF [illegible] FOR SUBPROJECT EXPENS[illegible] [illegible]LY DOLS [illegible].

36

ANNEX A

PID Cables

FROM GOVERNMENT EMPLOYMENT TO EMPLOYMENT BY THE QUASI GOVERNMENT NURSERIES. WE FEEL THAT PROJECT ASSISTANCE SHOULD CONCENTRATE FIRST ON IMPROVING AND SUPPORTING THE GOVERNMENT EXTENSION SERVICE THAT ALREADY EXISTS THROUGHOUT YEMEN. WE WANT THE EXTENSION AGENTS TO BE PRIMARILY TRAINERS. IF THEIR SALARY WAS DEPENDENT ON SEEDLING SALES THEY MIGHT CONCENTRATE ON PROMOTING AND INCREASING THESE SALES TO THE DETRIMENT OF CONDUCTING TRAINING AND DEMONSTRATIONS.

5. THE AL IRRA AND JAROUBA STATIONS WILL CONCENTRATE ON DEMONSTRATIONS/TRAINING AND PRODUCING DISEASE FREE BUDWOOD AND IMPROVED FRUIT VARIETIES FOR THE OTHER NURSERIES, RATHER THAN LARGE SCALE SEEDLING PRODUCTION.

6. RESERVING ~~XXXXXX~~ SEEDLING SALES PROFITS BY PRODUCING NURSERIES. WE ARE EXPLORING WITH YARG/MOA THE POSSIBILITIES OF ANY REVENUE GENERATED BY NURSERY SALES BEING REINVESTED IN THE NURSERIES. THE LEGAL FRAMEWORK TO ACCOMMODATE THIS TYPE OF PROCEDURE ALREADY EXISTS. THE PRECEDENT EXISTS WITHIN THE MOA FOR RECYCLING REVENUES GENERATED BY A SPECIFIC PRODUCTION UNIT. INITIALLY WE ARE PROPOSING THAT ANY REVENUE AT AL IRRA AND JAROUBA STATIONS BE PUT INTO A FUND AND USED TO FINANCE STATION OPERATIONS.

7. TRANSFER OF JAROUBA STATION TO THE TIHAMA DEVELOPMENT AUTHORITY (TDA). BEFORE THE PROPOSED PROJECT IS COMPLETED THE JAROUBA STATION SHOULD BE FULLY OPERATED AND MANAGED

WE HAVE OBTAINED A MORE COMPLETE PICTURE OF FRUIT TREE SEEDLING PRODUCTION IN YEMEN. THERE ARE NOW AT LEAST 10 GOVERNMENT OR QUASI GOVERNMENT FRUIT TREE NURSERIES WITH 3 MORE PLANNED, NOT INCLUDING JAROUBA AND AL IRRA. SEEDLING PRODUCTION IN 1981 WAS 117,000 BUT BY THIS YEAR WILL BE ABOVE 500,000. CONSEQUENTLY THERE IS NO NEED FOR THE AL IRRA AND JAROUBA STATIONS TO CONCENTRATE ON SEEDLING PRODUCTION AND THUS THERE IS AN INSUFFICIENT REVENUE BASE TO PAY EXTENSION AGENTS FROM REVENUE GENERATED AT THESE STATIONS. IT IS DOUBTFUL IF ANY OF THE OTHER NURSERIES, NOT PART OF THIS PROJECT, WILL HAVE A SUFFICIENT VOLUME OF SEEDLING SALES TO ALLOW FINANCING FIELDMEN/EXTENSION AGENTS. WE DO NOT KNOW THE AMOUNT OF REVENUE THAT ANY OF THE NURSERIES WILL YIELD ON A SUSTAINED BASIS AND THEREFORE ARE NOT PREPARED TO RECOMMEND THIS APPROACH BE UTILIZED. SEEDLING SALES AND NURSERIES MAY NOT PROVIDE AS SECURE A LONG RANGE INSTITUTIONAL ARRANGEMENT AND REVENUE BASE FOR EMPLOYING EXTENSION AGENTS AS THE YARG, UNLESS THE NURSERIES STAY PRIMARILY IN THE SEEDLING PRODUCTION BUSINESS WITH A HIGH VOLUME OF SALES INDEFINITELY. FUNDING EXTENSION AGENTS FROM SEEDLING TREE SALE REVENUE WOULD MEAN EITHER EMPLOYING NEW EXTENSION AGENTS, I.E. SETTING UP AN EXTENSION SERVICE IN COMPETITION WITH EXISTING GOVERNMENT EXTENSION SERVICE, OR TRANSFERRING EXISTING EXTENSION AGENTS FROM

OF PROJECT DESIGN WHEN THE RESEARCH WAS IN A PRELIMINARY STATE.

2. BASED ON FURTHER RESEARCH AND MORE COMPLETE INFORMATION WE NOW FEEL THAT SOME OF THE INTERIM REPORT'S CONCLUSIONS SHOULD ESSENTIALLY BE DISCARDED.

3. MISSION SUGGESTS THAT AID/W REVIEW OF THE INTERIM REPORT BE LIMITED TO THE INFORMATION ABOUT ECONOMICS AND BENEFICIARIES. THE MISSION, CID, AND THE HORTICULTURE DESIGN TEAM DO NOT ENDORSE THE FOLLOWING PORTIONS OF THE INTERIM REPORT: EXECUTIVE SUMMARY ITEMS 4 AND 5, THE SECTION ON NECESSARY INSTITUTIONAL FRAMEWORK PAGES 22-33, THE INSTITUTIONAL FRAMEWORK SECTION OF THE CONCLUSIONS PAGES 41-43, AND ANNEX B. THE FOLLOWING PARAGRAPHS CONTAIN COMMENTS ON THOSE PORTIONS OF THE INTERIM REPORT WHICH THE MISSION, CID, AND THE DESIGN TEAM DO NOT ENDORSE.

4. INTERNAL FINANCING OF EXTENSION AGENTS FROM SEEDLING SALES. AS STATED ON PAGE 23 THE AGRICULTURAL INPUT SUPPLY, CREDIT AND MARKETING PRIVATE ENTERPRISES IN YEMEN DO NOT HAVE THE SIZE AND VOLUME OF BUSINESS YET THAT WOULD ALLOW EMPLOYMENT OF FIELDMEN/EXTENSION AGENTS. LIKEWISE IT DOES NOT SEEM POSSIBLE TO EMPLOY EXTENSION AGENTS IN THE PROPOSED PROJECT WITH REVENUE GENERATED FROM SEEDLING SALES AT EITHER THE JAROUBA OR AL IRRA STATIONS BECAUSE SEEDLING PRODUCTION AND SALES ARE BEING DEEMPHASIZED IN THE PROJECT PAPER DESIGN. SINCE THE DRAFTING OF THE INTERIM REPORT WE

"CORRECTIONS MADE ON THIS COPY MUST BE MADE ON ALL COPIES"

TELEGRAM

INDICATE
☐ COLLECT
☐ CHARGE TO AID

FROM	CLASSIFICATION
AMEMBASSY SANAA	UNCLASSIFIED

~~EXDIS~~:
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ACTION: SECSTATE WASHDC IMMEDIATE

UNCLAS SANAA

AIDAC

E.O. 12065 N/A

SUBJECT: PROJECT 279-0052 AGRICULTURE DEVELOPMENT SUPPORT - HORTICULTURE INTERIM REPORT

REF: A) STATE 181991 B) STATE 137060

1. MISSION (ENDORSES) ACCEPTS THE BASIC CONCLUSION OF THE INTERIM HORTICULTURE REPORT THAT FRUIT PRODUCTION IN YEMEN IS AND WILL CONTINUE TO BE A VERY PROFITABLE ENTERPRISE. THAT CONCLUSION IS SUBSTANTIATED BY THE INDIVIDUAL TREE CROP BUDGETS IN THE REPORT AND BY THE CURRENT ACTIONS OF FARMERS.

2. THERE ARE OTHER PORTIONS OF THE REPORT, HOWEVER, THAT ARE LESS CONCLUSIVE SINCE THEY REPRESENT THE OPINION OF THE AUTHOR REGARDING PROJECT DEVELOPMENT AND STRATEGY AND EXCEED HIS SCOPE OF WORK AS IT APPEARS IN REF. B. WE FEEL THAT THE SUGGESTIONS MADE DID RAISE IMPORTANT QUESTIONS AND HAD SOME VALIDITY DURING THE EARLY STAGES

DRAFTED BY:	DRAFTING DATE	TEL. EXT.	CONTENTS AND CLASSIFICATION APPROVED BY.
AGR:CTAtwood:1	7/7/82		Robert W. Beckman, A/ Director

CLEARANCES:

PROC:TBratrud (INFO)
CONT:DHickson

- Storage Shed and Workshop;

- Fumigation Shed;

- Proposed Equipment (small orchard tractor, rototillers, insecticide sprayers, irrigation equipment, shop equipment, and improved weather station).

(ii) Staffing

The expatriate personnel, counterparts, and laborers needed for managing and operating the station are listed in Section III and Annex M. Job descriptions and qualifications for AID-funded personnel are provided in Annex N.

(b) Al Irra Deciduous Horticulture Station (DHS)

(i) Proposed Facilities

The facilities described below are generally very similar to those requested for Al Jarouba (T-SHS). Since the justification is similar, it is not repeated except for items not requested there.

- One permanent house for station managers;

- One or two water wells with pumps, as needed, for supplying water for irrigation and potable use;

- An elevated water storage tank;

- Office-classroom-training building complex;

- Maintenance shop;

- Equipment storage shed;

- Lathe house, shade-house facility;

- Fumigation facility;

- Generator;

- Greenhouse with heating, cooling, and humidifying;

- Weather measuring station;

- Proposed equipment (small tractor, rototillers, spray equipment, irrigation equipment, miscellaneous tools).

(ii) Staffing

Minimum staffing requirements at Al Irra are listed in Section III and Annex M. Detailed job descriptions for AID-funded personnel are in Annex N. Figure 3 shows how the HITS Stations will impact upon the Department of Horticulture in the MAF.

b. Plant Protection Program (PPP)

(1) Framework

A plant protection program adapted to Yemen's needs, human resources, and institutional capabilities is of high priority if an effective tree fruit industry is to be developed. The problems of identifying and eradicating citrus pests and the diseases and pests of deciduous and some tropical fruits are many, but they are small compared to the problems associated with certification of citrus trees and budwood. A general plan for regulating movement of plant material in-country as well as importation of foreign material is proposed.

The administrative organization of the Plant Protection Program is shown in Figures 4a and 4b (existing and proposed). It has been agreed in the MAF that the Plant Protection Department (PPD) should be reorganized. The German Plant Protection Group, Dr. A. B. Ashworth, and FAO consultants have recommended models. It is generally agreed the director of the PPD should administer the two sub-departments: (1) Quarantine and Inspection and (2) Pesticide and Environmental Standards. A committee of plant protection experts consisting of donor personnel and an MAF representative act as the director's advisory group.

Leadership training and technical assistance is urgently needed in the PPD. Little experience or expertise in managing a PPD exists. The situation in which diseased trees are being sold by nurseries to farmers will greatly damage the prospects of increasing fruit production unless the Plant Protection Program is implemented immediately. Technical assistance in the form of long-term personnel and an immediate TDY to cope with the diseases that presently exist in nursery stock to be sold in January 1983 is essential.

(2) Goals and Objectives

The goals and objectives of the PPP are:

- To prevent future losses in agriculture by preventing the introduction of foreign diseases and pests; and

- To increase crop production through the control and eradication of those diseases and pests already in the YAR.

FIGURE 3

Department of Horticulture

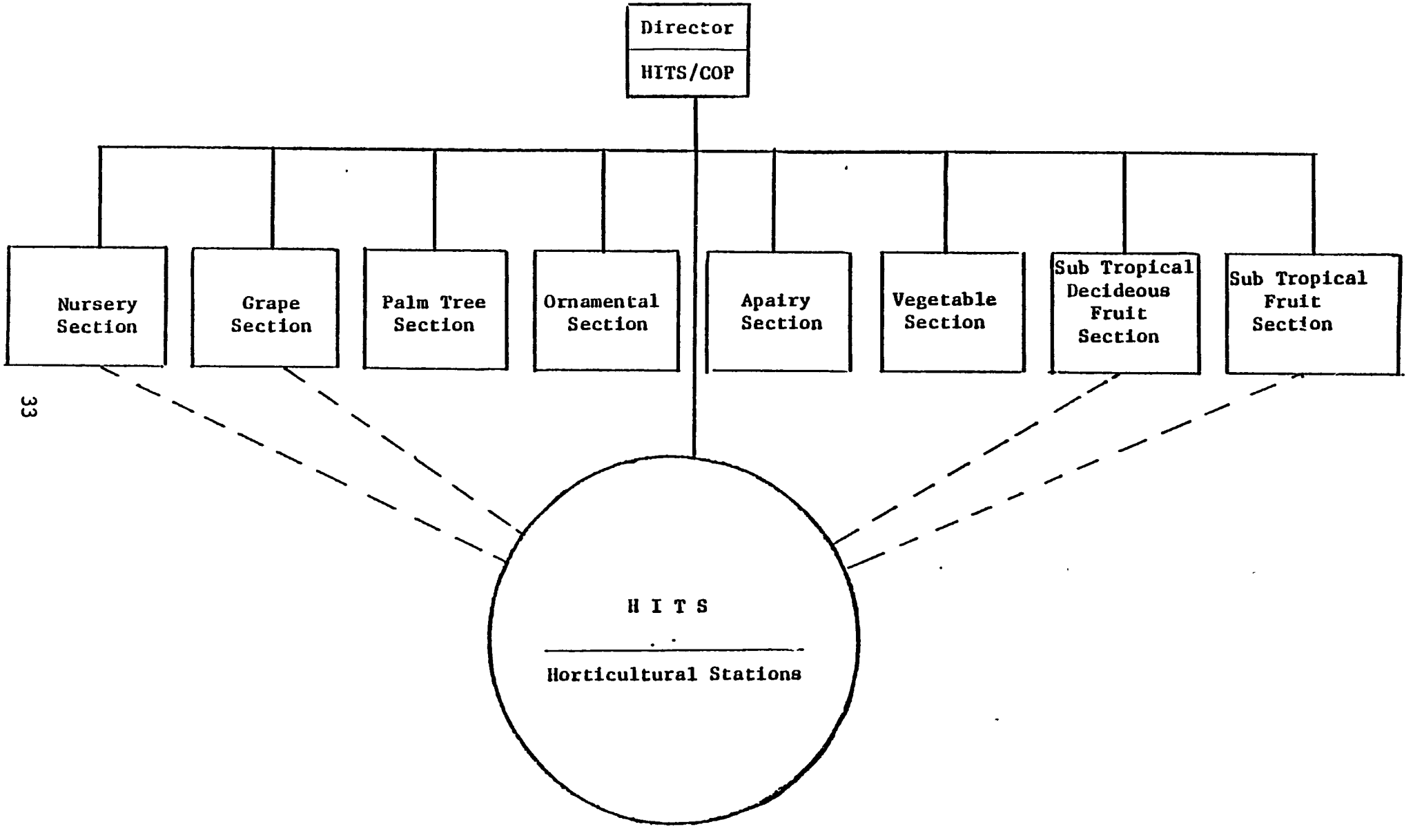


FIGURE 4 a

Department of Plant Protection

(Existing)

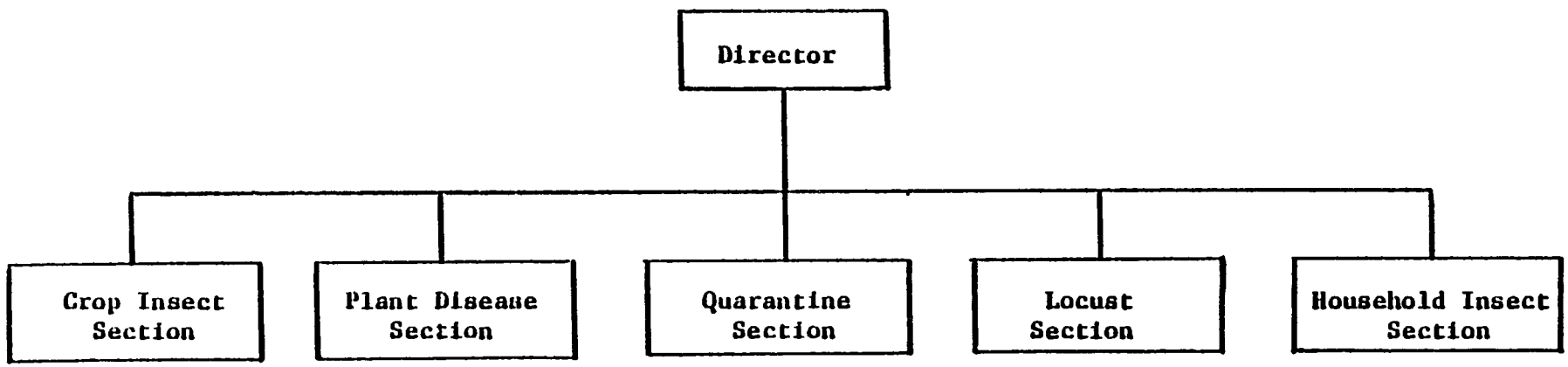
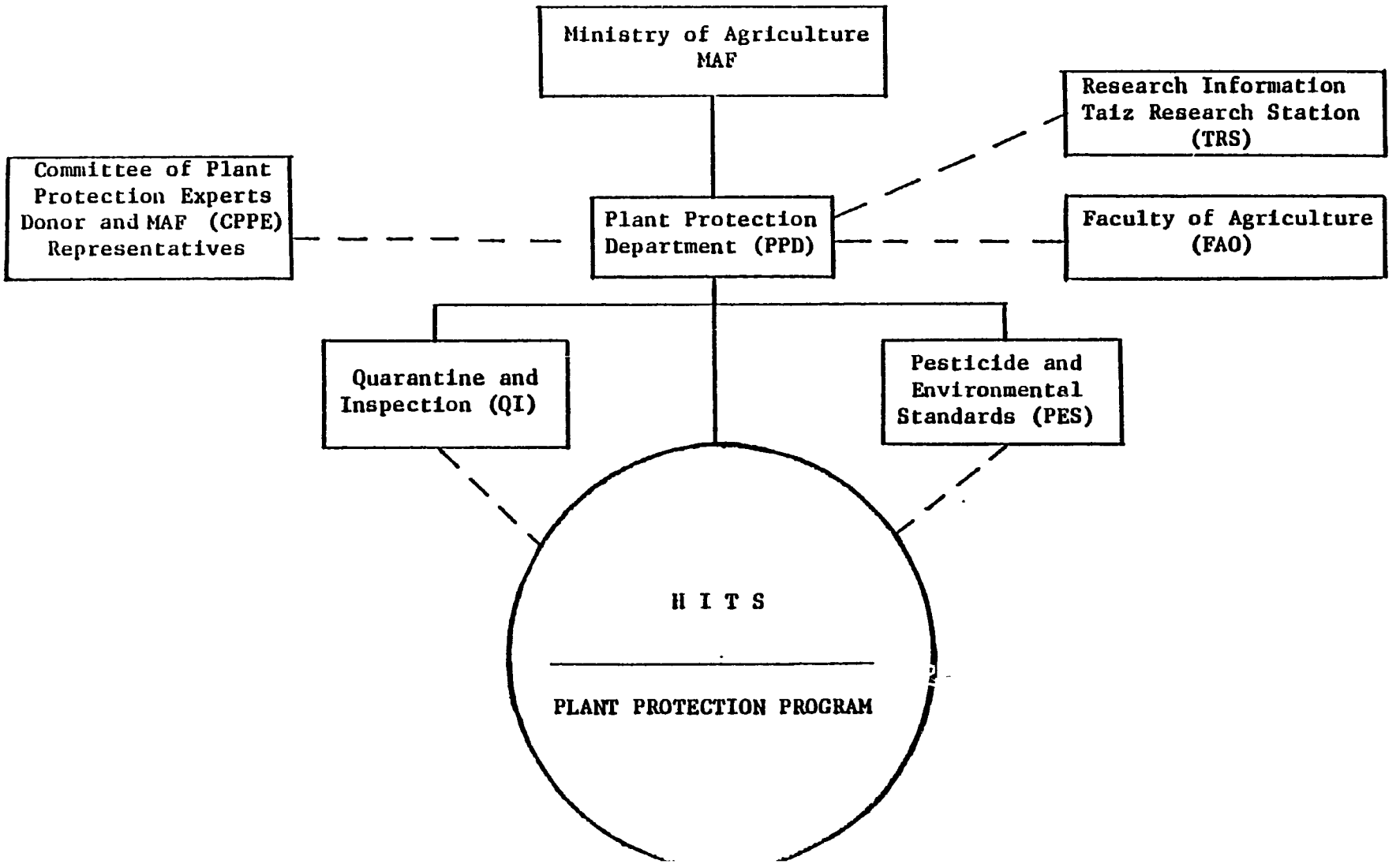


FIGURE 4 b

Proposed

Organization of the Department of Plant Protection

(modified from models proposed by the German Plant Protection Group and de B Ashworth GTZ and FAO Consultant)



(3) Staffing requirements are listed in Section III and Annex M. Detailed job descriptions for AID funded personnel are in Annex N.

c. Training

Training is the third general type of output in the project design to achieve project purpose.

Training has been recognized by CID and USAID/Yemen as the greatest need within the YARG. There is a scarcity of adequately trained personnel at all levels, and the YARG is attempting to identify means by which it can overcome this problem. The YARG is making a great effort to upgrade staff through both short- and long-term educational programs. However, it needs assistance in carrying out this goal, and the HITS design addresses this need in the fruit subsector.

Training in the YAR through the horticulture stations and on-the-job training for plant protection work and fruit production is an essential element of HITS. The training in YAR will consist of informal (short- and medium-term) and formal (short- and long-term). Some degree and non-degree training is planned in the U.S. in fruit production, pomology, and plant protection.

The long-term training program is critical, and it is anticipated it will have the greatest impact upon YARG's capacity to support and sustain fruit production. This can be achieved by meeting the training goals discussed in Annex M. Meeting those goals, in a large measure, depends upon persons being available for training at the right time. Some YARG personnel, several with eastern bloc training, have already been identified for training and are anxious to receive western technical training. Further, the MAF has already taken steps to identify more persons than can be accommodated by present budgets.

How effective HITS will be in achieving the training goal depends largely upon the English language proficiency of the nominated participants. Preimplementation authority of the Core Subproject (0052) permits early English language training in the YAR before a subproject is funded. This mechanism is currently being used to prepare MAF personnel for the training thrust of HITS. The Ibb School graduates can provide the MAF with a valuable supply of personnel for HITS to work with as counterparts while other personnel are in training status, thus broadening the base of trained personnel.

d. Communications and the Use of Media

The long-run effectiveness of HITS depends in substantial degree upon the effectiveness of the various aspects of its outreach program. The final aspect of the project design deals with an output that focuses directly upon the farmers who are the ultimate beneficiaries. As previously mentioned, considerable effort in the HITS is directed toward training of extension and other personnel who will have an impact upon the farmers and other beneficiaries.

The HITS design includes an outreach approach that goes directly to the beneficiaries. The key strategy is to use the media as a means to communicate with the rural farmer, local merchants who sell imputs, and others. The MAF has experience with the use of mass media, as it currently programs short weekly TV and newspaper spots on agricultural production. Attachment 5 to Annex M illustrates a recent newspaper article.

A key problem to be overcome in the outreach effort is mass illiteracy. However, television is found in about 80 percent of the homes in the YAR. This fact opens up the opportunity to make direct contact with fruit producers, both the subsistence and orchard producer, regarding techniques that will not only encourage them to venture, but to adapt the technology needed to increase production. Use of radio and TV gets around the illiteracy problem.

It has long been recognized that the conventional approach to extension in developing countries, in general, has failed to bring about a satisfactory extension of technology to poor and disadvantaged farmers. The reasons are generally known and understood. The opportunity for HITS to use TV in a developing country where the majority are poor farmers, yet most of whom have TV, is innovative and worth a trial.

It is critical that the personnel proposed for extension use their expertise to bring about successful extension of technology to the farmer. They will be carefully selected and trained.

Figure 5 shows how the HITS impacts upon the Department of Extension.

Requirements to implement this aspect of the design are as follows:

- One TDY extension specialist for an immediate impact before tree sales occur (January-February 1983).

- Two long-term (2 year) extension specialists, one of whom must be experienced in mass media approaches, to work with the MAF and CID/Core in developing materials for the total outreach effort.

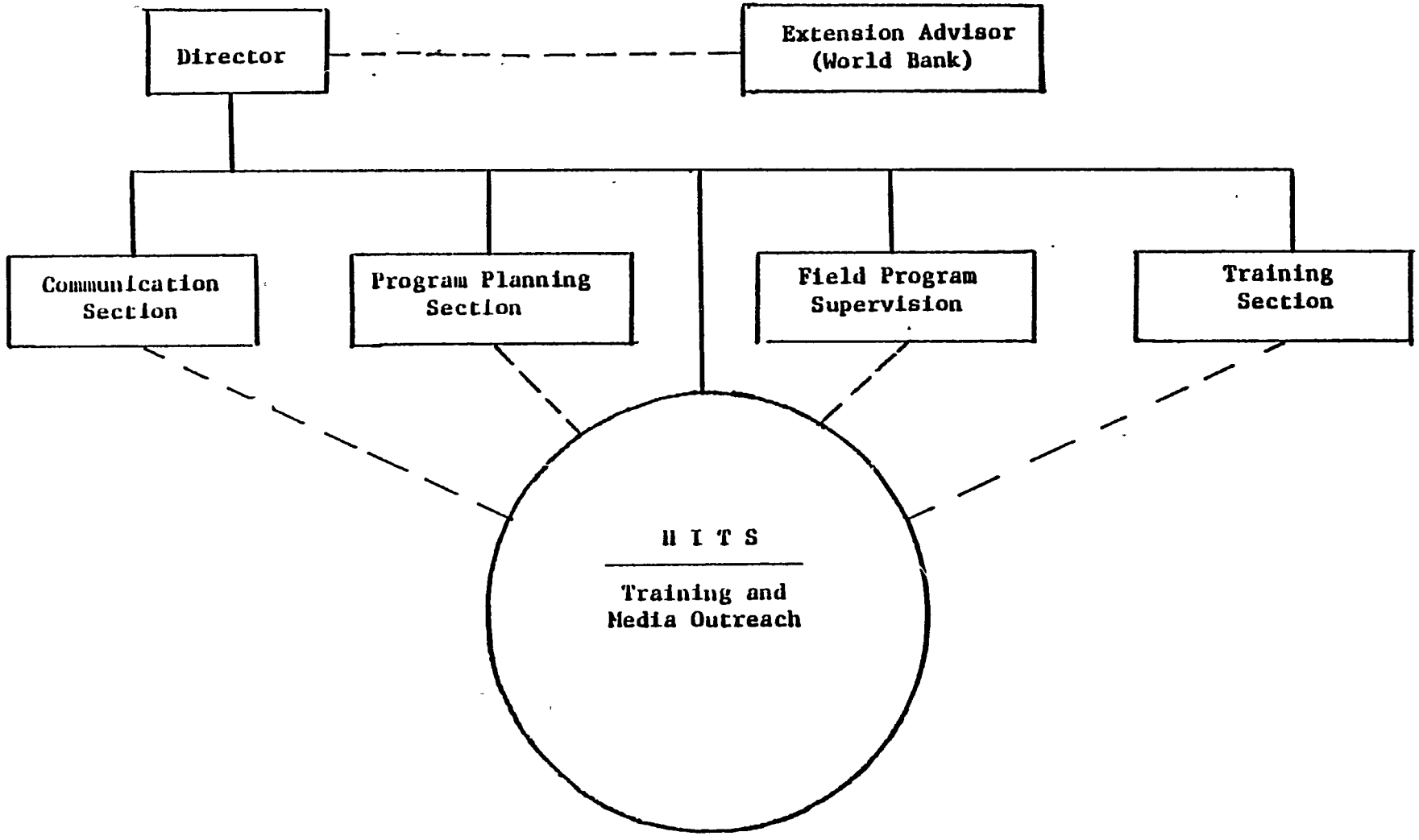
3. Conclusion

The elements of the project have been designed to fit together in such a manner that each becomes critical to achieving the project's purpose. Without an effective plant protection program, developing improved varieties would be futile. Without the support of a plant pathologist and entomologist in key policy and implementation positions in the MAF, a plant protection capability could not be developed and instituted. Similarly, a plant protection capability will not of itself achieve and sustain increased fruit production.

Other aid donors are providing assistance which addresses some of the problems, but their programs are on a piecemeal basis. (See Annex O for a review of donors and agencies that are active in the fruit sector.)

FIGURE 5

Department of Extension



HITS has been designed to help alleviate or moderate all of the constraints to increasing fruit production, thus addressing the country's needs in a more comprehensive manner while complementing other donor assistance. For AID to do less than proposed by HITS would result in yet another piecemeal approach which would leave one or more constraints blocking the path to progress. To consider doing more than proposed would over-burden the limited support capacity of the YARG. The design team concludes that the project is within the technical capacity of the MAF, and it can achieve its purpose without undue hardships on the YARG.

The mix of proposed technical assistance should be carefully monitored during implementation to help insure that the project remains on a sound footing. When, and if it is considered appropriate, design modifications should be considered. Evaluations needed to accomplish this are included in the project design.

The proposed 7-year length of the project is necessary and critical in order to develop all project inputs, including: (a) Completing all in-country and U.S. training; (b) developing new, improved fruit varieties;[9] (c) positioning trained participants and counterparts in key positions; and (d) closely monitoring for a brief period the performance of:

- All trained personnel and counterparts;
- Newly developed varieties under field conditions;
- The plant protection disease and pest control/eradication program strategy;
- The HITS Stations under total MAF management;
- The outreach program (regular extension and mass media program).

The HITS design seeks to benefit from the experience of many development projects that simply do not allow adequate time to produce and test, under field conditions, the outputs of the project. The proposed time frame for HITS should be evaluated during implementation to help insure that this objective can be met. If needed, modification in the length of the project should be considered.

Assumptions related to achieving the project's outputs and purpose are minimal. With proper management, the risk of not achieving the project's objectives is relatively small.

In conclusion, the technical approach proposed by HITS is considered to be sound, and the proposed implementation methodology is practical.

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[9]This is a key technical condieration in view of the lagged (4 to 6 years) timeframe for newly developed vine and tree varieties to bear fruit.

B. Social Considerations

The HITS Project is designed to institutionalize within the MAF a capacity to provide farmers the necessary information and training which will enable them to increase the quantity and improve the quality of fruit production. In recent years, the demand for fruit has increased substantially. Increased imports have met part of the new demand. Farmers, irrespective of land holding size, are beginning to purchase varying amounts of fruit trees in an effort to cash in on this demand. The demand for tree stock is high, and is expected to continue to be so. (See Annexes L and M where this point is discussed in more detail.) However, the general unavailability of clean, disease and pest free tree stock, the limited traditional cultural practices and the unavailabilty of an effective extension (outreach) program are serious constraints to the production of higher quality fruit in sufficient quantities to meet demand. The HITS Project is specifically designed to create MAF institutions which are capable of addressing these constraints.

1. Beneficiaries

Beneficiaries of HITS are essentially participants in the entire fruit subsector in Yemen. They can be more specifically identified as follows:

a. Small subsistence farmers (increasingly women) who cultivate a few trees to benefit from a small salable surplus and an additional source of food and nutrition;

b. Small-to-medium scale orchard growers with 10 to 100 trees who produce for the commercial market and who have access to water and capital to support their operations;

c. Rural seasonal laborers who will have an additional source of wage labor from orchard growers;

d. Nurserymen who will have access to cleaner and improved varieties of budwood for production of better tree stock to sell to farmers;

e. Merchants who sell imputs or market the increased production; and

f. Consumers who will have access to an increased supply of better quality fruits.

In terms of magnitude, the majority of the beneficiaries will be consumers and small-scale farmers. The inclusion of the latter group is based on the on-going Agricultural Census which began in 1978 and which covered eight of the ten provinces of the YAR. This census has reported that nearly 80 percent of rural households are involved in agriculture, and, of this amount, 60 percent farm less than one hectare and about 86 percent farm less than four hectare. While no accurate data are available to describe which farmer group (backyard versus orchard growers) constitutes the majority of the fruit subsector in terms of number, size, and production, these statistics

suggest that, potentially, if not actually, the fruit subsector is largely composed of small- and medium-scale farmers who cultivate less than four hectares in some form of mixed (crops and fruit) cropping pattern. A great majority of the households have one or more fruit trees in the yard, and whatever fruit is produced is consumed. Labor on the small and medium size farms is generally provided by family members and increasingly by women and children, since 40 to 60 percent of the rural men are migrating to urban areas and to Saudi Arabia for varying periods to earn significantly higher wages.

A clearer statistical picture of the fruit subsector in Yemen will be a side-output of the HITS data collection and analysis strategy.

A limited survey conducted during project design (see Social Analysis, Annex K) suggests that the medium-scale farmers, who have better access to capital and water resources, may be more responsive initially to innovations that will be offered by HITS. However, it is assumed they will also provide models for increased small-scale farmer participation in the fruit subsector. Given the general characteristics that most of the available literature indicates small-scale, illiterate, and poor farmers exhibit, this assumption is very realistic and reasonable. The initial responsiveness of very small-scale farmers is not expected to be high. However, given the wide availability of radio and television in rural Yemen and the fact that a high percentage of households have a male member employed in Saudi Arabia or an urban area so that they have access to small amounts of cash, the project may have a greater-than-anticipated impact initially on existing small-scale fruit growers.

2. Insuring Small-Scale Farmer Participation

To help insure participation by both existing and potentially new small-scale farmers, the project incorporates the following design elements:

a. Initial emphasis will be placed on fruits that are traditionally produced in Yemen and for which a set of traditional cultural practices exist;

b. Intervention through new technology will be minimized, with stress on easily assimilated techniques which complement traditional cultural practices;

c. Broad distribution of simple, heavily illustrated printed material to farmers at the time of seedling purchase from nurseries;

d. Broad distribution of the same material to extension agents and agricultural technicians who have access to farmers;

e. Encouraging mixed cropping of trees with traditional crops to minimize risks;

f. Heavy use of radio, television and illustrated newspapers to demonstrate simple tree planting and care techniques.[10]

g. Use of mass media to announce tree distributions and extension agent classes; and

h. Experimentation with at least two simple, portable, video systems for use in extension agent training and farmer demonstrations--both at and away from HITS Stations.

3. Water Constraint

One constraint to increased participation by many small-scale farmers in fruit production is a limited supply of water. Most small-scale farmers practice rainfed cultivation. The size of their farms generally do not justify the added costs of irrigation by well or pump. The project will incorporate demonstrations on improved management of existing water supplies, including natural precipitation, and economical alternatives for augmenting and conserving supplies. Some farmers cooperatively construct wells--a practice that HITS will encourage. Water harvesting techniques being tested in the southwest United States may prove practical for small farmers.

4. Extension Approach

The HITS Project proposes to use the traditional extension approach plus a unique outreach program which will reach a broad spectrum of potential clientele. The project will mount an extensive outreach program via the media, radio, television, and newspapers, all of which are widely available in Yemen. Leaflets and pamphlets will be distributed to nurserymen for use at the point of tree stock sales and by extension agents in farmer visits and demonstrations. In addition, training will be provided for those who sell inputs and buy fruit crops from farmers. This comprehensive strategy, consisting of direct and indirect outreach efforts, should prove effective.

The MAF currently uses media outreach, but to a limited extent. The technology exists in Yemen for making much greater use of television and radio. Inasmuch as requests for technical assistance have already been received from nurserymen, there is reason to believe that they will help educate farmers. The MAF has employed female extension agents, and much more attention can very readily be given to women farmers.

5. Role of Women

As noted above, women are playing an increasing role in agriculture owing to the migration of males to urban areas and Saudi Arabia in search of higher wages. In response to this phenomenon, the Extension Department began hiring women extension agents. There are presently 23 female agents in YAR. Thirteen female students from Surdud were recently trained in honey bee culture at the Ibb Secondary Agricultural Institute at Ibb, and female extension personnel are expected to participate in the HITS training

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[10] Such a program already exists for oranges.

programs. If necessary, special sections of courses can be provided for female agents and, further, they can participate indirectly at any time through the use of the proposed portable video recording systems.

Women farmers should benefit significantly from the mass media outreach program. This is very important given the high probability that they will not be able to have much (if any) direct contact with male extension agents because of rigid Arab social customs. Because more women are illiterate, they should also benefit from the proposed heavy use of TV and radio and illustrations in printed materials.

6. Agricultural Sociology

USAID/Yemen and CID recognize there is a significant void in available information on the socio-cultural characteristics of rural Yemen. The MAF has also recognized this need. The project design team recommends that great effort be expended in acquiring information on the problems in implementation of the HITS program and impacts from of various types of rural development programs.

Presently, there is no individual working directly in the MAF who is providing information and guidance in the area of rural sociology or agricultural institutions. However, the Minister has recently elevated rural development to a directorate status and assigned a Director General. USAID/Yemen and CID believe it would be more effective, both in terms of costs and substantive achievements, to propose assigning a Core Rural Development Advisor as a full-time counterpart to the newly appointed General Director for Rural Development and thereby help to develop a capacity for socio/economic analyses there than to assign social science personnel to HITS. The individual in Core would provide significant assistance to the Ministry in planning and conducting assessments of social/cultural problems in the agriculture sector. He would also be of immense assistance to the development and implementation of the overall AID program in the agriculture sector.

7. Lack of Confidence in New Technology

The project design is based on the fact that small, poor farmers in particular and, to a lesser extent, all farmers do not have confidence in new technology. The entire HITS program is designed to reduce risk and raise confidence. For example, the Plant Protection Program, through inspection, control, and eradication procedures, will help protect farmer investments in fruit trees and reduce risk from crop failure. In conjunction with farmer training, it should have a very positive effect on increasing the confidence level of all farmers and encourage their increased participation in fruit cultivation.

C. Economic and Recurrent Cost Analyses

Annex L presents a detailed analysis of the micro/macroeconomic and recurrent cost implications of the proposed project. Following is a brief summary of that annex. The reader is encouraged to reference the annex and the accompaning statistical tables.

1. Fruit Production and Consumption

Fruit production and consumption in the YAR is reported for grapes, dates, and other fruits. Grapes are the most important fruit crop in the country. Production of grapes has more than doubled over the past decade, largely resulting from an increase in area under cultivation. Production of other fruit has more than tripled over the past decade. Production expectations for all fruit are at an average annual compound rate of 5 percent over the 1981-2000 period.

Consumption, including imports, has been increasing at very high rates, and is expected to continue to do so. Per capita consumption of grapes, dates, and other fruit over the period 1981-2000 is projected to increase by 30 to 38 percent.

Consumption has been stimulated by significant increases in income and population and also by changes in the relative prices of fruit. Table 4 summarizes production and consumption data.

2. Fruit Marketing

Since 1975-76, fruit prices in Sana'a have, on the average, increased by 26 percent as compared to an increase of 97 percent in all foodstuffs and 112 percent for all commodities. Price increases in other food commodities tend to increase the demand for fruit. Annex L discusses fruit prices in more detail.

There are two distinct markets for fruit in Yemen--the import market, which is controlled by the YARG, and the domestic products market, which is relatively free of public sector influences. Government licenced importers sell to urban wholesalers who, in turn, distribute to a wide variety of retailers in urban and rural areas. The YARG controls price margins in the import market.

For domestic products, an estimated 60 to 70 percent is marketed. Grapes are sold largely through urban centers. Other fruits are sold mainly at the farm or in local trading centers. Prices appear to be set by groups of traders through an apparent subjective analyses of local supply and demand conditions. Price variations (ranging from 20 to 30 percent) have been noted between different market locations, reflecting local conditions. Three major characteristics influence prices of fruit: (a) Fruits are normally seasonally produced, and, hence, supplies are concentrated in particular time periods; (b) fruits are highly perishable and, thus, difficult and costly to store and transport; and (c) consumers usually desire to consume fruit perennially, resulting in highly fluctuating prices that are lower during harvest and higher in other periods.

3. Profitability of Fruit Production

Costs and returns were prepared by Asmon[11] for several fruit crops. This analysis (see Annex L) generally shows a strong profitability for

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[11] I. Asmon, "YAR Horticultural Production, Extension, and Training Project, Interim Report, Ronco Consulting Corporation, June 1982.

TABLE 4

PRODUCTION AND CONSUMPTION ESTIMATES FOR FRUITS

YEMEN ARAB REPUBLIC

1981-2000

	Domestic Production (000 Tons)[a]				Annual Compound Growth Rate (%)
	1981	1986	1990	2000	1981-2000
Grapes	64.3	80.4	111.9	220.1	6.7
Dates	6.3	7.3	7.6	12.4	3.6
Other Fruits	80.7	96.8	101.5	199.7	4.9
	Total Consumption (000 Tons)				
Grapes	64.3	83.2	101.5	157.6	4.8
Dates	13.2[b]	16.8	20.1	30.3	4.5
Fresh Fruits[c]	205.7[d]	261.3	314.0	473.8	4.5
Preserved Fruits[e]	21.8	27.7	33.3	50.2	4.5
	Per Capita Consumption[f] (kg)				
Grapes	8.87	9.97	10.94	13.01	2.0
Dates	1.82	2.01	2.17	2.50	1.7
Fresh Fruits	28.37	31.33	33.84	39.12	1.7
Preserved Fruits	3.00	3.32	3.59	4.14	1.7

[a] Figures used by YARG in preparation of Second Five-Year Plan.

[b] Assumes imports of 6.9 thousand tons.

[c] Including juices.

[d] Estimate assumes imports of 125.0 thousand tons, which is approximately 25,000 above 1980 CPO import figures and approximately 107,000 tons below Ministry of Supply and Trade 1981 import figures (see Table L-5).

[e] All imported. Includes juices. Assumes half of fruit and vegetable juice imports are fruit juices.

[f] Population estimates are: 1981--7,251,160; 1986--8,340,974; 1990--9,278,944; 2000--12,111,635. Annual population growth rates assumed: 1980-90, 2.9%; 1990-2000, 2.7%. Per capita growth in real income assumed at 4% per year. Income elasticity of demand coefficients assumed:

	1980-90	1990-2000
Grapes	0.6	0.450
Dates	0.5	0.375
Fresh Fruits	0.5	0.375
Preserved Fruits	0.5	0.375

fruits for which estimates were prepared (oranges, limes, peaches, mangoes, bananas, papayas, and guavas). With irrigation by well water, the internal rates of return (IRR) are from 31 to 43 percent, except for bananas (21.8 percent) and papayas (95.2 percent). When surface water is available the IRR's are improved to extremely acceptable levels, i.e., 43 to 66 percent on average, except for bananas (160 percent) and papayas (244 percent).

Sensitivity analyses were completed for yield reductions and complete crop losses (wipe-outs) resulting from wind, hail, disease, pests, etc., and price reductions. The results are summarized in Table 5. (The impacts from water availability are noted above.) Yield reductions of 50 percent reduce the IRR's from levels of 31 to 43 percent to levels of 18 to 25 percent, except for papayas and bananas where profitability is eliminated.

Price reductions have greater impacts on the IRR's than yield reductions. Complete crop loss in three of twenty production years reduce IRR's by about 5 to 7 percentage points. A yield cut of 50 percent accompanied by 3 years of total crop loss reduces IRR's to below 20 percent for farmers using well irrigation, but for those with surface water, the IRR's are reduced only to between 21 to 34 percent.

4. Policy Considerations

There are several policy instruments available to the YARG to influence private sector fruit production, including price, duties, subsidies, and embargoes. At present, the import duty is 27 percent on fresh fruit. The economic basis for the policy is not clear. Evidence strongly suggests that Yemen consumers are willing to pay a price premium for fresh domestic fruit. To the extent that this is true, the duty does not restrict the consumption of imported fruit to the extent it would otherwise.

No identifiable price subsidies exist in the fruit subsector, including input price subsidies; neither are any recommended. Sales of budded wood to nurseries and budded trees and seedlings to farmers by the MAF are expected to cover costs of production.

In general, the project does not recommend any modification of the existing economic and financial policy matrix in the fruit sector.

5. Macroeconomic Impact

The HITS beneficiaries include all farmers who grow fruit, consumers who eat fruit, farm input suppliers, fruit marketing businessmen, extension agents and horticultural technicians whose knowledge is upgraded, participant trainees who receive formal degrees, the MAF as an institution, and YARG through import substitution (saving of foreign exchange).

No attempt was made to quantify macroeconomic returns to some of the beneficiary groups such as persons with more training. Outputs in person numbers, however, are listed in the logframe (magnitude of outputs section).

A simple model assuming that the HITS can increase grape production yields per hectare by 25 percent and other fruit production by 75 percent by 1990 was developed. The difference between the tonnage of fruit production expectations with and without HITS was estimated at 168,700 tons

TABLE 5

Internal Rates of Return with Sensitivity Analysis

Well Irrigation[a]	Initial	With 50% Reduction: Yield	Price	With Wipe Out[b]	With Wipe Out and Yield Cut[b]
Oranges	40.9	24.0	22.5	35.4	19.6
Peaches	39.3	23.3	20.6	34.7	19.1
Limes	43.1	25.0	22.2	36.0	19.7
Papayas[c]	95.2	11.2	18.5	n.a.	n.a.
Bananas[d]	21.8	f	f	3.9[g]	n.a.
Mangoes	30/5	18.3	16.9	24.3	13.5
Guavas	34.0	19.8	17.7	29.9	16.2
Surface Water Irrigation[c]					
Oranges	58.7	37.0	35.4	51.3	31.6
Peaches	50.9	30.5	24.9	44.5	25.5
Limes	.0	42.2	38.7	55.0	33.8
Papayas[c]	.0	68.0	56.4	n.a.	n.a.
Bananas[d]	.0	16.8	3.7	61.7[g]	n.a.
Mangoes	.9	28.5	26.4	33.6	21.3
Guaves	.1	29.5	27.3	39.8	24.6

a Assumes a well investment of YR 100,000 for papayas, bananas, mangoes, and guavas. Assumes a YR 200,000 well investment for peaches, limes, and oranges. Estimated well life of 20 years. Assumes a pump set investment of YR 42,000 for papayas, bananas, mangoes and guavas. Assumes a YR 84,000 pumps set investment for limes, peaches, and oranges. Assumes a 10-year life for pump sets. Fruit is assumed to grow on one hectare of a 15 ha farm; therefore, capital investment outlays are assumed to be 1/15 of total for the first enterprise. Pump is assumed to be replaced in year 11. Assumes oxen cultivation.

b Assumes complete loss of crop in years 5, 10, and 15.

c Nine-year period assumed. Three tree cycles.

d For 10-year period.

e Annual costs reduced by YR 3,500 (pump and O&M cost) and no well investment outlays Assumes oxen cultivation.

f All net cash flows are negative.

g Wipe out years four and nine.

Source: Calculated from budgets presented in Tables 13-19, Annex L.

for other fruit and 83,300 tons for grapes over the 7 years. The net value of this fruit (gross return less production costs) for each year was matched to the HITS, USAID, and YARG costs for each year. Using these amounts as cash flows, the IRR for the HITS is 64 percent. If the first year money outlays by USAID and YARG are considered as an initial investment and all later years net cash flows are discounted at 12 percent, a net present value of $40 million results, yielding a benefit-cost ratio of 11.9. Regarding foreign exchange impacts, if consumers substitute domestic fruit for imported fruit as production increases, there is a potential $8.5 million saving of foreign exchange over 7 years. Additionally, YAR would have 34,800 tons of grapes to export instead of 10,400, with a value of perhaps $6 to $7 million. There is a ready market for fresh grapes in Saudi Arabia and the Gulf States.

6. Recurrent Cost Implications

The YARG contribution to the HITS is budgeted at 23.52 percent of the total (see Annex G). Budgets within YARG are both general and specific. Recurring costs of salaries and wages, travel and per diem, office space, and office utilities and maintenance for professional and nonprofessional staff related to the HITS is YR 1,248,000 annually. Additionally, recurring costs for utilities and maintenance at Al-Irra and Jarouba (YR 20,000), road maintenance (YR 5,000), farm supplies (YR 22,900), office supplies (YR 5,000) and irrigation supplies (YR 5,000) total YR 57,900 annually. The grand total of recurring costs related to the HITS is thus YR 1,305,900.

To cover these costs, YARG has several budget categories. General type budgets cover the annual YR 1,248,000 costs for salaries, wages, travel, per diem, office space, and office utilities and maintenance. Other YARG budgets that are available to cover HITS activities include the Extension Department and fruit-related sections of the Horticulture and Plant Protection Departments. For the SFYP (1982-86), these three budgets total YR 13,893,000 on an annual basis. Added to the YR 1,248,000 (previous paragraph) available from general funds, the total is YR 15,141,000 available on an annual basis. With total HITS recurrent costs of YR 1,305,900 annually, HITS represents 8.6 percent of YARG's various available budgets. Given that HITS is the most comprehensive donor assistance to the fruit subsector, the design team and USAID/Yemen conclude that 8.6 percent is a reasonable proportion of MAF budgets to be allocated for HITS recurrent costs.[12]

7. Data Collection and Analysis

The paucity of data in general and for specific individual fruits precluded the answering of some important questions during project design. To assist project managers in monitoring project activities and to provide necessary information for evaluation teams, several lines of continuing investigation are recommended.

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[12] The percentage is actually smaller than 8.6 percent since more of the general budgets go towards horticultural activities than the YR 13,893,000 identified specifically for HITS. Without more detail, the exact percentage cannot be calculated.

a. Farmers' Costs and Returns

The budgets prepared by Asmon are preliminary in nature and need to be refined based on actual Yemeni experience. It is planned that farmers will be asked a few questions when they buy trees at a nursery. Questions wll be regarding their farm location, fruit production plans, and willingness to cooperate in answering additional questions at a later date. A random stratified sample of these farmers can then be drawn for use in organizing a study estimating costs and returns for production of individual fruit crops. In the process, technical coefficient information can also be acquired that will assist project managers in making cultural practice and other recommendations. The first step is the initial identification of fruit producers as to location, type of fruit enterprise, and size of operation. HITS personnel, both long-term and TDY, can contribute to the assembly and analysis of data, but the major participant should be the agricultural economist (Agriculture Planning Advisor) in Core and his counterparts. MAF needs the services of production economists in all aspects of crop and livestock production, and they should be provided by Core rather than through specific subprojects.

b. Marketing

The SPID indicates that the design team will "review the fruit marketing system and make recommendations for further fruit marketing and processing studies which should be undertaken as the program develops." The present state of knowledge on fruit marketing is clearly deficient in providing any detail on the marketing structure for domestically grown fruit, i.e., numbers of buyers and sellers, how fruit is transported, nature of price determination, costs of marketing activities, etc.

It is recommended that market structure studies be undertaken for each of the fruits of concern in the HITS Project. This will necessitate a survey of local markets in fruit growing areas. From the farmer sample discussed in 7.a. above, fruit can be followed from the farm gate into the marketing channels. Of particular interest will be the degree of fruit production commercialization by farmer type, size, and for individual fruits. After describing the marketing structure, marketing costs (margins) for the various functions and for types of middlemen can be estimated.

Since grapes are the most likely candidate for export in the future, a study should be initiated within 2 years that would yield information to facilitiate entering into the international market. Complementary with the above recommendations is the collection of price information for fruits in local markets throughout the country. These studies should be conducted by professional marketing research personnel in MAF. HITS personnel can be of great assistance.

c. Research Implementation Plans

Two recent developments serve to accomplish the above research plans. One is the establisment of a new Directorate of Marketing in the MAF. The other is the recent appointment of a person to be head of the Department of Agricultural Economics in the Directorate of Planning and Statistics in the MAF. The Core Subproject Agricultural Planning Advisor

works in the Directorate of Planning and Statistics, and his counterpart is the Head of the Department of Agricultural Economics. As indicated above, HITS personnel will cooperate and work closely with the CID/Core Agricultural Planning Advisor and MAF personnel in accomplishing the required tasks. Conducting the studies in the Directorate of Marketing the Department of Agricultural Economics in MAF directly serves the purpose of the HITS Project regarding institutionalization.

D. Financial Plan

As summarized in Tables 6 through 8, the toal cost of the HITS Project is (rounded) $18 million. Of this amount, the AID contribution is $14 million and the YARG contribution is $4.2 million in the local currency equivalent of Yemeni Rials (YR), or 23.5 percent. The YARG contribution does not include an estimate for the costs of publication of printed materials and development of media programs for the media outreach element of the project. There is no easy way to estimate the cost of personnel, television, radio, newspaper space, paper for handouts, TV cameras, recording equipment, transportation, film, ink, and a host of other items associated with these programs. The design team and USAID/Yemen believe that the cost for these items is more than sufficient to increase the YARG's overall contribution to the project to over 25 percent ($4.5 million). For this reason, USAID/Yemen concludes that the 25 percent minimum YARG contribution is met.

The AID contribution is approximately $10 million in U.S. dollars and about $4 million in local currency (YR). These funds will be obligated in accordance with Table 9, Proposed Obligation Schedule.

Contingency and inflation rates have been estimated at 5 percent and 10 percent, respectively. Inflation rates have been compounded over Years 2 through 7 of the project, and represent a total of $2.6 million on both the AID dollar and local currency budgets.

Annex G presents the detailed financial plan for the project. Marginal differences between summary and detailed financial plan tables are the result of rounding.

E. Implementation Arrangements

1. USAID

The USAID/Yemen Agriculture Development Office (ADO) will assume full oversight and monitoring responsibility in consultation with other elements of the Mission. This will include, but not be limited to, participating in contract negotiation, selecting long- and short-term technical assistance, approving annual workplans, expediting diplomatic relations with the YARG, approving budgets and organizing external evaluations. A Projects Officer will have ready access to the CID HITS Subproject Director (see below) and field Team Leader, and he will work cooperatively with the USAID Agriculture Development Officer and CID/Core COP for coordination with other elements of the Agriculture Development Support Program.

USAID/Yemen will arrange for other technical inputs from AID that are required, such as review and periodic monitoring by an AID engineer

HITS

TOTAL BUDGET SUMMARY

($000)

YEAR

	1	2	3	4	5	6	7	TOTAL
DOLLAR BUDGET SUMMARY (AID								
Actual Cost	1943.7	1405.8	1146.1	1084.0	879.1	726.0	483.2	766[illegible]
5% Contingency[a]	0.0	70.3	57.3	54.2	44.0	36.3	24.2	286.3
Subtotal	1943.7	1476.1	1204.0	1138.8	923.1	762.3	507.4	7955.4
Inflation (10% comp.)[b]	0.0	140.5	240.7	358.8	408.0	443.2	372.8	1964.0
Total (AID)	1943.7	1616.6	1444.1	1497.0	1331.1	1205.5	880.2	9918.2
LOCAL BUDGET SUMMARY								
Actual Cost	1417.7	456.4	364.1	311.9	218.7	191.4	196.4	3156.6
5% Contingency	0.0	22.8	18.2	15.6	10.9	9.6	9.8	86.9
Subtotal	1417.7	479.2	382.3	327.5	229.6	201.0	206.2	3243.5
Inflation (10% comp.)	0.0	45.7	76.5	103.2	101.5	116.8	151.5	595.2
Total	1417.7	524.9	458.8	430.7	331.1	317.8	357.7	3838.7
AID TOTAL BUDGET[c]	3361.4	2141.5	1902.9	1927.7	1662.2	1523.3	1237.9	1375[illegible]
YARG TOTAL BUDGET IN $$$	1604.8	330.0	372.3	394.3	513.6	483.4	519.4	4217.8
GRAND TOTAL AID & YARG[d]	4966.2	2471.5	2275.2	2322.0	2175.8	2006.7	1757.3	17974.7

a/ Contingency not included in year 1.

b/ Inflation not factored on contingency.

c/ Includes $479,739 of pre-implementation costs through October 31, 1982 - an anticipated date for the HITS reaching full project status.

d/ Marginal differences between summary and detail budget tables result from rounding.

AID

SUMMARY DOLLAR BUDGET

($000)

YEAR

		1	2	3	4	5	6	7	TOTAL
I.	Salaries	450.0	438.4	309.9	307.2	211.3	211.3	220.3	2148.4
II.	Indirect Cost	286.9	278.6	190.4	194.7	130.0	124.9	134.1	1339.6
III.	Consultant Fees	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IV.	Allowances	244.2	241.2	157.5	154.5	97.1	94.1	94.1	1082.7
V.	Travel & Transportation	340.9	69.7	56.4	40.9	45.2	16.0	25.2	594.3
VI.	Expendable Equipment & Supplies	38.5	28.5	24.5	23.5	22.5	15.5	9.5	162.5
VII.	Non-Expendable Equipment & Supplies	543.2	43.0	65.0	12.0	53.0	5.0	0.0	721.2
VIII.	Participant Training	40.0	306.4	342.4	351.2	320.0	259.2	0.0	1619.2
	Total Dollar Budget	1943.7	1405.8	1146.1	1084.0	879.1	726.0	483.2	7667.9

AID

SUMMARY LOCAL CURRENCY

($000)

YEAR

		1	2	3	4	5	6	7	TOTAL
I.	Salaries	89.9	89.9	89.9	61.7	33.5	33.5	33.5	431.9
II.	Operations	263.0	278.0	178.0	188.0	122.0	122.0	128.0	1279.[illegible]
III.	Travel and Per diem	4 .6	4 .6	34.2	34.2	31.2	18.9	18.9	228.6
IV.	Training	41.0	1.0	21.0	0.0	10.0	0.0	0.0	73.0
V.	Expendable Equipment and Materials	29.0	29.0	23.0	18.0	13.0	10.0	9.0	131.0
VI.	Nonexpendable Equipment and Materials	941.2	5.0	10.0	2.0	1.0	0.0	0.0	959.2
VII.	Other Direct Costs	8.0	8.0	8.0	8.0	8.0	7.0	7.0	54.0
	Subtotal	1417.7	456.5	364.1	311.9	218.7	191.4	196.4	3156.7

TABLE 9

PROPOSED OBLIGATION SCHEDULE

AGRICULTURAL DEVELOPMENT SUPPORT

HORTICULTURE SUBPROJECT

279-0052
($000)

FY 82	FY 83	FY 84	FY 85	FY 86	FY 87	FY 88
500	4,000	2,500	2,500	1,600	1,600	1,300

of the AID-funded construction elements of the project. This constitutes an important function given the lack of engineering skills on both the USAID/Yemen and CID/Yemen staffs.

2. CID

The project was designed and will be implemented by the Consortium for International Development (CID) as a subproject of the Agriculture Development Support Program (279-0052). AID will sign a subproject contract with CID. California State Polytechnic University at Pomona (CSPU) has been, and will continue to be, the lead university and will be responsible for meeting all technical aspects of the subproject. Staff recruitment shall be through all participating CID universities.[13] CSPU will be responsible for subproject administration in close cooperation with the CID Executive Office in Tucson, Arizona, and with the Core Subproject administration.

Since many of the CID universities have excellent horticulture programs, there will be a large pool of professionals and technicians from which to draw. The project does not require any full-time individuals with highly unusual, rare skills. Staffing, therefore, is not expected to be a problem. Positions at Jarouba will require individuals to live in relative isolation, and this will be duly considered during recruitment.

The project will require TDY expertise in outreach methodology. Experience limited to the standard U.S. extension model will not be sufficient for the situation in the YAR. This expert should have had experience in a variety of extension methodologies which may be applicable in the YAR. He should have experience in reaching large numbers of small-scale, relatively isolated, and illiterate farmers. If necessary, USAID will assist CID in locating and attracting the services of such expertise.

The HITS Team Leader will be selected from among the long-term technical staff that will be stationed in Sana'a. He will report directly to the HITS Subproject Director on the CPSU campus and the CID Chief of Party (COP) in Yemen (279-0052). He will coordinate his activities as appropriate with Core/Yemen advisors assigned to the MAF.[14] He will work closely with the USAID Projects Officer.

CPSU will assign a Sub-Project Director on the CPSU campus who will coordinate all technical and administrative backstopping through the CID network. Additionally, the CID Executive Office will assign a Deputy Director (part time) to work collaboratively with the Subproject Director to insure full and appropriate backstopping of HITS.

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[13] Participating CID universities are the University of Arizona, California State Polytechnic University at Pomona, Colorado State University, the University of Idaho, Montana State University, New Mexico State University, Oregon State University, Texas Tech University, Utah State University, Washington State University, and the University of Wyoming.

[14] CID Core advisors include an Agricultural Planning Advisor to the Directorate of Planning and Statistics and an Agriculture Advisor to the Directorate of General Services.

CID will enter into a subcontract(s) with a local contractor for renovation, construction, and erection of prefabricated, or other appropriate houses and station facilities at Jarouba and Al Irra.[15] In order to facilitate the work under the subcontract(s), facilitate MAF participation, and provide some amount of legal protection to CID, operating in a country with relatively limited legal protection for outsiders in any disputes that may arise, the MAF will be signatory to the subcontract. Selection of the contractor will be in accordance with standard AID procedures, and will be in close collaboration with USAID/Yemen.

CID expects the Mission to arrange periodic oversight and monitoring by an AID engineer to assist in insuring that AID procedures and quality standards are met. In addition, the anticipated CID Subproject Director is a Registered Engineer, and his services may be utilized in monitoring and overseeing the construction program.

3. YARG

The Project Agreement will be signed with the Central Planning Office of the YARG, and the Ministry of Agriculture and Fisheries will be the implementing agency. Within the Ministry, the Divison of General Services and its Departments of Agriculture Extension, Plant Protection, and Horticulture will be the major action agents. Each of these departments will identify appropriate counterparts to work with CID's AID-funded technicians. Where counterparts are identified for long-term training in the U.S., the YARG will be encouraged to identify substitute or secondary counterparts to help insure smooth project operation and also to maximize the training that is provided by long-term HITS technicians. The counterpart for the HITS Team Leader will be the Director of the Department of Horticulture. He and the HITS Team Leader will work closely to effect the necessary level of cooperation between the co-equal departments, all of which will play critical roles in the project.

Construction: As noted above, the MAF and CID will sign the contract(s) for construction of facilities at the horticultural improvement stations. The purpose is to provide some legal protection to CID. The MAF will be solely responsible for arranging for construction of the access road to Jarouba and Al-Irra.

4. Other Donor and Agency Coordination

There are several donor and other agencies active in the fruit subsector in the YAR. Work is largely being done on a piecemeal basis. Annex O briefly outlines other donor and agency participation in the fruit subsector. In summary, they include:

- One previous AID project (279-0024)
- Confederation of Yemeni Development Associations

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[15] It is not clear exactly how many construction contracts will be negotiated as this depends upon the degree of mobility that local contractors will have in servicing project sites that are 250 km. apart, separated by very rugged terrain.

- Agricultural and Cooperative Credit Bank
- World Bank
- U.N. Food and Agriculture Organization
- United Arab Organization for Agriculture Development
- Local Development Associations
- Yemen Marketing Cooperative
- Tropical Products Institute
- FOODIC
- Federal Republic of Germany Plant Protection Project for Field Crops
- Japanese Rural Development (Nursery) Project
- Islamic Rural Development (Nursery) Project
- Private Business Sector (input suppliers and fruit merchants)

HITS, as proposed, will be the most comprehensive activity undertaken to institutionalize within the MAF a capacity to support increased fruit production. As such, promoting closer coordination among the various institutions that impact upon the fruit subsector is critical. The key strategy for accomplishing this objective is through participation in the existing informal horticultural advisory committee composed of various donors and key CID personnel. CID's AID-funded technicans will encourage an expansion of the activities of this committee and recommend consideration of more formal relations--if appropriate and when the effectiveness of current informal operations will not be hindered. Also, HITS and Core technicians will be able to encourage better coordination through the key high-level advisory positions they occupy in the MAF.

HITS staff will also work in close coordination with the recently approved Agricultural Research Development Project. The objective of this project is to help develop plans for coordination of all agricultural research in the YAR. This will be accomplished by working with the National Research Council and its various components.

5. Implementation

Following is a detailed plan of the proposed implementation schedule (also presented in Annex I).

Summary Implementation Plan

Time Frame	Place	Activity
	Jarouba	
Pre Implementation		Bud seedlings Develop irrigation system Reburbish student living quarters Build shade house Plant seedlings for '83 Thin banana plants and select best varieties Develop plan for station
	Al-Irra	
Pre Implementation		Develop plan for land use Level land Fence land Drill well Start development of irrigation system Plant windbreak
	Over-all program	
Pre Implementation		Training program on cultural practices all areas of Yemen for extension and nursery technicians Meet with MAF Hort advisors committee Draft seedling tree disbursement plan for 1982 Develop plan work for first year of project Development of HITS paper Project approval Grant agreement signed CID contract signed
First Year:		
Quarter	Jarouba	
		TDY - Plant protection Develop program Clean up disease, insects and index for viruses Construct staff houses Indepth training program started

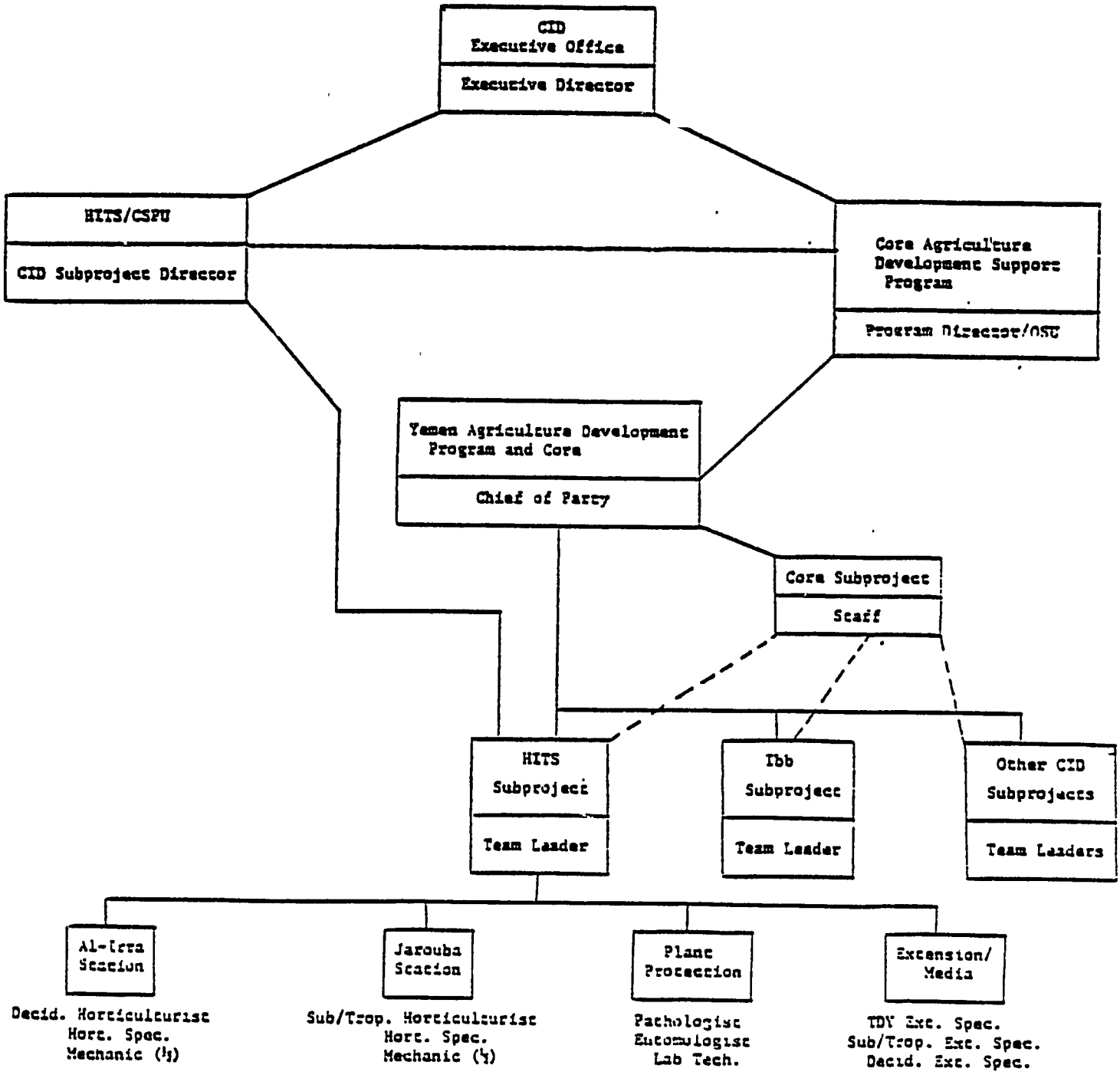
First Year (cont'd):

Quarter	
	Al-Irra
2	Construct - house
3	Classrooms, shop, lathe house
3	Complete irrigation system
3	Green house
3	Start tree planting
	Over-all
1	Extension TDY in place
	Start training program development first month of the year
1	All team members hired and and in place
	Counterparts assigned by MAF
1	Plant protection strategy developed
	Advisory Committee organized
1	Extension trainees identified
1	Short course session started first quarter
1	Plant Protection courses started first quarter
2	Short course trainees to U.S.
4	First annual HITS evaluation
4	First interns in place
4	Varietal testing at Al-Irra begins
4	First demonstration blocks at Al-Irra completed
4	Second annual work plan completed
4	MAF candidates for advanced degrees in horticulture and plant protection identified

Figure 6 presents the proposed personnel organizational plan to be used for implementing the HITS Subproject.

FIGURE 6

CID Organizational Plan



6. Covenants and Conditions

USAID/Yemen proposes three covenants for inclusion in the Project Agreement. The most important covenant is that the YARG/MAF undertake to implement and sustain implementation of the existing legislation concerning a plant protection program in the YAR. Implementation of this legislation is indeed critical to the success of HITS. The vastness of the countryside and the existence of a partially undefined border with Saudi Arabia will render this a difficult task. As noted above, the MAF has recently taken steps to implement this legislation, inter alia, in anticipation of the support that HITS will provide, i.e., five agricultural inspectors have been appointed. This is a major, but not sufficient, step which signals YARG intentions. A covenant will help to insure further progress along these lines.

Proposed legislation regarding plant chemicals has been developed and submitted to the legislature for ratification. While outside the MAF rubrick, the Ministry is expected to continue to encourage ratification. Furthermore, under HITS, the Ministry will be preparing itself for implementing the legislation pending ratification. For these reasons, USAID/Yemen is not proposing that the Project Agreement include a covenant relative to plant chemicals.

Additional covenants will be sought, but not included, in the project agreement. They relate to (a) installation by YARG of a telephone line to the Jarouba Station, providing a badly needed line of communication to other project staff; and (b) agreement that YARG will expedite the improvement of the road to the Jarouba Station. Both of these covenants are important in terms of the timely recruitment of qualified staff at Jarouba.

7. Evaluation Plan

USAID/Yemen policy requires that all projects be evaluated periodically during implementation in terms of their effectiveness, efficiency, and significance in contributing to accomplishment of the project purpose. In accordance with this policy, the HITS Project will be reviewed annually. An internal CID assessment will be conducted at the end of Year 1 and every other year thereafter (Years 1, 3, 5, and 7). An external evaluation is proposed for Year 2 and every other year thereafter (Years 2, 4, and 6). The external evaluation at the end of year 6 will, in effect, constitute the end-of-project evaluation. The internal CID assessment in Year 7 will constitute CID's closeout report.

Internal CID assessments will be collaborative, involving MAF, USAID, and CID. Key CID staff will participate, with assistance, from CPSU and the CID Executive Office, as appropriate. External evaluations will be organized by USAID/Yemen and funded by HITS. They will be conducted by a combination of AID/Washington and external consultants, and will involve at least one CID representative as a resource person. External evaluations will review problems and progress of the past 2 years, building on the information documented by the last CID internal assessment. These evaluations will focus on accomplishment toward achievement of the project purpose. Timing of these evaluations will likewise facilitate development of the Work Plan for the subsequent year.

Key criteria for all of the above will include, but not be limited to:

- The number and effectiveness of demonstration programs/work-shops/media spots conducted for small-scale farmers though the media outreach program, at HITS stations, and in villages by extension agents;

- Sales of improved, disease-free nursery stock to farmers by farm size;

- Numbers of extension agents, agricultural technicians, nurserymen trained at existing facilities or HITS Stations;

- Quantitative and qualitative progress in implementing the Plant Protection Program, including MAF effectiveness in implementing plant protection legislation;

- Programmed efforts to improve coordination among the various agencies and other donors involved in the fruit subsector;

- Experience in identifying improved fruit varieties in pest/disease free condition;

- Production costs and revenues of HITS Stations and nurseries;

- Progress in implementing project data collection and analysis program; and

- Progress of participant training programs.

To facilitate the evaluation plan, each long-term technical expert will, in close consultation with the Team Leader and his counterpart, develop an appropriate data collection strategy whereby key progress indicators may be monitored. Agreement on what constitutes key indicators for each project element will be reached during consultation.

Funding for the external evaluation plan is included in the budget for up to four persons for a total of 120 working days ($66,600). Relative to the cost of the HITS Project and importance of the data to be generated in the team reports, this is a small amount.

8. Procurement

Most of the procurement will be from the United States. However, several items will be purchased off the shelf in the YAR. The origin of these items will probably be Italy, the United States, France, and Japan. A small amount may originate in Saudi Arabia. As a result, the project proposes to secure a source/origin waiver from Code 000 (U.S. only) to Code 941 (Special Free World). A waiver, including detailed justification, will be prepared early during project implementation seeking approval to procure about $190,000 in equipment and supplies from Code 941 countries. (See Annex F for a draft waiver.)

BY THE YEMEN GOVERNMENT WITH SUFFICIENT TECHNICALLY TRAINED PERSONNEL AT THE STATION AND IN SUPPORT POSITIONS AT THE PROVINCE AND NATIONAL LEVEL. THE SHIFT OF ADMINISTRATIVE, AND TECHNICAL RESPONSIBILITY FROM USAID/CID TO THE YARG WILL GRADUALLY INCREASE OVER THE NEXT THREE TO FIVE YEARS. WE WANT TO TRANSFER THE STATION TO THE YARG AGENCY WHICH WILL HAVE THE BEST CAPABILITY TO OPERATE THE STATION, WHETHER IT BE THE TIHAMA DEVELOPMENT AUTHORITY OR THE MINISTRY OF AGRICULTURE. THE TIHAMA DEVELOPMENT AUTHORITY IS UNDER THE MINISTRY OF AGRICULTURE AND THEREFORE WE SEE THIS AS LARGELY AN INTERNAL YARG/MOA DECISION. IT SHOULD ALSO BE NOTED THAT UP TO THIS DATE THE TDA HAS NOT OPERATED ANY HORTICULTURE NURSERIES WHEREAS THE MINISTRY OF AGRICULTURE OPERATES EIGHT FRUIT TREE NURSERIES, NOT INCLUDING AL IRRA, AS WELL AS FOUR FORESTRY SEEDLING NURSERIES. TWO OF THE MOA FRUIT TREE NURSERIES AND ONE FORESTRY NURSERY ARE IN THE TIHAMA. THE JAROUBA STATION IS LOCATED ON LAND OWNED BY THE MINISTRY OF AGRICULTURE. SINCE THE BEGINNING OF STATION DEVELOPMENT AT JAROUBA IN 1977/78 THE MINISTRY OF AGRICULTURE WITH USAID ASSISTANCE HAS BEEN THE IMPLEMENTING AGENCY. REGARDLESS OF WHETHER THE MINISTRY OF AGRICULTURE OR THE TDA EVENTUALLY ASSUMES ALL RESPONSIBILITY FOR OPERATING THE JAROUBA STATION WE WOULD PREFER TO SEE FULL COOPERATION OF BOTH INSTITUTIONS IN SUPPORTING NOT ONLY JAROUBA BUT ALL AGRICULTURE

ACTIVITIES IN THE TIHAMA RATHER THAN AN EITHER OR SITUATION..

8. WE FEEL THAT IT IS IMPORTANT FOR THE MOA TO DEVELOP ITS INSTITUTIONAL CAPACITY TO SUPPORT ALL SEGMENTS (GROWERS, EXTENSION AGENTS, NURSERIES, ETC.) OF THE FRUIT INDUSTRY A STRENGTHENED MOA CAPACITY IN HORTICULTURE SHOULD HELP THEM GUIDE THE ENTIRE FRUIT PRODUCTION SUBSECTOR WITH A RESULTING INCREASE IN YEMEN'S FRUIT PRODUCTION. THE INCREASED PRODUCTION CAN BE ATTAINED THROUGH UTILIZATION OF IMPROVED CULTURAL PRACTICES, INTRODUCTION OF IMPROVED VARIETIES, AND IMPLEMENTATION OF AN EFFECTIVE PLANT PROTECTION PROGRAM. THE FOCUS OF THIS PROPOSED HORTICULTURE PROJECT HAS SHIFTED AWAY FROMX A CONCENTRATION ON SEEDLING PRODUCTION BECAUSE OF THE RECENT PROLIFERATION OF NURSERIES IN YEMEN. THE PROJECT WILL CONCENTRATE INSTEAD ON: X 1) DEVELOPMENT OF MOA INSTITUTIONAL CAPACITY, 2) DEVELOPMENT OF A TRAINING PROGRAM FOR FARMERS AND EXTENSION AGENTS, 3) IMPROVEMENT OF CULTURAL PRACTICES THROUGH RESEARCH AND DEMONSTRATIONS AT THE AL IRRA AND JAROUBA STATIONS, AND 4) COOPERATIVE PARTICIPATION IN DEVELOPMENT OF AN EFFECTIVE PLANT PROTECTION PROGRAM.

ZWEIFEL

ANNEX B

Project Checklist

PROJECT CHECKLIST

HORTICULTURE SUBPROJECT
(279-0052)

NOTE: Listed below are statutory criteria applicable generally to projects with FAA funds and project criteria applicable to individual fund sources: Development Assistance (with a subcategory for criteria applicable only to loans); and Economic Support Fund.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE?
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 79 App. Act Unnumbered; FAA Sec. 653 (b); Sec. 634A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure)?

The Horticulture Subproject to the Agriculture Development Support Project has been discussed in USAID/Yemen's 1983 Congressional Presentation, Country Development Strategy Statement (CDSS) and the Annual Budget Submission (ABS).

2. FAA Sec. 611(a) (1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost of the U.S. of the assistance?

a. Yes; b. Yes.

All plans will be articulated prior to project authorization and funding.

3. FAA Sec. 611(a) (2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

USAID/Yemen and the implementing agent will closely monitor project developments and keep AID/W informed.

4. FAA Sec. 611(b); FY 79 App. Act Sec. 101. If for water or water-related land resource construction, has project met the standards for planning Water and Related Land Resources dated October 25, 1973?

Not applicable.

5. FAA Sec. 611(e). If project is capital assistance (e.g. construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?

Not applicable.

6. FAA Sec. 209. Is project susceptible of execution as part of regional or multi-country project? If not why is project not so designed? Information and conclusion whether assistance will encourage regional development programs.

Not so designed. Upon subproject completion YARG may wish to expand project activities by developing a regional development program with other area countries.

7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

a. Yes
b. Yes
c. Yes
d. Yes
e. Yes

IOPS is designed so that the YARG will be less dependant on outside food sources and foster greater agricultur independence.

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

U.S. developed technology and equipment is a major component of this project.

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

Negotiation with the YARG has elicited high level support for this project. Specific YARG inputs in the form of land, salaries construction of a road and the provision of local labor have been identified.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?

No.

11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes.

12. FY 79 App. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely

No. The project basically provides for satisfying internal needs.

to cause substantial injury to U.S. producers of the same, similar, or competing commodity?

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); 111; 113; 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

a. Project will help all levels of the population increase food production as well as monies from the sale of produce with an emphasis toward small farmers.

b. Higher yielding crops will produce more income and better nutrition.

c. Farmers will be able to purchase quality seedlings at reasonable costs.

d. Women, who constitute a major resource will benefit from increased health as well as for infant children through increased yields in production of produce.

e. Project will provide detailed information for similar climates as well as quality seedlings capable of growth in parts of the region.

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.)

Funding is grant to the YARG.

(1) (103) for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; (103A) if for agricultural research, is full account taken of needs of small farmers;

Project purpose is to institutionalize a capacity to support increased fruit production. Increased production is an indirect result of the project.

(2) (104) for population planning under sec. 104(b) or health under sec. 104(c): if so, extent to which activity emphasizes low-cost, integrated delivery systems for health, nutrition and family

Not applicable.

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planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

(3) (105) for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

Training will be provided at the degree and non-degree levels. Further individual poor farmers will benefit from new agricultural practices.

(4) (106) for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

Research will aid in continued refinement of produce varieties.

(i) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

(ii) to help alleviate energy problems;

Not applicable.

(iii) research into, and evaluation of, economic development processes and techniques;

Project will help Yemeni farmers become more financially independent and the YARC from substantial produce importation.

(iv) reconstruction after natural or manmade disaster;

(v) for special development problems, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

This project builds on an earlier successful USAID horticulture project.

(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

Small enterprises will benefit from better quality of produce to sell as well as a more consistent produce availability.

c. (107) Is appropriate effort placed on use of appropriate technology?	Yes.
d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?	Yes.
e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to the Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?	Yes, Horticulture development is a major long-term program.
f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental and political processes essential to self-government.	Components of the project support training at all levels, development of the MOA capabilities to manage agriculture resources and aid the most distressed farmer produce better crops by which to feed himself, family and generate a higher standard of living.
g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase or productive capacities and selfsustaining economic growth?	Yes.
2. Development Assistance Project Criteria (Loans Only)	
a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects.	Not applicable.
b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?	Not applicable.

3. Project Criteria Solely for Economic Support Fund.

a. FAA Sec. 531(a). Will this assistance support promote economic or political stability? To the extent possible, does it reflect the policy directions of section 102?

Yes. The Horticulture project is designed so that the YARG will, over time, be less dependent on foreign sources for fruits and vegetables, in turn improving its foreign trade.

b. FAA Sec. 533. Will assistance under this chapter be used for military, or paramilitary activities?

No.

ANNEX C

Logical Framework

ANNEX C

LOGICAL FRAMEWORK

Agricultural Development Support Program (279-0052)

Horticulture Improvement and Training Subproject (HITS)

NARRATIVE SUMMARY	OBJECTIVELY VERIFICABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
GOAL: To increase rural incomes in the YAR through agriculture development. SUBGOAL: To increase the quantity, quality and diversity of fruits produced in the YAR.	SUBGOAL: (1) Increase in number the new fruit growers and expansion of production by existing growers. (2) Increase in tree survival rates. (3) Improved vigor and yield of of trees. (4) Increased demand for stock by nurseries.	(1) Evaluation of sample of fruit growers over the life of the project. (2) Review of nursery records. (3) Review of fruit import/export data.	(1) YARG maintains appropriate fruit pricing policy. (2) Fruit production remains important economic activity in the YAR. (3) Farmers willing to allocate more land to fruit production and have access to requisite capital and other inputs. (4) Marketing channels will expand to handle increased population.
PROJECT PURPOSE: To institutionalize within the MAF an expanded capacity to support increased fruit production through extension, plant protection, and the delivery of disease-free stock of improved fruit varieties to the fruit subsector.	PURPOSE (End of Project Status): (1) Operational horticulture improvement stations providing 50,000 buds to nurseries annually and developing improved varieties. (2) Functional MAF plant protection program monitoring nurseries to ensure production and sales of insect/disease-free trees to farmers. (3) Functional extension program servicing farmers for expanding fruit production. (4) Increased sales of nursery stock to farmers.	PURPOSE: (1) Review of records at horticulture improvement stations and nurseries. (2) Evaluation of PPD. (3) Evaluation of sample of fruit growers. (4) Review of records extension agents. (5) Evaluation of extension information produced; review of records re: distribution of information.	PURPOSE: (1) YARG remains committed to increasing fruit production. (2) Trained persons remain employed in respective positions. (3) YARG remains committed to enforcing plant protection laws. (4) Farmers willing to adopt improved farm practices and fruit varieties.
OUTPUTS: (1) Establishment of horticulture training and improvement station. (2) Expanded plant protection department trained in plant protection methods. (3) Trained extension agents, horticulture specialists, horticulture technicians, agricultural inspectors, nurserymen. (4) Expanded horticulture information production and distribution program for farmers, nurserymen and private horticulture input suppliers.	MAGNITUDE OF OUTPUTS: (1) Two-stations (2) One department (3) 250 extension agents 200 specialists 10 technicians 5 inspectors 10 nurserymen (4) Three programs	OUTPUTS: (1) Review of MAF records. (2) Physical inspection. (3) Evaluation of station records.	OUTPUTS (1) Appropriate persons will be available for training and in timely manner. (2) Improved varieties can be adaptable in the YAR. (3) Timely provision of construction/engineering services.

LOGICAL FRAMEWORK

NARRATIVE SUMMARY	OBJECTIVELY VERIFICABLE INDICTORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
(5) Developed improved fruit varieties in insect/disease-free condition. (6) Farmer demonstration program and workshops.	(5) Not limited. (6) Minimum of ten.	(1) Project Records	(1) Farmers willing to participate in demonstration programs.
INPUTS USAID: (1) Technical Assistance (2) Participant Training (3) Commodities (4) Construction Building (5) Other Costs YARG: (6) Counterparts (7) Participants (8) Land for project sites (9) Construction (road) (10) Local labor	MAGNITUDE OF INPUTS: USAID: (1) $) (2) $) (3) $) $14 Million (4) $) (See Annex G for (5) $) details) YARG: (6) $) (7) $) (8) $) $ 4 Million (9) $) (See Annex G for (10) $) details. Also see Section IV.D)	INPUTS: (1) USAID/YARG records (2) Drawdown on CID work plan budgets	INPUTS: (1) YARG identifies counterparts (2) Timely availability of funds/ TDY support

ANNEX D

Environmental Concerns

ANNEX D

Environment Concerns

The HITS project is directed primarily toward:

(1) Establishing two horticultural training and improvement (Research) stations;

(2) Expanding the plant protection department and training in plant protection methods;

(3) Training extensive agents, specialists, etc., in fruit production and tree culture management; and

(4) Expanding horticulture information, production, and distrubition program for farmers.

Of these activities mentioned above, the demonstration and use of pesticides in the operation and management of the (Research) stations is the only activity with direct environmental concerns. The expansion of the plant protection program program and associated training will have indirect positive effects upon the use of pesticides and fungicides in Yemen.

No Environmental Protection Agency (EPA) banned pesticide will be used on these stations or recommended for use outside of the stations during the life of the project. When EPA approved pesticides are used on the stations, they will be used in accordance with EPA and USDA guidelines. The use of these approved insecticides will be for the purpose of demonstrating proper management for improving fruit production and for training personnel in effective, safe use of pesticides.

In conclusion, because HITS stations will engage in "Research activities which may have an effect on the physical and natural environment but will not have a significant effect as a result of limited scope, carefully controlled nature and effective monitoring" as defined in Reg. 16, 216.C (1) (iii), no environmental assessment is needed for this project.

The above material was thoroughly discussed with the regional AID engineer, Mr. Jim Kasanos, who assisted in arriving at the conclusion noted above.

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ANNEX E

Mission Director's Certification

AGENCY for INTERNATIONAL DEVELOPMENT
UNITED STATES AID MISSION TO YEMEN ARAB REPUBLIC
الولايات المتحده الامريكيه بعثة وكالة التنميه الدوليه الى الجمهوريه العربيه اليمنيه

USA Address
SANAA (USAID)
Department Of State
Washington, D.C. 20520

International adress:
USAID
P. O. Box 1088
Sanaa, Y. A. R.

ص.ب ١٠٨٨
صنعاء - اليمن

CERTIFICATION PURSUANT TO SECTION 611(e) OF THE FOREIGN ASSISTANCE ACT OF 1961 AS AMENDED

I, C.F. Weden, Acting principal officer of the Agency for International Development in the Yemen Arab Republic, having taken into account, among other things, the maintenance and utilization of projects in the Y.A.R., previously financed or assisted by the United States, do hereby certify that in my judgment the Yemen Arab Republic has both the financial capability and the human resources capability to maintain and to utilize effectively the facilities to be assisted under the grant to the Agricultural Development Support Program (Project 279-0052), Horticulcure Subproject.

C. F. Weden
Acting Director

8/24/82
Date

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ANNEX F

Source - Origin Procurement Waiver

ANNEX F

Source-Origin Procurement Waiver

Draft Action Memorandum for the Director
Office of Commodity Management

Through: Ms. Antoinette Ford, AA/NE

From: Charles Ward, Mission Director, USAID/Yemen

Subject: Request for Procurement Source/Origin Waiver from Geographic Code 000 (U.S. only) to Geographic Code 941 (special free world)

a.	Cooperating Country:	Yemen Arab Republic
b.	Authorizing Document:	Project Approval Memo Horticulture Improvement and Training Subproject (279-0052)
c.	Nature of Funding:	Grant Dollars and Yemeni Rials
d.	Description of Commodities and Approximate Values:	See Attachment
e.	Origin:	Italy, U.K., France, Japan, Saudi Arabia
f.	Probable Source:	Yemen Arab Republic

Discussion: The Horticulture Improvement and Training Subproject will institutionalize within the Yemen Ministry of Agriculture and Fisheries a capability to support increased production of fruit. The project will include the establishment of two (2) horticulture stations in rural areas. A proportion of the equipment for these stations will be purchased off shelf in Yemen but will have originated in the U.K., Italy, France or Japan. The need for non-U.S. equipment is based on the general availability of spare parts in Yemen for certain kinds of equipment. Furthermore, all of the equipment proposed for off-shelf purchase will be used in demonstrations to nurserymen, extension agents and farmers. The purpose of the project can only be facilitated economically by using equipment that is readily available in country and for which Yemeni are already familiar with maintenance requirements.

Some of the materials to be purchased by a local construction contractor for facility erection will, likewise, be from European or Saudi Arabian origin. These items, such as steel reinforcement bars, are readily available in country.

Recommendation: That you approve a source-origin waiver for the Horticulture Improvement and Training Subproject from Code 000 (U.S. only) to Code 941 (Special Free World) for procurement of items listed in the Attachment to this memorandum.

Approved _____

Disapproved _____

Date _____

Attachment: a/s

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ANNEX F

Attachment

Procurement from Code 941 Origin

Item	Est. Cost ($)
Orchard spraying equipment	$ 7,000
Two (2) Purcelli pumps and 88 HP Perkins Motor	75,164
Furnishings and Office Equipment	12,000
Valves, 24 6" Low Pressure Valves	1,440
Pressure Pump and Motor for Sprinkler Drip System	12,000
Two (2) Storage Tanks, 2,000 Gallon Capacity	12,000
Two (2) Small Orchard Diesel Tractor and Accessories	48,000
Spray Equipment	7,000
Two (2) Diesel Rototillers	7,200
Miscellaneous Equipment	5,000
TOTAL:	$186,804
ROUNDED:	$190,000

Construction

Basic materials for construction will be from Yemen. However, some, e.g., reinforcing steel and other steel used in construction, will be purchased by the construction contractor off-shelf but from European or Saudi Arabian sources. An estimate of this procurement has not been made since some of the buildings funded by this project will be prefab and others locally constructed. A firm decision on the split will be made during project implementation.

ANNEX G

Detailed Financial Plan

ANNEX G

List of Tables

Total Budget Summary	G-1
AID Summary Dollar Budget	G-2
AID Summary Local Currency Budget	G-3
Detailed Financial Plan	G-4
AID Dollar Budget	G-4
AID Local Currency Budget	G-10
YARG Contribution	G-17

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HITS

TOTAL BUDGET SUMMARY

($000)

YEAR

	1	2	3	4	5	6	7	TOTAL
DOLLAR BUDGET SUMMARY (AID								
Actual Cost	1943.7	1405.8	1146.1	1084.0	879.1	726.0	483.2	7667.
5% Contingency[a]	0.0	70.3	57.3	54.2	44.0	36.3	24.2	286.3
Subtotal	1943.7	1476.1	1204.0	1138.8	923.1	762.3	507.4	7955.4
Inflation (10% comp.)[b]	0.0	140.5	240.7	358.8	408.0	443.2	372.8	1964.0
Total (AID)	1943.7	1616.6	1444.1	1497.0	1331.1	1205.5	880.2	9918.2
LOCAL BUDGET SUMMARY								
Actual Cost	1417.7	456.4	364.1	311.9	218.7	191.4	196.4	3156.6
5% Contingency	0.0	22.8	18.2	15.6	10.9	9.6	9.8	86.9
Subtotal	1417.7	479.2	382.3	327.5	229.6	201.0	206.2	3243.5
Inflation (10% comp.)	0.0	45.7	76.5	103.2	101.5	116.8	151.5	595.2
Total	1417.7	524.9	458.8	430.7	331.1	317.8	357.7	3838.7
AID TOTAL BUDGET[c]	3361.4	2141.5	1902.9	1927.7	1662.2	1523.3	1237.9	13756.9
YARG TOTAL BUDGET IN $$$	1604.8	330.0	372.3	394.3	513.6	483.4	519.4	4217.8
GRAND TOTAL AID & YARG[d]	4966.2	2471.5	2275.2	2322.0	2175.8	2006.7	1757.3	17974.7

a/ Contingency not included in year 1.

b/ Inflation not factored on contingency.

c/ Includes $479,739 of pre-implementation costs through October 31, 1982 - an anticipated date for the HITS reaching full project status.

d/ Marginal differences between summary and detail budget tables result from rounding.

AID

SUMMARY DOLLAR BUDGET

($000)

YEAR

		1	2	3	4	5	6	7	TOTAL
I.	Salaries	450.0	438.4	309.9	307.2	211.3	211.3	220.3	[illegible]8.4
II.	Indirect Cost	286.9	278.6	190.4	194.7	130.0	124.9	134.1	1339.6
III.	Consultant Fees	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IV.	Allowances	244.2	241.2	157.5	154.5	97.1	94.1	94.1	1082.7
V.	Travel & Transportation	340.9	69.7	56.4	40.9	45.2	16.0	25.2	594.3
VI.	Expendable Equipment & Supplies	38.5	28.5	24.5	23.5	22.5	15.5	9.5	162.5
VII.	Non-Expendable Equipment & Supplies	543.2	43.0	65.0	12.0	53.0	5.0	0.0	721.2
VIII.	Participant Training	40.0	306.4	342.4	351.2	320.0	259.2	0.0	1619.2
	Total Dollar Budget	1943.7	1405.8	1146.1	1084.0	879.1	726.0	483.2	7667.9

AID

SUMMARY LOCAL CURRENCY

($000)

YEAR

		1	2	3	4	5	6	7	TOTAL
I.	Salaries	89.9	89.9	89.9	61.7	33.5	33.5	33.5	431.9
II.	Operations	263.0	278.0	178.0	188.0	122.0	122.0	128.0	1279.0
III.	Travel and Per diem	4 .6	4 .6	34.2	34.2	31.2	18.9	18.9	228.6
IV.	Training	41.0	1.0	21.0	0.0	10.0	0.0	0.0	73.0
V.	Expendable Equipment and Materials	29.0	29.0	23.0	18.0	13.0	10.0	9.0	131.0
VI.	Nonexpendable Equipment and Materials	941.2	5.0	10.0	2.0	1.0	0.0	0.0	959.2
VII.	Other Direct Costs	8.0	8.0	8.0	8.0	8.0	7.0	7.0	54.0
	Subtotal	1417.7	456.5	364 .1	311 .9	218.7	191.4	196.4	3156

Detailed Financial Plan

HITS

AID Dollar Budget

($000)

YEAR

	1	2	3	4	5	6	7	TOTAL
I. SALARIES & WAGES								
A. On Campus								
1. Home Office								
Subproject director, 0.5 FTE	22.0	22.0	22.0	22.0	22.0	22.0	22.0	154.0
Secretary, 0.5 FTE	7.0	7.0	7.0	7.0	7.0	7.0	7.0	49.0
Technical Consultant, 0.25 FTE	10.0	10.0	10.0	10.0	10.0	10.0	10.0	70.0
2. TDY Consultants, months, $175/work day	18.2	2.1	9.1	0.0	0.0	0.0	0.0	29.4
Evaluation team (4) 10 days each	0.0	7.0	0.0	7.0	0.0	0.0	7.0	21.0
Subtotal	57.2	48.1	48.1	46.0	39.0	39.0	46.0	323.4
B. Off Campus								
Deciduous Horticulturist, 1.0 FTE	42.0	42.0	42.0	42.0	42.0	42.0	42.0	294.0
Tropical-subtropical Horticulturist, 1.0 FTE	42.0	42.0	42.0	42.0	42.0	42.0	42.0	294.0
Plant Pathologist 1.0 FTE	44.0	44.0	44.0	44.0	44.0	44.0	44.0	308.0
Entomologist, 1.0 FTE	44.0	44.0	44.0	44.0	0.0	0.0	0.0	176.0
Lab Technician, 1.0 FTE	22.0	22.0	0.0	0.0	0.0	0.0	0.0	44.0
Agriculture Extensionist (2), 1.0 FTE x 2 = 2.0 FTE	80.0	80.0	0.0	0.0	0.0	0.0	0.0	160.0
Mechanic	25.0	25.0	25.0	25.0	0.0	0.0	0.0	100.0
Subtotal	299.0	299.0	197.0	197.0	128.0	128.0	128.0	1376.0

Detailed Financial Plan (Cont.)

($000)

YEAR

		1	2	3	4	5	6	7	TOTAL
	C. Fringe Benefits								
	1. On campus (28.2% of A)	16.1	13.6	13.6	13.0	11.0	11.0	13.0	91.3
	2. Off Campus (26% of B)	77.7	77.7	51.2	51.2	33.3	33.3	33.3	357.7
	Subtotal	93.8	91.3	64.8	64.2	44.3	44.3	46.3	449.0
	SUBTOTAL (Salaries & Wages)	450.0	438.4	309.0	307.2	211.3	211.3	220.3	2148.4
II.	INDIRECT COST								
	A. On Campus (43%)	102.7	95.7	68.8	72.4	50.8	46.5	54.3	491.2
	B. Off Campus (24%)	123.8	123.8	81.6	81.6	52.3	52.3	52.3	567.7
	C. CID G&A (8%)	60.4	59.1	40.0	40.7	26.9	26.1	27.5	280.7
	Subtotal	286.9	278.6	190.4	194.7	130.0	124.9	134.1	1339.6
III.	CONSULTANT FEES	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IV.	ALLOWANCES								
	A. Post Differential (25%)	74.8	74.8	49.3	49.3	32.0	32.0	32.0	344.2
	B. Cost of Living (6%) est.	17.9	17.9	11.8	11.8	7.7	7.7	7.7	82.5
	C. Sunday Pay Differential (5%)	15.0	15.0	9.9	9.9	6.4	6.4	6.4	69.0
	D. Educational Allowance	31.5	31.5	21.0	21.0	10.5	10.5	10.5	136.5
	6 two-years - 4 two-years 2 three-years @ 5250 each								
	E. Move-In, Move-out Expense	90.0	90.0	55.0	55.0	33.0	33.0	33.0	389.0
	F. Storage $1500/family	12.0	12.0	7.5	7.5	4.5	4.5	4.5	52.5
	G. Temporary Living Allowance	3.0	0.0	3.0	0.0	3.0	0.0	0.0	9.0
	Subtotal	244.2	241.2	157.5	154.5	97.1	94.1	94.1	1082.7

Detailed Financial Plan (Cont.)

($000)

YEAR

	1	2	3	4	5	6	7	TOTAL
V. TRAVEL AND TRANSPORTATION								
A. Per Diem								
1. Domestic ($75/day); 70 days tech TDY	.75	.75	.75	.75	.75	.75	.75	5.25
2. International (130/day) 240 days tech TDY	11.7	7.8	3.9	3.9	1.3	1.3	1.3	31.2
10 days Evaluation TDY team (4)	0.0	5.2	0.0	5.2	0.0	0.0	5.2	15.6
B. Travel								
1. Domestic ($500/trip)	2.0	1.5	1.0	1.0	.5	.5	.5	7.0
2. International (10 trips tech assistants) $2500/trip	7.5	5.0	2.5	2.5	2.5	2.5	2.5	25.0
Evaluation Teams (4)	0.0	10.0	0.0	10.0	0.0	0.0	10.0	30.0
C. Transportation (55% of cost)								
1. Commodities	290.5	37.4	46.2	16.5	29.2	9.9	3.9	433.6
2. Household Goods	26.4	0.0	0.0	0.0	9.9	0.0	0.0	36.3
3. Mail Pouch Services	2.0	2.0	2.0	1.0	1.0	1.0	1.0	10.0
Subtotal (Rounded)	340.9	69.7	56.4	40.9	45.2	16.0	25.2	594.3

Detailed Financial Plan (Cont.)

($000)

YEAR

VI. EXPENDABLE EQUIPMENT & SUPPLIES

	1	2	3	4	5	6	7	TOTAL
A. On Campus								
1. Office Supplies & Equipment	2.5	2.5	2.5	2.5	2.5	2.5	2.5	17.5
B. Off Campus								
1. Office Supplies	5.0	5.0	5.0	5.0	5.0	5.0	5.0	35.0
2. Farm Supplies	20.0	10.0	10.0	10.0	10.0	5.0	0.0	65.0
3. Teaching Materials	5.0	5.0	1.0	1.0	1.0	1.0	1.0	15.0
4. Printing	1.0	1.0	1.0	1.0	1.0	0.0	0.0	5.0
5. Miscellaneous Supplies	5.0	5.0	5.0	4.0	3.0	2.0	1.0	25.0
SUBTOTAL	38.5	28.5	24.5	23.5	22.5	15.5	9.5	162.5

Detailed Financial Plan (Cont.)

($000)

YEAR

	1	2	3	4	5	6	7	TOTAL
VII. NON EXPENDABLE EQUIPMENT & MATERIALS								
A. On Campus	2.0	2.0	2.0	2.0	0.0	0.0	0.0	8.0
B. Off Campus								
1. Vehicles	45.0	0.0	45.0	0.0	30.0	0.0	0.0	120.0
2. Household Goods	48.0	0.0	0.0	0.0	18.0	0.0	0.0	66.0
3. Equipment								
Al-Irra	120.0	20.0	10.0	5.0	5.0	5.0	0.0	165.0
Jaruba	298.2	10.0	5.0	0.0	0.0	0.0	0.0	313.2
Office	5.0	1.0	1.0	3.0	0.0	0.0	0.0	10.0
Lab Plant Protection	25.0	10.0	2.0	2.0	0.0	0.0	0.0	39.0
SUBTOTAL	543.2	43.0	65.0	12.0	53.0	5.0	0.0	721.2

Detailed Financial Plan (Cont.)

($000)

YEAR

VIII. PARTICIPANT TRAINING	1	2	3	4	5	6	7	TOTAL
A. Degree								
1. Horticulture								
B.S. (5)	0.0	111.0	126.0	138.0	150.0	162.0	0.0	687.0
M.S. (1)	0.0	22.2	25.2	27.6	0.0	0.0	0.0	85.0
Ph.D. (1)	0.0	22.2	25.2	27.6	30.0	0.0	0.0	105.0
2. Plant Protections								
B.S. (3)	0.0	66.6	75.6	82.8	90.0	97.2	0.0	412.2
M.S. (1)	0.0	22.2	25.2	27.6	0.0	0.0	0.0	75.0
Ph.D. (1)	0.0	22.2	25.2	27.6	30.0	0.0	0.0	105.0
Subtotal	0.0	266.4	312.4	331.2	300.0	259.2	0.0	1459.0
B. Short Courses U.S.A								
Horticulture (3) 6 mo/each	18.0	18.0	18.0	0.0	0.0	0.0	0.0	54.0
Plant Protection (5) 6 mo/each	18.0	18.0	18.0	18.0	18.0	0.0	0.0	90.0
Travel @ $2,000	4.0	4.0	4.0	2.0	2.0	0.0	0.0	16.0
Subtotal	40.0	40.0	40.0	20.0	20.0	0.0	0.0	160.0
Subtotal (Participant Training)	40.0	306.4	342.4	351.2	320.0	259.2	0.0	1619.2
TOTAL	1943.7	1405.8	1146.1	1084.0	879.1	726.0	483.2	7667.9

AID LOCAL CURRENCY BUDGET FOR HITS

($000)

YEAR

	1	2	3	4	5	6	7	TOTAL
I. SALARIES & WAGES								
A. Office	7.5	7.5	7.5	7.5	7.5	7.5	7.5	52.5
Sec. 0.5 FTE, Translator 05 FTE	7.5	7.5	7.5	7.5	7.5	7.5	7.5	52.5
B. Motorpool & Warehouse Drivers (1)	11.2	11.2	11.2	11.2	11.2	11.2	11.2	78.4
C. Technicians								
1 Tech 3 yrs @ 22,000	22.0	22.0	22.0	0.0	0.0	0.0	0.0	66.0
1 Tech 4 yrs	22.0	22.0	22.0	22.0	0.0	0.0	0.0	88.0
Merit (1%)								
General Increase (10%)								
Ramadan Bonus (8.5%)								
Severance (8.5%)	19.7	19.7	19.7	13.5	7.3	7.3	7.3	94.5
Subtotal	89.9	89.9	89.9	61.7	33.5	33.5	33.5	431.9
II. OPERATIONS								
A. Office								
1. Utilities	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0
2. Communications	3.0	3.0	3.0	3.0	3.0	3.0	3.0	21.0
3. Rent	4.0	4.0	4.0	4.0	4.0	4.0	4.0	28.0
4. Maintenance	1.5	1.5	1.5	1.5	1.5	1.5	1.5	10.5

AID LOCAL CURRENCY BUDGET FOR HITS (Cont.)

($000)

YEAR

	1	2	3	4	5	6	7	TOTAL
5. Printing	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0
6. Bonds	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	10.5	10.5	10.5	10.5	10.5	10.5	10.5	73.5
B. Vehicles								
1. Gasoline & Oil	20.0	20.0	20.0	20.0	20.0	20.0	20.0	140.0
2. Insurance & License	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0
3. Spare Parts & Tires	3.0	3.0	3.0	3.0	3.0	3.0	3.0	21.0
4. Outside Service	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0
Subtotal	25.0	25.0	25.0	25.0	25.0	25.0	25.0	175.0
C. HOUSING								
1. Rent	200.0	200.0	125.0	125.0	75.0	75.0	75.0	875.0
2. Utilities	16.0	16.0	10.0	10.0	6.0	6.0	6.0	70.0
3. Maintenance	8.0	8.0	5.0	5.0	3.0	3.0	3.0	35.0
4. Retro Fitting $2000/house	0.0	16.0	0.0	10.0	0.0	0.0	6.0	32.0
Subtotal	224.0	240.0	140.0	150.0	84.0	84.0	90.0	1012.0

AID LOCAL CURRENCY BUDGET FOR HITS (Cont.)

($000)

YEAR

D. Warehouse	1	2	3	4	5	6	7	TOTAL
1. Small Tanks & maint.	2.0	1.0	1.0	1.0	1.0	1.0	1.0	9.0
2. Road & Yard	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0
3. Lighting - Compound	.5	.5	.5	.5	.5	.5	.5	3.5
Subtotal	3.5	2.5	2.5	2.5	2.5	2.5	2.5	18.5
SUBTOTAL (Operations)	263.0	278.0	178.0	188.0	122.0	122.0	128.0	1279.0

AID LOCAL CURRENCY BUDGET FOR HITS (Cont.)

($000)

YEAR

	1	2	3	4	5	6	7	TOTAL
III. TRAVEL PER DIEM								
A. Travel								
1. Domestic Hort. Specialist	0.5	0.5	0.5	0.5	0.5	0.5	0.5	3.5
2. International Hort. Specialist	2.5	2.5	2.5	2.5	2.5	2.5	2.5	17.5
B. Per Diem								
1. Domestic (120/day)	19.2	19.2	12.0	12.0	12.0	7.2	7.2	88.8
2. International (@ 96/day) Hort. Specialist 7 days	0.7	0.7	0.7	0.7	0.7	0.7	0.7	4.9
C. R & R								
@ 1,670/person	16.7	16.7	12.5	12.5	12.5	5.0	5.0	80.9
D. Evacuations (medical) 2 @ 3,000	6.0	6.0	6.0	6.0	3.0	3.0	3.0	33.0
Subtotal	45.6	45.6	34.2	34.2	31.2	18.9	18.9	228.60

AID LOCAL CURRENCY BUDGET FOR HITS (Cont.)

($000)

YEAR

	1	2	3	4	5	6	7	TOTAL
IV. TRAINING								
A. English Language	1.0	1.0	1.0	0.0	0.0	0.0	0.0	3.0
B. Arabic Language	40.0	0.0	20.0	0.0	10.0	0.0	0.0	70.0
Subtotal	41.0	1.0	21.0	0.0	10.0	0.0	0.0	73.0
V. EXPENDABLE EQUIPMENT AND MATERIALS								
1. Office								
Supplies	2.0	2.0	2.0	2.0	2.0	1.0	1.0	12.0
Equipment	1.0	1.0	1.0	1.0	1.0	0.0	0.0	5.0
2. Warehouse	1.0	1.0	1.0	1.0	1.0	1.0	0.0	6.0
3. Training	2.0	2.0	2.0	2.0	1.0	1.0	1.0	11.0
4. Irrigation	10.0	10.0	5.0	5.0	2.0	2.0	2.0	36.0
5. Farm Supplies	10.0	10.0	10.0	5.0	5.0	5.0	5.0	50.0
6. Lab Supplies	3.0	3.0	2.0	2.0	1.0	0.0	0.0	11.0
Subtotal	29.0	29.0	23.0	18.0	13.0	10.0	9.0	131.0

AID LOCAL CURRENCY BUDGET FOR HITS (Cont.)

($000)

YEAR

VI. NON-EXPENDABLE EQUIPMENT & MATERIALS & BUILDING	1	2	3	4	5	6	7	TOTAL
(Jouraba)								
1. Fencing	10.0	0.0	0.0	1.0	0.0	0.0	0.0	11.0
*2. Irrigation	25.0	5.0	5.0	1.0	1.0	0.0	0.0	37.0
3. 2 Houses 210m^2 @ 250	67.5	0.0	0.0	0.0	0.0	0.0	0.0	67.5
4. Storage & Maint. Shop	43.0	0.0	0.0	0.0	0.0	0.0	0.0	43.0
*5. Shop Equipment	7.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
6. Fumigation Shed	3.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
*7 Equipment (orchard)	7.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
(Al-Irra Station)								
8. 2 Wells	137.8							137.8
*9. 2 pumps	75.2							75.2
*10. Irrigation System	83.7							83.7
*11. Fuel Tanks	9.5							9.5
12. Equipment Shop & Maint.	47.7							47.7
*13. Shop Equipment	7.4							7.4
14. Storage Shed	10.8				0.0			10.8
15. Office & Storage Building	67.9							67.9
16. Office Furniture	12.0							12.0
17. Greenhouse	73.5							73.5

AID LOCAL CURRENCY BUDGET FOR HITS (Cont.)

($000)

YEAR

		1	2	3	4	5	6	7	TOTAL
18.	Greenhouse Equip.	18.0							18.0
19.	Weather Station	7.5							7.5
20.	Classroom	60.0							60.0
21.	Paving Yard	24.0							24.0
22.	1 House 210^2m	67.5							67.5
*23.	2 Small Orchard Tractors	48.0				0.0			48.0
*24.	Spray Equipment	7.0							7.0
*25.	2 Rototillers	7.2							7.2
*26.	Greenhouse Equip	9.0							9.0
*27.	Miscellaneous Equip.	5.0	0.0	5.0	0.0	0.0	0.0	0.0	10.0
	Subtotal	941.2	5.0	10.0	2.0	1.0	0.0	0.0	959.2
VII.	OTHER DIRECT COSTS								
A.	Pouch	2.0	2.0	2.0	2.0	2.0	1.0	1.0	12.0
B.	Communications	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0
C.	Printing	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0
D.	Data Collection & Analysis Operation	3.0	3.0	3.0	3.0	3.0	3.0	3.0	21.0
E.	Generator	1.0	1.0	1.0	1.0	1.0	1.0	1.0	7.0
	Subtotal	8.0	8.0	8.0	8.0	8.0	7.0	7.0	54.0
	TOTAL LOCAL CURRENCY	1417.7	456.5	364.1	311.9	218.7	191.4	196.4	3156.7

*To be purchased locally off shelf

YARG Contribution to HITS

(YR 000)

YEAR

	1	2	3	4	5	6	7	TOTAL
I. Salaries								
A. Counterparts								
(1) Dire tor, Horticulture, MAF	75.0	75.0	75.0	75.0	75.0	75.0	75.0	525.0
(1) Hort Tech Deciduous Fruit	50.0	50.0	50.0	50.0	50.0	50.0	50.0	350.0
(1) Hort Tech Tropical Fruit	50.0	50.0	50.0	50.0	50.0	50.0	50.0	350.0
(1) Entomologist Tech	50.0	50.0	50.0	50.0	50.0	50.0	50.0	350.0
(1) Plant Pathologist Technician	50.0	50.0	50.0	50.0	50.0	50.0	50.0	350.0
(1) Extension Agent Hodiedah	35.0	35.0	35.0	35.0	35.0	35.0	35.0	245.0
(1) Extension Agent Sana'a	35.0	35.0	35.0	35.0	35.0	35.0	35.0	245.0
(1) Mechanic	25.0	25.0	25.0	25.0	25.0	25.0	25.0	175.0
(1) Lab Technician	35.0	35.0	35.0	35.0	35.0	35.0	35.0	245.0
5 Plant Protection Trainees	125.0	125.0	125.0	125.0	125.0	125.0	125.0	875.0
5 Hort Trainees	125.0	125.0	125.0	125.0	125.0	125.0	125.0	875.0
B. Support Staff								
MAF & Regional Offices estimated staff time contributions	50.0	50.0	50.0	50.0	50.0	50.0	50.0	350.0
Laborers (6) Jarouba	20.2	20.2	20.2	20.2	20.2	20.2	20.2	141.4
(6) Al Irra	20.2	20.2	20.2	20.2	20.2	20.2	20.2	141.4
Guards (2) Jarouba	25.0	25.0	25.0	25.0	25.0	25.0	25.0	175.0
(2) Al Irra	25.0	25.0	25.0	25.0	25.0	25.0	25.0	175.0
Subtotal	795.4	795.4	795.4	795.4	795.4	795.4	795.4	5567.8

YARG CONTRIBUTION (Cont.)

(YR 000)

YEAR

	1	2	3	4	5	6	7	TOTAL
II. General Expense								
Travel & Per Diem (7)	12.6	12.6	12.6	12.6	12.6	12.6	12.6	88.2
Office Space (7)	420.0	420.0	420.0	420.0	420.0	420.0	420.0	2940.0
Utilities & Maintenance for offices	20.0	20.0	20.0	20.0	20.0	20.0	20.0	140.0
Utilities & Maintenance Al Irra & Jarouba	20.0	20.0	20.0	20.0	20.0	20.0	20.0	140.0
Farm Supplies	0.0	0.0	0.0	22.9	22.9	22.9	22.9	91.6
Office Supplies	0.0	0.0	0.0	5.0	5.0	5.0	5.0	20.0
Travel - Air Fare Rome & return for trainees	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Ph.D.	0.0	6.8	0.0	0.0	6.8	0.0	0.0	13.6
2 M.S.	0.0	6.8	0.0	6.8	0.0	0.0	0.0	13.6
8 B.S.	0.0	27.5	0.0	0.0	0.0	27.5	0.0	55.0
	472.6	513.7	472.6	507.3	507.3	528.0	500.5	3502.0
III. Buildings								
2 Houses - Jarouba	800.0	0.0	0.0	0.0	0.0	0.0	0.0	800.0
1 House - Al Irra	350.0	0.0	0.0	0.0	0.0	0.0	0.0	350.0
	1150.0	0.0	0.0	0.0	0.0	0.0	0.0	1150.0
IV. Construction & Establishment Roads								
Jarouba	2250.5	0.0	0.0	0.0	0.0	0.0	0.0	2250.0
Al Irra	500.0	0.0	0.0	0.0	0.0	0.0	0.0	500.0
Land Leveling - Al Irra	20.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0
Road Maintenance	2.0	5.0	5.0	5.0	5.0	5.0	5.0	32.0
Al Irra & Jarouba	2772.0	5.0	5.0	5.0	5.0	5.0	5.0	2802.0

YARG Contribution (Cont.)*

(YR 000)

YEAR

	1	2	3	4	5	6	7	TOTAL
V. Ag. Machinery								
Replace (2) rototillers	0.0	0.0	0.0	0.0	76.0	0.0	0.0	76.0
Replace (1) tractor	0.0	0.0	0.0	0.0	100.0	0.0	0.0	100.0
Miscellaneous Equipment	0.0	0.0	0.0	0.0	5.0	0.0	0.0	5.0
Subtotal	0.0	0.0	0.0	0.0	131.0	0.0	0.0	181.0
VI. Land								
Expand Al Irra	2000.0	0.0	0.0	0.0	0.0	0.0	0.0	2000.0
VII. Transportation & Furnishings (non-recurrent cost)								
Irrigation Supplies	0.0	0.0	0.0	0.0	5.0	5.0	5.0	15.0
VIII. Processing Commodities	160.0	0.0	80.0	0.0	60.0	0.0	0.0	300.0
TOTAL	7350.0	1314.1	1353.0	1307.7	1553.7	1333.4	1305.9	15517.8
5% Contingency	0.0	65.7	67.7	65.4	77.7	66.7	65.3	408.5
Inflation 10% Compounded	0.0	131.4	284.1	432.8	720.7	814.0	1007.6	3390.6
Total YR	7350.0	1511.2	1704.8	1805.9	2352.1	2214.1	2378.8	19316.9
Total $ (4.58 exchange rate)	1604.8	330.0	372.2	394.3	513.6	483.4	519.4	4217.8

Total USAID contribution plus YARG contribution $17,551.3 or exchange rate $1 = 4.58 YR; YARG contribution is 23.5 percent of total.

ANNEX H

Equipment List

ANNEX H

Equipment List

JAROUBA STATION

Estimated Cost of Development

1.	Fencing	$ 3,000
2.	Irrigation System	25,000
3.	Two houses, $219m^2$ at $225/m^2$	67,500
4.	Furnishings, 2 houses	12,000
5.	Renovation of existing facility	25,000
6.	Equipment storage and maintenance shop $178m^2$ at $240/m^2$	42,720
7.	Shop equipment	7,000
8.	Fumigation shed	3,000
9.	Orchard spraying equipment	7,000
		$192,220

AL IRRA STATION

Estimated Cost of Development

1.	Two wells, Alwatary Industrial	$137,800
2.	Two Purcelli pumps and 88 hp Perkins motor	75,164
3.	Irrigation System (see attached)	83,690
4.	Generator, diesel, 40 kw, shed, fuel tanks	9,500
5.	Equipment and maintenance shop, $178m^2$ at $240/m^2$	47,720
6.	Shop equipment (see attached)	7,385
7.	Storage shed, $90m^2$ at $120/m^2$	10,800
8.	Office and storage building, $283m^2$ at $240/m^2$	67,920
9.	Furnishings and office equipment	12,000
10.	Greenhouse, $245m^2$ at $300/m^2$	73,500
11.	Greenhouse equipment - temperature control, humidifier	18,000
12.	Weather station	7,500
13.	Classroom, $250m^2$ at $800m^2$	60,000
14.	Paving, $4,000m^2$ at $800/m^2$	24,000
15.	Nursery and orchard equipment (see attached)	76,200
16.	Vehicles	45,000
17.	One house $210m^2$ at $322/m^2$	67,500
		$823,679

Irrigation System

1.	Mainline 365m of 30cm buried and fittings, plastic pipe at 1500	$10,800
2.	Valves, 24 6" low pressure valves at 60	1,440
3.	Pressure pump and motor for sprinkler and drip system	12,000
4.	Laterals - 2,000 2" plastic at 3.00 plus fittings	8,000
5.	Plastic sprinkler hose 1/2 22,000 at 40¢	8,800
6.	Fittings	3,500
7.	Sprinklers, browning 900 at 3.00	2,700
8.	Filter for drip irrigation	3,000
9.	Emitters 3,500 at 70¢ per unit	2,450
10.	Plastic hose - spaghetti type - 45,00 at 10¢	4,500
11.	Fittings for drip	3,000
12.	Two storage tanks, 2,000 gallons each	12,000
13.	Reservoir storage, gunnite lined	8,000
14.	Domestic water system	3,500
		$83,690

Shop Equipment

1.	Arc welder	$ 900
2.	Gas welder and accessories	500
3.	Air compressor	800
4.	Bench grinder	175
5.	Work benches	1,200
6.	Power saw	600
7.	Bench vise	150
8.	Overhead hoist	1,200
9.	Tire equipment	400
10.	Miscellaneous tools and equipment	2,000
		$ 7,925

Nursery and Orchard Equipment

1.	Two small orchard diesel tractors and accessories	$ 48,000
2.	Spray equipment	7,000
3.	Two diesel rototillers at $3,600	7,200
4.	Greenhouse equipment	9,000
5.	Miscellaneous equipment	5,000
		$ 76,200

ANNEX I

Detailed Implementation Schedule

ANNEX I

Detailed Implementation Plan

Time Frame	Place	Activity
	Jarouba	
Pre Implementation		Bud seedlings Develop irrigation system Reburbish student living quarters Build shade house Plant seedlings for '83 Thin banana plants and select best varieties Develop plan for station
	Al-Irra	
Pre Implementation		Develop plan for land use Level land Fence land Drill well Start development of irrigation system Plant windbreak
	Over-all program	
Pre Implementation		Training program on cultural practices all areas of Yemen for extension and nursery technicians Meet with MAF Hort advisors committee Draft seedling tree disbursement plan for 1982 Develop plan work for first year of project Development of HITS paper Project approval Grant agreement signed CID contract signed
First Year: Quarter	**Jarouba**	
		TDY - Plant protection Develop program Clean up disease, insects and index for viruses Construct staff houses Indepth training program started

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First Year (cont'd):

Quarter		
	Al-Irra	
2		Construct - house
3		Classrooms, shop, lathe house
3		Complete irrigation system
3		Green house
3		Start tree planting
	Over-all	
1		Extension TDY in place
		Start training program development first month of the year
1		All team members hired and and in place
		Counterparts assigned by MAF
1		Plant protection strategy developed
		Advisory Committee organized
1		Extension trainees identified
1		Short course session started first quarter
1		Plant Protection courses started first quarter
2		Short course trainees to U.S.
4		First annual HITS evaluation
4		First interns in place
4		Varietal testing at Al-Irra begins
4		First demonstration blocks at Al-Irra completed
4		Second annual work plan completed
4		MAF candidates for advanced degrees in horticulture and plant protection identified

Second Year:

1	Second short course extension agency training begins (Session 1)
1	MAF agricultural inspectors sent on internship to U.S.
1	Qualified candidate(s) from first internship program sent to U.S. for B.S. degree

Second Year (cont'd):

Overall

2	MAF candidates for advanced degrees sent to U.S.
2	Second Jarouba and Al-Irra interns in place
2	MAF agricultural inspectors return from internship in U.S.
3	Third annual work plan completed
4	First intersnhip at Jarouba and Al-Irra completed
4	Second annual HITS review (external)

Third Year:

Quarter	
1	Third short course extension agent training begins (session 1)
1	Qualified candidate(s) from internship selected and sent to U.S. for B.S. degree
1	Third annual work plan completed
	Continutation and improvement and training programs

Fourth Year:

4	Al-Irra management turned over to MAF
4	Fourth annual short course ends
4	Second external evaluation

Fifth Year:

1	Plant protection program turned over to MAF
4	Fifth annual work plan completed
4	First B.S. candidates returning from U.S.
4	Fifth annual short course ends and extension agent training program completed
4	Fifth annual review (internal)

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Sixth and Seventh Years:

Deciduous, Tropical, Sub Tropical specialists and plant protection specialists will continue indepth training programs

End of project evaluations

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ANNEX J

Summary: Evaluation of the Tropical and Subtropical Fruit Improvement Project (279-0024)

ANNEX J

Summary: Evaluation of the Tropical and Subtropical Improvement Project[1/]

This review of the Tropical and Subtropical Fruit Improvement Project in Yemen (No. 279-0024) comes five years after signature of the Project Agreement.

An implementing contract was not concluded until ten months after that (May 1977). Under the contract, services were to end in December 1979. A contract team was not in place, however, until the Fall of 1978 and not functioning normally until early 1979. In April 1979 the contract was extended to September 1981.

The negative effects of delay have been lasting. Principally, the project suffered a loss of "credibility," which accounts in part for the YARG's (Government of the Yemen Arab Republic) reluctance to commit its people to the undertaking. Morale suffered. It became difficult to coordinate project inputs.

Our findings with respect to AID's performance in organizing the project would support the following statements.

- Faced with the dilemma that no bids were received for the implementing contract, AID sought out and accepted a contractor whose qualifications were known to be limited in this field.

- AID funding of this project was adequate in amount; but allotments and authorizations to spend were made in a fashion that inhibited orderly forward planning.

- It is a credit to the AID Mission's sense of responsibility that it accepted the burden of mobilizing and coordinating YARG contributions to the project; but it was not successful, on the whole, in doing so.

- Working in difficult circumstances, the AID Mission was slow and inefficient in completing the physical development of the research stations.

- AID/Washington can be faulted for discontinuity in staffing for project management.

- Until recently, relations between the AID Mission and the contractor were strained. Small problems were allowed to fester. Lack of operational budgets hindered orderly planning; responsibilities overlapped.

- The AID Mission's management of the project has improved over the last half year with the resolution of a number of administrative problems. The physical condition of the stations is fair. The Mission and the contractor have responded effectively to YARG's interest in plant dissemination.

1/ Prepared by the Ronco Consulting Corp., July 1981

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YARG was prompt in allocating land for the research stations but both sites had serious disadvantages. It did not live up to its commitment to assign project counterparts, to make personnel available for training and to insure a regular supply of project labor. It also cancelled planned socio-economic studies designed to provide a context for future development of horticulture work. The YARG's principal interest in the project was short-term dissemination rather than long-term resting of imported tree varieties. This put it at cross-purposes with the original concept of the project as primarily a research activity. The project having responded to this interest, YARG appears more inclined to support it.

Our findings with respect to the contractor include the following:

- It has performed with dedication within the limits of its own capacities and the constraints of the working environment.

- It contributed to (but was not the sole cause of) delay in the posting of a contract team.

- The contractor lacked the experience and the on-campus and on-site scientific qualifications to meet its contract responsibilities in full. For example, systematic records of plantings and testings were not kept.

- While having fallen short in research work, the contractor did make the required reports; did prepare adequately for socio-economic studies (preparations that can be utilized in the future); and is now caring in a highly improved manner for on-going work at the research stations.

The purpose of the project was to "create the potential for future institutionalization of horticulture work in Yemen..." through the establishment of research stations, personnel training, testing and dissemination of improved technology, collaboration with other agencies in a research "network," and so forth.

A number of deciduous and tropical varieties are being tested at stations created by the project and at several "outreach" sites (governmental and private). However, research activity as a whole has been limited, including work on improved cutltural practices. Other project activities such as training have been neglected. The stations themselves represent the principal achievement in "institutionalization."

The project has had no measureable effect on sector goals concerning crop diversification, farm income, and nutrition.

A number of recommendations are made in connection with redesign and extension of the project. Major themes include:

- Build on project achievements, however limited. An entirely new start would be wasteful.

- Recognize and adapt to the fact that top faculty will seldom accept two-year assignments taking them away from their professional career

- Raise sights on contract team staffing in a wider range of functions.

- A balanced research/dissemination program is seldom desirable with improved research techniques and development of nurseries for propagation.

- Consider ways to move the government toward greater participation on the project.

- Coordinate project research with horticultural research elsewhere.

- A fresh effort should be made to initiate in-country, third-country and U.S. training.

ANNEX K

Social Soundness Analysis

ANNEX K

Social Soundness Analysis

Outline

I. Background

A. Existing Social Landscape

B. Organizational Units

C. Characteristics and Function of Leadership

D. Motivation for Participation

E. Communication Strategies

F. Land Tenure

II. The Project

A. Summary of Project

B. Summary of Beneficiaries

C. Survey of Fruit Growers

D. Constraints to Fruit Tree Cultivation

E. Possible Solutions

F. Effects of Increased Fruit Production on the Agriculture Sector

G. Development of an Extension System

ANNEX K

Social Soundness Analysis

I. BACKGROUND[1/]

A. Existing Social Landscape

Modern Yemeni society is based on relations among social groups whose membership is determined by birth and whose subsequent ranking follow a strict hierarchy. Descent and stratification are important parts of Yemeni society. The existing class pattern appears to have been stable for an extended time.

Education and literacy parallel the social strata rather closely. The traditional educational system has been dominated by the Sayyids, and many of them acquired their education in that system. A larger proportion of literacy among other social classes appears to have been acquired during migration in search of work. The overall literacy rate for males is 10 to 25 percent, and the rate is estimated at two percent for females. Generally, this averages to approximately 13 percent for the entire country. The school enrollment is approximately three percent of secondary aged children, five percent of preparatory aged children, and 29 percent of primary school aged children. The education facilities have been undergoing considerable improvement since 1970. Between 1970 and 1978 the number of primary schools increased by 400 percent, secondary schools by 700 percent, and Sanaa University was established. Generally, the pattern for all schools is one in which fewer girls than boys attend classes.

In 1970 the YAR government launched an adult literacy program. The Ministry of Education is responsible for the program through the Supreme Literacy Organization. In 1976 there were 23 centers with 171 classes for a total enrollment of 4,887 adults. Increasing numbers of women are attending literacy programs, which frequently combine home economics courses with basic literacy classes. The minimum age for attendance is 12 years of age.

The Muslim influence is powerful in the daily life of the people. Marriage customs, sex roles, divorce, inheritance laws, as well as most human functions, are dictated by the rules of Islam. Accordingly, women are subordinated to men and children are a blessing.

Central to any discussion of quality of life is the topic of health care and conditions. Existing relevant statistics are as follows:

- The crude birth rate in Yemen is 46 per 1,000; the crude death rate is 27 per 1,000; and the infant mortality rate is reported at around 24 percent (World Bank).

1/ Parts of this section were prepared by Dr. Jean Kearns, University of Arizona, 1981, with additional analysis by Dr. Barry R. Bainton, Consortium for International Development.

- The life expectancy at birth averages 37 years.

- The medical doctor/person ratio in 1976 was one doctor for every 23,256 inhabitants.

- Approximately eight percent of the population has easy access to water.

- The nutritional intake per person is approximately 75 percent of minimum caloric requirements daily.

B. Organizational Units

1. Kinship Groups

The most basic and exceedingly important social unit is the household or family. The most common living situation throughout Yemen is the extended patriarchal family. A typical household consists of man, his wife or wives, his married sons with their wives and children, his unmarried children, and possibly other relatives such as widowed or divorced mothers or sisters. After the death of the father, each married son ideally establishes his own household. Children grow up sharing meals with parents, siblings, father's siblings and wives and children as well as grandparents. Polygamy, high rates of migration, divorce and infant mortality create endless variations in the above described pattern.

Few households consist of only the nuclear family. Women who do not share a kitchen with other adult females are considered by some to be living alone--many households function without men, but a YAR kitchen does not exist without women. Absent males are considered part of the household as long as they do not have a separate household elsewhere. It appears that men living away from their families prefer to live with other members of the kin group or with fellow tribesmen.

The division of responsibility and authority within the household varies according to number, sex, age and personalities of members. In most extended families, the grandfather would be undisputed head of the household. Generally, girls marry men older than themselves, and, as a result, many may be widowed at a relatively early age and therefore assume management of a household. Husbands, wives and siblings normally retain separate ownership of land inherited from their parents, but generally family members cooperate in farming.

2. The Muslim Religion

One of the strongest organizations/influences in the Yemem Arab Republic is Islam. The Area Handbook of the Yemen, 1977, discussed the strata of society in the following way:

"In the broadest terms south Arabian societies break down into five strata that more or less parallel the strata found in the ancient kingdoms. At the top of the hierarchy stand the Sayyids, who claim descent

from the Prophet Muhammad and, as a concomitant, religious and spiritual superiority. A stratum of hereditary holy men of Qahtani of south Arabian ancestry, variously known as mashaykh (sing., shayk) or qadis (sing., qadi), comes next. In many areas they share equivalent rank but do not intermarry with the next stratum, the tribes (gubayl; sing., gabila). Below the tribes are artisans and merchants in respectable trades, who enjoy superiority to families who practice despised trades. The lowest social group, the akhdam (sing., khadam), occupies a position so disdained that it does not, for practical purposes, belong to ordinary society."

The Koran and the Sharia either form the foundation of judicial law or inspire it directly.

C. Characteristics and Function of Leadership

Yemen is in the middle of rapid social change. Economic forces are altering social life in ways that are little understood and basically uncontrollable. The country is a mixture of Islamic traditionalism, modern inventions, various levels of poverty, widespread new wealth, age-old elitism, new technology and primitive labor patterns.

Theoretically, within a tribe all tribesmen are equal and the shaykh is in the leadership position. Shaykhs may be elected by all members of the group or may be selected from certain leading families; or the position remains hereditary within a single extended family. Currently, some Yemeni communities have two shaykhs. One who is "old" may be recognized as "the power" while the "young shaykh" is recognized as the change agent. The young shaykh probably possesses more education than the old shaykh and he probably is a member of an old shaykh's family. This seeming split in authority is a relatively new phenomenon in Yemen, and is an indication of the changing leadership roles.

Increased buying power and the resultant increasing educational opportunities, changes in leadership roles, changing family authority patterns and modifications in traditional roles for men and women will change some of the existing order in Yemen. The rapidity and extent of social change in Yemen is bringing about a redefinition of leadership and authority roles. Three of the most significant changes which influence leadership are consumption patterns, immigration and remittances, and the role of women.

Social change which has brought about increased consumer goods can only be estimated. The introduction of the radio or television into a village will enable villagers to glimpse outside life and to acquire knowledge from sources other than traditional village sources. In addition, the importance of outside influences may be seen in modifications of family patterns and/or authority.

Labor migration and remittances resulting from the migration certainly contribute to the changing role of leadership and authority. The absence of a major portion of the male labor force in a village could result in several or all of the following changes: 1) The remaining male leadership will become stronger and will be in a stronger, more ingrained position when the migration force returns; 2) The remaining women will be in a position to

take over previously male dominated roles of decision-making; 3) Social mobility may become possible with economic changes. This mobility may result in higher social classes entering the commercial sector of the economy and may allow the farmers to leave the subsistence sector; 4) Increased income from remittances may make education available to a large segment of society and may also mean leadership roles will be available for a larger variety of people; 5) Increased wealth may make it possible for nuclear families to exist separately from the extended family and the traditional authority role of that group; 6) More money may be available to invest in rural areas.

The role of women is changing. At the present time, women tend to marry young, with the average female marriage age at around 14 years. Women are expected by society to have children with the average being 6.8 live births per woman. Side by side with these societal expectations is a real labor shortage due to the migration of husbands, fathers and brothers. The result is women taking on many traditional male tasks especially in the rural agricultural labor force. Emigration and recent progress in family planning is expected to result in a decreased birth rate. This could result in children being less of a burden to the women and may ultimately enable women to gain more economic power than they previously had. This may also result in more educational opportunities for girls, more job possibilities and a freer social climate for women.

D. Motivation for Participation

The emigration of labor and the remittances have affected agriculture more deeply than other sectors of Yemeni life. This is primarily due to the fact that the rural areas supply most of the emigrants. Therefore, there is a decrease in the available labor for rural agricultural work. This has led to the abandonment of marginal lands and a general decrease in agricultural production. Emigration has also increased the cost of the remaining labor. At the same time, the farmers are facing increasing competition from imported foodstuffs some of which are not subject to duty payments.

When determining specific motivational techniques, the approach must be multi-faceted in nature. That is, successful motivation must be determined to incite initial interest, while at the same time the possible end result must be evaluated in terms of the population's view of the gains from the project.

Several studies show that regardless of whether the cash crop is a commodity or a food crop, the extra family income from improved farm practices most often will not be spent on family nutrition. Instead, the income is spent on consumer goods such as processed foods or qat. There are indications that when the family produces a variety of vegetables and fruit for market at least some of this produce will be included in the family diet.

E. Communication Strategies

The development of techniques of communication have affected social relations in many ways. Communication, to be effective, must be related to need. How well one is understood will ordinarily be a function of:

1. The relationship of the information to the need;

2. The relationship of existing information in the perceptual field; and

3. The openness of the communicatee at the moment of communication. In carrying out a program aimed at bringing information to rural communities and large numbers of people, the project workers may utilize a combination of extension methods which can be categorized as follows:

Individual Approach: Farm and home visits, office calls, personal written directions/letters, audio-visual techniques and on-site demonstrations;

Group Approach: Method demonstrations, result demonstrations, meetings and discussions with village and tribal shaykhs, field trips, farmers' field days and short courses, exhibits at souqs or in village market places;

Mass Approach: Mobile extension units, films, color slides, pictures, posters, charts, newsletters, handbills, leaflets, circulars, press, radio and television.

Dr. Ingeman Hernanessan, Director of the Yemeni Swedish Save the Children Clinic in Taiz, said the paraprofessionals were excellent helpers in their village nutrition and health programs. The teaching method which appeared to be most successful actively involved the women in sharing experiences with the group. Those experiences were then used by the instructor to teach specific points.

The basic method of person-to-person communication would be most effective at the village level. Person-to-person discussions should be planned so that the information which is distributed at any one point of time is a standard presentation. Information should go to group leaders first. In addition radio and television may be used. Radio and television programs should be aired at times when large numbers of the target population may be available. According to the Rockefeller Foundation, the most powerful media in Yemen are films (cinema) and television. Observations and/or informal interviews may provide additional information which will help in planning specific communication strategies for specific groups. For example, at the present time the national T.V. station airs a limited number of Agricultural extension films, generally of European origin, with a voice over in Arabic. While the state T.V. station is owned and operated by the government, it does carry commercials and some of these are for agricultural technology products such as well pumps and tractors. To our knowledge no surveys have been conducted to determine the size and composition of the rural ownership nor to assess the impact of these programs and ads.

Ultimately, the success or failure of any project rests on the variety and/or amount of people who are affected by the project in any way. People become participants and/or supporters through an understanding of the project which, in turn, comes about through the acquisition of information about the project.

The project team members must be sensitive to and must plan with the following items in mind:

1. Content of the information must be understandable and self-explanatory;

2. Informational releases must repeat information so as to help the people understand the whole project more fully;

3. The specific time sequence of informational releases should be based upon local group conditions, concerns and understanding;

4. The specific method of information sharing must relate to existing methods of dissemination as well as newly created ones (if deemed necessary);

5. The initial setting of the project must be part of the planning with special reference to the ultimate goals of the project relative to the broader populations.

6. Considerations relative to diffusion of information must include social characteristics of the populations, organization of the population, how people allocate their time, human motivation, expected responses to incentives, and specific communications strategies;

7. When planning spread effects of information, consideration should be given to climate, environment, demography, time and space, relationship perceptions, value systems of the group, behavioral beliefs, political beliefs and the cultural atmosphere.

F. Land Tenure

Yemeni who own land are of a higher social status than those who do not. The recent Census of Agriculture indicates that 79.3 percent of the farms in the Tihama and 53.1 percent in the Uplands are totally owned. Another 12.3 percent in the Tihama and 32.2 percent in the Uplands are partially owned. Only 8.5 percent of farms in the Tihama and 14.7 percent in the Upland are farmed by tenant farmers. Where tenancy exists, it is usually a share - crop type arrangement. The share arrangements vary according to irrigation of non-irrigated land as well as other factors. Generally, the share arrangements range from one-quarter of the crop to one-half of the crop as the landholder's share. A 1973 FAO study estimated that 60 to 70 percent of arable land was privately owned. 15 to 20 percent was held by religious groups, two to three percent was in state farms, and one to three percent was owned collectively.

In many cases land ownership is not firmly established; multiple ownership claims represent a large proportion of the disputes brought before shaykhs and other local officials. Farmers generally verbally claim to own the land they work even if they give a share of the crop to someone else, and rich landlords often boast of owning all the land the eye can see and more.

Land holding sizes vary both with climate zone and geography. Despite this variation, a rough breakdown of land holding groups may be developed. The 1981 Census of Agriculture shows 60.3 percent of the farms (12.1 percent of the area) are under one hectare in size. However, for the Tihama, the figure is 13.7 percent of farms (0.9 percent of area) and for the Uplands, 64.3 percent of farms (17.8 percent of the area). Farms over four hectares represent 13.5 percent for the entire country (61.4 percent of area).

For the Tihama and Uplands, the percentages are 41.6 and 10.5 respectively. Land holdings per farm average 1.74 ha in the Uplands and 5.70 ha in the Tihama - 2.17 has for the entire country. Size of land holding is an inadequate measure of land value. Location, productivity, and access to water are extremely important considerations. Water availability is the critical element. Seventy-seven percent of all land holdings (60% of arable lands) are exclusively rain-fed. Six percent of all holdings (.1% of arable lands) have access to a permanent (spring or well) water source.

Rural Social Structure: Although Yemeni social structure is a complex arrangement based on ascriptive occupation, descent, and marital alliance, in rural areas the most significant status indicator is land ownership. Rural agriculturalists range across the socio-economic spectrum from landed gentry to landless. Quantity, quality, and location of agricultural parcels are therefore major status determinants. Landholders may be divided into three groups:

1. Peasants engaged in subsistence cultivation. Representing the largest segment of rural population, these peasants have access to the fewest resources and many augment their own production with sharecropping. They tend to raise traditional cereal crops. Cropping patterns are not varied and they are not major growers of cash crops. Although they have the least resources, the subsistence cultivators may be the most efficient of all agricultural groups.

2. Middle peasants whose land holdings are in the intermediate category. They often have better access to water resources Middle peasants not only produce subsistence row crops, but devote large portions of their holdings to cash crops. Middle peasants cultivate a broad crop mix dependent upon local environmental conditions and available technologies.

3. A relatively small number of households are large landowners. It is commonly assumed that such large tracts are in the hands of local political leaders or shaykhs. This is only partially correct. In fact, large estates are often held by government officials and merchants. Based on sharecropping data, leasers tend not to be shaykhs in the lowland regions. In the midlands and highlands, lands owned by shaykhs account for only 15 percent of lands sharecropped. Positions of local leadership are not merely dependent upon control of scarce resources. Leadership is to some extent dependent upon local consent, and therefore, learning, experience, and demeanor are also important requisites of power. To the extent that shaykhs are wealthy, but are often not the wealthiest men in an area, their position must always be regarded in comparison to their constituencies. It is erroneous to assume that all titled local leaders are either extremely wealthy or feudal landlords. The rural Yemen situation is analogous to the United States where anyone with the title mayor cannot be assumed to have either excessive wealth or political clout.

Many large land holders are merchants, professionals and government officials who have status from their lands but do not operate them themselves. As land is as much a source and demonstration of status as a source of income, it is not surprising that under owner operation they are among the least efficient operations.

Finally, there is another type of farm which does not fit into the above classification, yet deserves some mention. Tutville and Carapico in Yemen Agricultural and Economic Changes, American Institution for Yemen (1981) describe two households in their study of Boyt Shuwage which they found to represent the movement away from agriculture. "In both cases farming is pursued as a matter of interest -- social and/or intellectural -- rather than solely a means of provisioning the household." (p. 155). These households are share-cropping households, i.e., the household has rented the land from a large land owner. While not constituting a sample from which one might project a regional, much less a national, strategy, it does point to a type of household that may exist in other villages and which should be looked for in subsequent studies. The study suggests this may be a farmer type who could act as a change agent in a community. Tutville and Carapico observe: "By the time he has paid a share (which he declined to specify) to the landowner and shares to those who help him plow, weed, and harvest, there is not enough left to be worth selling. Economically it may not be worth the trouble now, but he enjoys experimenting with new grain and potato varieties and takes a kind of personal pride not only in farming but in being a sharecropper" (p. 156).

Farm labor throughout Yemen is generally provided by household members. In peak seasons men, women and often children work in the fields. Rural labor is in relatively short supply as many men have either moved to towns seeking work or emigrated to Saudi Arabia and the Gulf. Daily wages for hired laborers range from 70 YR a day (sometimes plus meals and qat). Labor costs have turned profitable crops like sorghum into net losers in some areas and discouraged labor intensive cropping schemes.

II. THE PROJECT

A. Summary of Project

The Horticulture Improvement and Training Subproject (HITS) is an institution building activity which will increase the MAF capability to provide farmers information and training that will enable them to increase the quantity and quality of fruit output. In recent years, in spite of massive imports, the demand for locally grown fruit has remained high. The demand for fruit trees is high and expected to continue to be so. However, traditional cultural practices are inadequate for optimum tree maintenance and production of high quality fruit. Through provision of high quality, disease-free nursery stock, farmer-oriented training classes at selected nurseries, distribution of simple, heavily illustrated pamphlets, TV and radio media outreach, and the development of a horticultural extension service, all growers can acquire new, relatively simple skills that will assure them a substantial return on their investment. So long as locally produced fruits bring a premium price in the marketplace, the incentive for the rewards from expanded fruit production will remain high.

B. Summary of Beneficiaries

Identifiable beneficiaries are the agencies and personnel in MAF, and indirectly, include farmers of all land holding sizes who opt to grow fruit trees. This group can be roughly divided into two groups:

1. The small growers who grow a few trees and benefit from a small salable surplus and an additional nutritional source, and 2) orchard growers of many trees who produce fruit for the commercial market. In addition, rural seasonal laborers will have an additional source of wage labor for an expanded period. Extension agents will receive training in an employable, technical skill. Wholesalers and retailers will have additional local fruits to market over a longer span of time. Input suppliers will have increased sales. Consumers will have access to a greater supply and variety of higher quality fruits.

The HITS program will have a positive nutritional impact on consumers as follows: Fruit will be cheaper, the use of improved fruit varieties will extend the fruit season, thus providing all citizens with more opportunity to eat fresh fruit during the year; an increased probability that children and adults in remote villages (who previously had no fruit trees) will have some; new fruits (e.g., avocado) may be of high nutritional value, and fruit for making fruit juices may become available, thus creating a significant alternative beverage preference to water and soft drinks.

C. Survey of Current Fruit Growers/Producers: Data Collection and Analysis

A typology of current fruit growers and producers was developed from limited data collection which focused on present beneficiaries. The survey covered Yemen's major climatic zones (lowlands, midlands and highlands) representing growers of tropical, subtropical, and deciduous tree crops. Data were collected on social standing, land holdings, conditions of fruit production, and access to water resources. Nineteen individuals were interviewed. Not all information sought could be obtained and some of the data may not be representative as many of those interviewed were unclear of the questionnaire purposes. There was a general reluctance to discuss market prices for fruit, quantities produced, and a lesser degree size of land holdings. Most worried that this information would be reported to the tax department.

1. The Typology

Although Yemen's climatic zones are varied and differ in socio-economic terms, a brief survey of fruit growers/producers reveals a number of strikingly similar characteristics. Briefly stated, those interviewed tend to be middle peasants. At least a segment of the middle peasantry, including those surveyed, have enjoyed s fficient success to save some venture capital to pursue new agricultural techniques and crops. Of the similarities noted, the following merit further discussion; (1) land holdings above average, (2) access to a permanent water source, (3) labor self sufficiency, (4) varied crop selection, and (5) no admitted experience in Saudi Arabia.

a. Among the fruit growers/producers surveyed, land holdings were in the range of one to five hectares in the midlands and highlands, from three to thirty hectars in the Tihama lowlands. Roughly speaking, holdings of this size (except for one Tihama grower whose total holding could not be obtained) are larger than holdings of 70 percent to 75 percent of the rural cultivators, most of whom could be described as subsistence peasants. Based on land holdings alone, the innovators in fruit cultivation are in the middle strata of the agricultural population.

b. As each ecological zone is varied, size of land holding is an inadequate measure. More important is location, productivity, and access to water sources. Peasants in fruit cultivation either have lands adjacent to Wadi areas or wells and sometimes both. Thus, at least some of their parcels receive adequate watering on a year-round basis. It is reasonable to assume that access to water and higher productivity account for the higher value of these parcels. By contrast, most cultivators rely solely upon seasonal rainfall. In the surveyed areas, well irrigation was the standard irrigation method for about 52 percent of current fruit growers, Wadi division channels were used by 26 percent, and springs were used by 21 percent. In the absence of lands near springs or Wadis, wells are the only source of reliable water. Well development costs are not uniform. Costs range from 1000 YR/meter for machine drilled wells to between 2500 YR/meter for hand dug wells. Well depth varies from 12 - 100 meters. Pump and motor sets cost between 40,000 YR and 100,000 YR.

c. Peasants in fruit cultivation not only own larger than average holdings but generally work these parcels themselves, drawing additional labor as needed from within their households. Only two of the growers surveyed, both with extensive holdings in the Tihama, relied on additional labor and only one of these on a full-time basis. Further, with one exception, additional labor was not used to maintain trees but for other crops. Labor self-sufficiency is an important factor in the profitability of farms. As labor costs escalate, some crops cannot be produced profitably (c.f. Messick).

d. Crop mix among the middle peasants tends to be wider than for subsistence cultivators. Furthermore, those with permanent water have an even broader mix. This pattern is followed in fruit production. In the midlands and highlands, fruit growers have a variety of tree crops under cultivation. In the Tihama, the growers surveyed cultivated only one type of fruit. While subsistence cultivators rely primarily on cereals, middle peasants also cultivate tomatoes, okra, melons, peppers, and potatoes. In several areas, new trees were intercropped with cash crops or fruit trees were used as wind rows, thus allowing for maximum land and water use. In this way, the cultivators surveyed were attempting to maximize their returns.

e. None of the fruit growers/producers interviewed admitted to having used repatriated funds to finance wells, extend holdings, or to purchase farm machinery. The question was posed as "how long were you in Saudi Arabia?" as this was felt to imply that the enumerator knew they had emigrated and they were thus more likely to respond positively. These results suggest two points. First, the subset of middle peasants in fruit cultivation have been successful in agriculture and have not needed to emigrate. Second, most returnees seek investment opportunities which promise a more immediate return, often making some use of the skills acquired abroad. Agriculture does not fit into these plans.

2. Summation

The subset of middle peasants engaged in fruit production or experimentation are believed to be the innovators in the agricultural sector. Their ability to take risks demonstrates the success they have enjoyed in earlier experiments. If successful in fruit production, these farmers will serve as a model for other growers, both those with larger and smaller holdings.

D. Current Constraints to Fruit Tree Cultivation

The constraints identified among non-fruit growers/producers are generally of a superficial nature. The lack of interest or ability to participate in fruit production stems from what is often called the conservatism of both the small farmer who has been successful with limited crops and the larger land holder who has not been motivated to experiment with new crops or techniques. In all societies, a similar pattern exists. Once the progressive farmer demonstrates the success of new crops or techniques, other farmers tend to follow his lead.

Non-fruit growers viewed fruit growers as wealthy, at least compared to themselves. They did not feel they were in a position to become involved in fruit production nor that they could do so competitively. Recognizing their limited assets, they expressed an unwillingness to take the risk.

Fruit tree cultivation was viewed as highly technical. This attitude has several possible causes. First a number of trees planted by new growers have died either because they were diseased when bought or were improperly planted. Second, some areas are almost regularly visited by foreign "experts," conveying the impression that without outside technical assistance, the trees will not produce. Since tree growth and condition is viewed as related to high technology, several interviewees stated they were not important enough to merit this type of help. The fear of high technology inputs has inhibited some peasants.

Cultivators with some of their holding near seasonal or permanent waterways felt the safest and most economically prudent course was to cultivate cereals they knew and whose production, if lost to drought or flood, represented a small setback. In short, they were unwilling to speculate with their land.

Cultivators in areas with some fruit tree cultivation were aware of the lead time involved in fruit cultivation. Many felt they could not wait for a return, particularly as the risk of tree loss seemed high. None of those interviewed were aware of intercropping of cereals and fruit trees.

Peasants in the Mauza area were also concerned with labor costs. It was widely believed (based on one large orchard in the area) that trees required large labor inputs. While most fruit growers actually expend little effort in tree maintenance, non-cultivators expressed concern over prohibitive labor expenditures.

Non-fruit growers as well as growers expressed concern about the availability of trees. Even those with new trees from government nurseries were under the impression that only through the good offices of local leaders or foreigners could trees be obtained, particularly if the number of trees desired was small.

Also common was the concern that fruit production might not be profitable. This concern was least common among growers of established local fruits, but even some of these expressed concern over new trees. In spite of consistently high prices for local fruit, some growers were unsure if they could compete with imported fruits and still earn a profit.

The limited supply of water is also a resource constraint to increased participation in fruit production. Non-fruit growers are aware that fruit crops need regular irrigation but reported in interviews that they could not afford the costs of well drilling and pump set-up.

E. Possible Solutions

Each of the above factors, while correctable through education, extension, and media, are currently inhibiting participation in fruit production. It is not possible to determine the extent of these constraints as some informants may have simply stated an obvious reason for not planting trees rather than describing their motivation for non-participation. Some constraints may be harder to eliminate than others. However, once the progressive peasants have fruit for sale and the profitability of fruit production is known, most constraints should be eased. There will, of course, be a small set of farmers who either choose not to participate or whose situation precludes participation. For those able to plant trees, the anticipated spread effect will follow the same general development patterns already known for qat and tomatoes.

One of the constraints - "Fruit tree cultivation viewed as highly technical" requires further discussion. As outlined above the possible reasons for this perception are: (1) the experience of new growers with dead trees; (2) the equating of fruit production with foreign experts and high technology; and (3) the fear of high technology. A solution to each of these is provided in the HITS program. These are discussed below:

(1) New growers and dead trees: It is certainly reasonable to argue that a farmer who has taken a risk to invest in fruit trees and found his trees died on him, might be adverse to trying it again. Further, it could be argued that he would have a negative influence on his neighbor and relatives decision to invest in fruit trees. Yet, experience at the Jaruba station where the CID staff had to turn people away when it was rumoured that trees were available, suggests that whatever negative influences do exist are still isolated and a strong positive demand is currently present.

Part of the problem is that demand has led to the importation of diseased and insect infested trees and root stock. This has begun to create a problem which the plant protection component of the HITS project is designed to address. YAR has laws in place which address this issue; they only lack enforcement.

Part of the problem is the current cultural practices which do not take into account the diseases in the current stock of fruit trees and which serve as a reservoir for infecting of new trees. Effective extension which will help farmers to identify and control plant disease should lessen the incidence of new growers ending up with dead trees.

2. "Foreign experts": While the team did not find any studies that systematically measured the attitudes of Yemeni farmers toward "foreign experts", there are a number of observations that would suggest why the attitude expressed in the field study might exist. YAR is the recipient of technical assistance from a wide number of donors, and also has attracted numerous commercial firms hoping to profit from YAR's rapid development and demand for new products. In the mind of the average Yemeni farmer, it can reasonably be assumed, there is little or no difference between these foreigners. Many of the foreigners are not accustomed to working in the Arab world and have little understanding of the cultural context of business there. They do not observe the social etiquette of doing business in YAR. A basic rule in Yemen as in other parts of the Arab world, especially the less developed parts, is the need to establish a personal relationship before one establishes a business relationship; that is, the need to establish personnel rapport first. The amount of time one must invest in establishing rapport is frequently a function of the business at hand. A simple commercial transaction, e.g., the purchase of a Yambia in the sauq, may require only a few minutes through the process of haggling. A more complex transaction such as technological transfer where the customer is a rural Yemeni farmer and the sales person a sophisticated, non-Arab speaking professional will take much longer. The purpose of this socializing is to develop a sense of trust in which the business can be transacted. "Foreign experts" who violate this rule do not invest enough time to build the personal trust in which to transmit the understanding about the technology they wish to convey and/or sell. Thus the technology becomes intimately identified with the individual presenting it. The line of reasoning of the farmer is, "If you don't trust the individual, how can you trust the technology he is promoting?"

The solutions to this constraint are fairly obvious.

(a) Persons promoting the technology should either be already known and trusted by the farmer and/or should spend the requisite amount of time to build rapport before promoting the technology.

(b) The technology should be promoted as a refinement of existing practices, when this is possible, rather than as a new "foreign technology" - i.e., appropriate technology promoted first and new later.

(c) Difference between the farmer and the "expert" should be down played. The farmer should be viewed as a "local expert" whose practices are rational in the light of his experience. This is a strong principle in the farming systems approach to agricultural development.

3. Fear of high technology. In the western sense, fruit tree production would not rank as a high technology field. But in the Yemeni farmer's context it very well might be classified this way.

Observational data would tend to indicate that Yemeni do not have an ingrained fear of technical commodities or processes. The rapid acceptance of such highly complex pieces of technology as the automobile television, radio and other imports, and more importantly the development of a local service sector to repair and maintain such technologies, albeit a small sector, suggest that the Yemeni are quick to accept something they can understand the use and benefit of and are willing to learn the skills required to operate it.

Further, fruit tree production is not a new technology to the Yemeni. What is being proposed in the HITS program is a quantitative change in the existing technology, e.g., disease and insect control, demonstrating qualitatively better cultural practices, and asexual propagation of fruit through budding techniques rather than sexually through seed. The success of the budding operation at the Jaruba station during the recent (February, 1982) budding operation suggests that through proper information and training Yemeni farmers can easily learn this technique.

4. Unwillingness to take risk. If all of the other conditions described above are met, would the HITS project still be constrained by the conservation of the Yemeni farmer? Is it true that the peasant Yemeni farmer would avoid taking a risk on fruit production? There is no definitive answer to this question. There are farmers today who have taken the risk and others who have not. Observational data strongly suggests that the Yemeni are imitators. If a new idea is introduced that does not conflict with the basic value system and it can be easily observed that those who accept the idea are better off, then the average Yemeni will try it. The rapid growth in corner grocery stores opened by returnees from Saudi Arabia, of cold storage shops, the adoption of gasoline powered water pumps, of tractors, etc. strongly suggest that the Yemeni are not adverse to taking risks when they can perceive a benefit. It can reasonably be assumed that the Yemeni are willing to take risk.

In order to capitalize on this, HITS should: (a) direct a part of its effort in identifying and working with the innovators in a community or region, (b) use demonstration sites which are accessible to farmers who can observe with their own eyes or hear from those they trust with their own ears about the benefits of the techniques and technology being demonstrated, and (c) use real case histories in the presentation of extension material regardless of the media.

The HITS program will be based on the following which will alleviate recognized constraints:

1. Initial emphasis will be placed on fruits traditionally produced in Yemen and for which there is a set of traditional cultural practices.

2. Intervention through new technology will be kept at a minimum with stress on easily assimilated techniques and those which complement traditional cultural practices.

3. There will be broad distribution of printed material (at least at the time of seedling purchase) in simple Arabic and profusely illustrated to serve as a farmer-reference guide and backup to the extension service.

4. Intercropping will be encouraged during the first years of tree growth.

5. Tree distributions in different regions will be publicized.

6. Mass media, especially TV, will be used to demonstrate simple tree care techniques.

7. Mass media will be used to announce sites where extension agents can be found for consultation.

8. Mass media will be used to announce the schedule of farmer/extension agent classes.

Several alternative solutions will be explored to the water access problem which exists in some areas. Some are:

1. Expansion and refinement of irrigation techniques already used for qat. Qat is irrigated in some areas with feeder lines from a welded water tank. These tanks are either filled from pumps or tanker trucks. Simple modifications can be made in this system to increase efficiency and water conservation. Less complicated, and cheaper systems may be built around 55 gallon drums, a valve, and plastic hose. The costs of such a system are well within the reach of all agriculturalists.

2. Increased use of water harvesting techniques, some of which are already in use in Yemen. They are low in cost and have been effective in many areas of the world.

3. Improved methods of irrigation, such as a shift from ditch-fed systems to piped systems. These will increase conservation of water. This may enable well operators to provide water to a larger number of surrounding farms. In the long run, piped water systems, using Yemeni manufactured plastic pipe, will provide more efficient use of water and the possibility of a broader water distribution network.

4. Plant trees under the eaves of houses or along Wadis.

5. Farmers with limited capital obtain funds for development of water systems from the newly constituted Agricultural Credit and Cooperative Bank. Funds are loaned to members of regional agricultural cooperatives. Membership in a cooperative begins at 100 YR. At present, there are less than 50 cooperatives, but as access to funds is limited to cooperative members, these are expected to grow. All loans must be approved and backed by presentation of collateral.

6. Sharing the costs of digging a well or borehole with nearby farmers. This is a common practice among many small-scale farmers who cannot afford these costs individually.

F. Effects of Increased Fruit Production on the Agriculture Sector

Once the viability and profitability of fruit production is established, the following effects can be anticipated. There will be a spread effect encompassing all segments of the agricultural population. At present, three distinct groups can be identified: backyard growers, orchard growers, and rural laborers.

There will be no significant alteration of the rural landscape. Anticipated long-range effects will be an improved financial (and nutritional) position for all beneficiary groups. However, relative social standing is unlikely to be modified.

One possible consequence of fruit production may be a shift away from dependence upon qat as the major cash crop. Qat is important in the rural economy because of its extremely high return on investment. It is anticipated that fruit production, while not yielding returns as high as qat, will be second only to qat. As the qat market is near or will shortly be near the saturation point, fruit production may become the most attractive alternative crop.

G. Development of an Effective Extension System

Integral to the project design is further development of the MoF's extension service. The HITS project is one of several being developed under the Title XII program which will improve the extension department.

Other Title XII activities operating in support of or contributing to this objective include the plans for the extension component in the poultry subproject, the extension effort carried out by the Ibb ATC, the training of students at the Ibb ATC, planning and advisary services being provided by the Core subproject adversary staff, plans in the 3rd Annual Work plan for the Core subproject to develop the Documentation and Learning Center in the MOAF. In addition, extension agents are being trained through other donor funding and YARG effort in a multi disciplinary program at the secondary agricultural institute at Surdud, at the Taiz Equipment Station and by the Tihama Development authority. Detailed information on the extension agent training program is presented elsewhere in the paper. CID report entitled, Agricultural Extension Services in Yemen: Assessment of Current Programs and Recommendations for Improvement.[2] as well as other CID documents[3] assess the extension situation in Yemen.

The project proposes to offer intensified training in horticulture to extension agents at the project demonstration farms and elsewhere. Two expatriate Horticulture Extension Specialists and a Media Extension Specialist TDY will technically backstop the agents and train them. Ten regional Horticulture Specialists will be trained from among the agents. At the end of the training phase, agents should be competent in all aspects of tree care,

maintenance, and disease prevention and eradication. This goal is achievable because crops initially produced and techniques taught to both farmers and agents will emphasize simple technologies which can be easily incorporated in traditional cultural practices without a large increase in labor input.

The project will provide horticultional extension expertise, something which MAF has never had and which is vital for effective extension production. Also the mass media expertise to make it possible to utilize T.V., radio and other direct contact methods appropriate for a largely illiterate population is new.

A key constraint has been the lack of trained manpower. Until the Ibb Agricultural Secondary School was established, there was no agriculture technical training in Yemen. Extension agents have not been well trained for their jobs, and low salaries for extension have not been encouraging. Extension personnel are paid from 18,000 to 30,000 rials per year. This is not competitive with the private sector or with other ministry jobs. The YARG plans to raise extension agents salaries.

To date, Ibb has not been able to attract as many students as it can handle. However, it is believed current difficulties there will be resolved when (1) improved methods of student recruitment now planned are implemented, and (2) students become aware of the limited employment opportunities for secondary school graduates with generalized training.

In the last ten years the number of general secondary school graduates has increased many fold. Where once a general diploma assured a well-paying status-enhancing position, today's graduates have fewer opportunities. The number of new businesses or governmental posts for unspecialized secondary school graduates is limited. It is believed that as students begin to understand the economic situation, more will seek training in employable skills. Ibb and the extension training program provide technical skills which should have a high potential market value. Qualified agents will hold positions of status within the communities they serve.

While Ibb may be able to solve the manpower problem in the long term, the immediate term is still a problem. Short term or near term resolution of the problem will be through technical training in country at the demonstration sets.

Given the present enrollment at Ibb and Surlud, it is expected that 20 to 25 graduates will become extension agents each year. These agents should come from all regions so that all agents are not from one area. It would be advantageous to have agents stationed in or near their natal areas, if they come from leader families. Where possible, agents should work closely with the agricultural cooperatives which are in a position to augment their work.

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ANNEX L

Economic Considerations

I. FRUIT PRODUCTION

Statistics on fruit production in the YAR are only reported for grapes, dates and a category called "other fruits."

A. Grapes

Grapes are the most important fruit crop in the YAR. Production has more than doubled in the past ten years and was estimated at 64,300 tons in 1981 (Table 1). Most of the increase has come from an increase in area planted (7,000 hectares in 1970/71 to 12,500 hectares in 1981). Yield estimates vary from 3,875 kg/ha in 1973/74 to 5,144 kg/ha in 1981. Yield gains over time have been at a slow rate. Yields in 1981 were 20 percent higher than 1970/71 but 1971/72 yields were nine percent higher than the previous year (Table 1).

Some 80 percent of grape production is in the Sanaa governate, with Hajjah accounting for nearly ten percent of the remainder (Table 2).

The Second Five Year Plan (SFYP) targets grape production increases at an annual compound growth rate of 6.7 percent from 1981-2000 (Table 3).

B. Other Fruits

The production of other fruits (excluding dates) has increased from 25,000 tons in 1970/71 to 80,700 tons in 1981 - a compound annual growth rate of 11.3 percent. However, most of the growth occurred from 1970/71 to 1972/73. The annual compound growth rate since 1972/73 has been only 3.4 percent (Table 1). All the production growth has resulted from an increase in hectares under cultivation. The highest yields (6,000 kg/ha) are recorded for the period of 1972/74).

The SFYP targets other fruit production at an annual compound growth rate of 4.9 percent. (Table 3).

Half of other fruit production is in the governates of Hodiedah and Taiz with another 15 percent in Ibb (Table 2). These percentages have been consistent over the period 1976/77 to 1979/80.

C. Dates

Date production has been estimated at 6,300 tons since 1975/76. Yield is listed at five kilograms per tree from 1,250,000 trees. The SFYP targets date production to rise at an annual compound rate of 3.6 percent for the period 1981-2000 (Table 3).

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II. FRUIT CONSUMPTION

A. Grapes

Grapes consumption in the YAR can be estimated directly from domestic production since imports are insignificant. Total consumption was projected for the future using a simple model based on real income and population changes.

For 1981-90 resident population was assumed to grow at a rate of 2.9 percent per year with a corresponding 2.9 percent per year growth effect on grape demand (population elastiticy of demand coefficient of 1.0). The income effect on demand for grapes for 1981-90 was placed at 2.4 per year calculated using a real per capita growth rate of 4.0 percent per year and an income elasticity of demand coefficient of 0.6. The combined effects would result in a growth in grape demand for 1980-1990 of 5.3 percent per year.1/

Using the above rates, grape consumption would reach 83,200 tons in 1986, 101,500 tons in 1990, and 157,600 tons in 2000 (Table 3). Using the resident population estimates assumed by YARG in the SFYP (Table 4), per capita consumption of grapes will be 9.97, 10.94, and 13.01 kgs in 1986, 1990, and 2000 (Table 3) - an annual compound rate increase of 2.0 percent.

B. Other Fruit

Since a variety of fresh fruits and juices are imported into the YAR, a consumption estimate must necessarily combine domestic production with imports. Import data for the YAR vary considerably among government agencies and, in the final analysis, one must make a judgment call regarding what figure to use for any particular year.

Import data published by the Central Planning Organization (CPO) reflect only imports arriving by ship at the Port of Hodiedah taken from customs records. Import data published by the Ministry of Supply and Trade (MST) reflect licenses to import and not actual quantities imported. The latter also contain inherent errors because of the lag time occurring between license application and actual imports. Thus, CPO data are thought to be underestimated while MST data are likely overestimated. The variations that have occurred in the past three years are detailed in Table 5. For purposes of this paper, fresh fruit imports were assumed at 125,000 tons for 1981 which, when added to domestic production, remitted in a total consumption estimate of 205,700.

Using the same population and real income growth assumption as for grapes and an income elasticity of demand coefficient of 0.5 for 1981-90 and 0.375 for 1990-2000, total fresh fruit consumption would rise to 473,800 tons by the year 2000 - an annual compound growth rate of 4.5 percent. Per capita, fresh fruit consumption would rise from 28.4 kgs in 1981 to 39.1 kgs in 2000 - an annual compound growth of 1.7 percent per year (Table 3).

1/ A real income growth of 4.0 percent was used by YARG for the SFYP. A judgment after reviewing the data in Table 8 would suggest it may be too high.

C. Dates

Date imports of 6,900 tons were assumed for 1981. When added to the 6,300 ton domestic production estimate, the total is 13,200 tons. Using similar assumptions as for fresh fruits regarding income and population, date consumption would grow to 16,800 tons in 1986 and to 30,300 tons by 2000. Per capita, the growth would be from 1.8 kgs in 1981 to 2.5 kgs in 2000 (Table 3).

D. Preserved Fruits

There is presently no capacity in the YAR for processing fruits into preserved products. Imports of preserved fruits and juices was estimated at 21,800 tons in 1981. Assuming a growth similar to fresh fruit, preserved fruit consumption would require 50,200 tons by 2000 - a per capita consumption of 4.1 kgs (Table 3).

III. FRUIT PRICES

Since 1975/76, fruit prices in Sanaa have increased only 26 percent as compared to an increase of 97 percent in all foodstuffs and 112 percent for all commodities (Table 6). In the past three years, prices of apples, oranges, bananas, and canned fruits have not changed. Grape prices have increased about 40 percent, sweet melons about 60 percent, and local lemons about 20 percent while apricots and mandarin prices declined. Little reported data are available regarding other fruit prices. Given this picture of prices, it can be concluded that fruit consumption in recent years has been stimulated not only by rising population and income but also by relative price relationships. While there is no empirical evidence available on which to base estimates, consumers may substitute some additional fruit for other foods as they become relatively higher priced.

Future Price Expectations

It can be reasonably expected that grape prices would not continue to increase as they have in the past three years. An estimate of future price trends can be made by subtracting the estimated increase in demand from the expected increase in supply and dividing by a price elasticity of demand, a coefficient of 0.5 is assumed.2/ Expected price trends for grapes assuming no export market potential would be as follows:

	Estimated increases:		
Period	In Supply	In Demand (annual percentage basis)	Expected Price Change
1981-1986	4.5	5.3	+1.6
1986-1990	8.6	5.1	-7.0
1990-2000	7.0	4.5	-5.0

2/ An income elasticity of demand of 0.6 has already been assumed for estimating future demand. An accepted proposition is that the income elasticity of demand plus the price elasticity of demand and all cross elasticities are equal to zero.

This analysis suggests grape prices will begin to fall within the next five years or so. However, there appears to be an export market potential of 10,400 tons by 1990 and 62,500 tons by 2000 (Table 7). If this potential is properly planned for and production increases are realized, the price of grapes would not be expected to decrease after 1986. This is important to recognize now if grape farmers are to be protected against falling prices.

A similar analysis can be made for other fruits as a group. Limited data preclude estimates for individual fruits. The following uses an assumption for the price elasticity of demand coefficient of -0.45.

Estimated increases:

Period	In Supply	In Demand (annual percentage basis)	Expected Price Change
1981-1986	3.5	4.9	+3.1
1986-1990	1.2	4.7	+7.8
1990-2000	7.0	4.2	-6.2

The above summary suggests that there will be pressure on fresh fruit prices to increase until 1990 and then decrease. The expected strong demand relative to expected production increases suggests a healthy environment for fruit producers in the YAR. Given the Yemeni preference for locally grown food, the picture appears particularly bright for implementing activities to increase fruit production during the next decade. However, if prices of imported apples, bananas, and oranges remain stable (as in the past three years) it could be expected that consumers will take a relatively higher proportion of imported to domestic fruit as relative price differences widen. Furthermore, if per capita real income gains of 4.0 percent per year are not realized, fruit demand levels will increase slower than the above estimates. Such a 4.0 percent gain has not been realized since 1977/78 (Table 8). A later discussion addresses macro economic factors.

The above price analysis is made assuming the HITS does not occur. For a further analysis, see Section X(H).

IV. FRUIT MARKETING STRUCTURE

There are two distinct markets in fruit products in Yemen. The import market which is under more control by the government and the market for domestic products which operates relatively free of public sector influence.

In the import market, most products are handled by a small number of government licensed importers who usually sell to wholesalers operating in the urban area. The wholesalers then sell to the highly competitive retail market which includes retail stores, supermarkets and the small local stands that populate city streets.

Because prices and margins are administered by the Ministry of Supply and Trade (MST) in the market for imported fruits and there has been a stable supply, there is little price variation throughout the season, although importers and wholesalers appear to have some flexibility in reducing prices moderately in response to market conditions. Interviews with authorities in

the MST indicate that, under current practices, maximum prices are determined by adding a fixed margin to handler's costs. Importers are allowed a profit of six percent of CIF price plus two percent for banking, two percent for administration, plus duty and handling at cost, plus transport at official rates. An ad valorem duty of 27 percent is levied on fresh fruit (Table 9). Wholesalers are allowed a two percent profit based on imported price, plus one percent for administration, plus handling and transport at official rates. Retailers are permitted a profit of 10 percent of the wholesale price plus 1.5 percent for handling.[3/] Retail and wholesale prices for imported fruit in YAR in different markets during 1980 and 1981 illustrate some of the problems associated with making meaningful market analyses given available data.[4/] The margins between the retail and wholesale levels appear to be significantly greater than those allowed by MST (Table 10). However, it should be noted that current selling practices can account for some of the discrepancy. Retailers buy their fruit by the carton and sell it by unit or by weight. For example, a retailer may buy a carton of oranges for YR 55 and then sell oranges for YR 6 per k.g. or YR 1 per fruit. Thus, in the latter case the retail price received per k.g. depends on the size of the oranges (number per carton).

For domestically grown fruit, a 1980/81 estimate is that 90 percent (by weight of production) of grapes are marketed with 70 percent (by weight of marketings) sold through urban centers. For other fruits, a smaller percentage is marketed (60 percent) and most (90 percent) are sold at the farm or in local centers (Table 11).

Prices appear to be set by groups of individuals through a seemingly subjective analysis of local supply and demand conditions. There appears to be little variation between retail outlets once prices for the day are determined expecting fruit that are mature and spoiling.[5/] One of the most noticeable characteristics of domestically grown fruit is its immaturity - understandable in terms of a lack of cooling capacity at every stage during marketing.

Wholesale price data are not reported for domestically grown fruit. As production expands, more market businessmen will likely emerge to buy, transport, and sell fruit. A new national marketing company owned by both public

3/ J. Allchin, "Marketing and Related Topics", International Bank for Reconstruction and Development, Agricultural Sector Study, Yemen Arab Republic, November 1981, Annex I, p 7.

4/ The lack of accurate data makes it difficult to estimate prices received and the problem is made worse by a general mistrust that market traders have for people attempting to ascertain prices. In the project design stage, numerous attempts were made to get estimates of prices paid and received by market traders, but the data turned out to be inconsistent.

5/ Local merchants do not seem to have complete freedom in developing their pricing strategy. Each community appears to have a group of senior community officials that perform a market surveillance function and monitor the local market shops. They appear to have some input into the MST and can recommend actions against retailers who engage in unfair trading practices.

and private sector interests is beginning operations with a view towards providing marketing services to producers of fruits and vegetables.

Price comparisons and generalizations about comparative prices in the two markets (imported and domestic) are hampered by the lack of similar products moving in both market channels. The often stated and widely accepted proposition that the Yemeni prefer domestically grown products over the imported varieties, and that they will pay a premium for domestically grown crops, is difficult to verify. The only product for which data are available for comparison is lemons, where the domestic variety enjoyed a significant price advantage - imported lemons averaging about YR 11.0 at five major cities while domestic lemons averaged from 14.5 YR to 17.6 YR (Table 10). However, it must be noted that the two fruits are significantly different. The local variety of lemons is actually a type of sweet lime while the imported lemon is the more familiar sour variety. The two types are used somewhat as substitutes in consumption, but wholesalers claim they have difficulty selling the imported sour lemons.

The price data (Tables 10 and 12) suggest some important marketing problems that will emerge with the development of the domestic fruit production sector. In particular, the increased supply of domestically produced fruit will have an impact on prices between locations and over time.

For example, domestically produced fruit shows more price variation between different market locations than in the import markets (Table 10). The price range for domestically grown apricots for five cities in 1980 ranged from 12 YR/kg in Dhamar to 16.1 YR/kg in Sanaa'a. The price differential for razibi grapes was over 5 YR/kg between Dhamar and Sana'a. Lemons ranged from 14.5 YR/kg in Hodeidah to 17.6 YR/kg in Taiz. In the event that domestic production of these types of fruits is increased, we might expect that these price differentials may lessen as more adequate market information is transmitted between location so prospective traders can be informed rapidly of profitable market opportunities.[6/]

Data in Table 12 reflect another price dimension of fruit markets. Agricultural products in general, and fruit in particular, are characterized by three characteristics that influence prices: 1) fruits are normally seasonally produced and hence supplies are concentrated in market channels in particular time periods, 2) fruits are highly perishable making them difficult and costly to store (also aggravates the oversupply problem during certain times of the year, and 3) on the demand side, consumers usually desire to consume fruits year round. Given these three factors, the usual seasonal price pattern is relatively low prices around harvest time and rising prices throughout the remainder of the year. The Yemeni prefer fresh to processed fruits, therefore, processing does not hold the potential it would without the preference.

6/ It must be recognized that the same degree of price differentials between locations may imply more efficient marketing than in the import markets where prices are more tightly controlled. With perfect market surveillance, one would still expect prices to differ among cities by the differences in the cost of transporting the crops to each city from the point of production.

The retail prices of domestically grown fruit crops in Yemen show considerable seasonal price variation (Table 12). In 1980, papayas ranged from 5 YR to 8 YR per fruit when they were available. Grape prices varied from 4 YR per kg between June and July to 3 YR between July and October.

Increases in the domestic production of these crops will in all likelihood lessen this seasonal price variation in domestically grown fruit. This is particularly true when considering the projects proposal to develop improved fruit varieties which can be grown over different periods during the year.

V. SUPPLY OF CREDIT AND OTHER INPUTS TO FARMERS[7/]

The private sector farm supply industries which provide inputs to farmers are in their infancy. Presently, the vast majority of inputs are imported and distributed by the Agricultural Credit Bank (ACB). The ACB has 11 branches: five in the Tihama (Hodeidah, Abs, El-Zura, Batelfaqih, Zabid) and six in the uplands (Sadah, Sanaa, Hajjah, Dhamar, Ibb, Taiz). An office has recently been opened in Marib which will be an additional future branch.

The ACB's prime function is to make loans to farmers and organizations for agricultural production related purposes. Short-term loans (less than 1 year) are currently made at 10½ percent annual interest rates for fertilizers, seeds, insecticides, pesticides, livestock feeds, small equipment items (e.g., sprayers), and operational costs. Medium-term loans (1 to 3 years) at 9½ percent annual interest are made for machinery, implements, irrigation pumps, engines, tree planting (including fruit), livestock, poultry, fisheries, bee keeping, storage facilities, transport facilities, bakeries, land reclamation, and irrigation projects. Loans for agricultural processing industries are made by the Industrial Bank. There is also a long-term type loan category which has essentially been inactive to date. From July 1976 to December 1980, YR54 million of short-term loans (average size YR4,445) and YR150 million of medium-term loans (average size YR31,305) have been made. Most of the short-term loans (83 percent) have been made for operational costs. In the medium term category, half of the loans have been made for irrigation projects and another 26 percent for agricultural machinery and implements. One hundred thirteen loans for tree planting were made in the amount of YR1.6 million.

In 1982, the ACB merged activities with the Local Cooperation for Development Bank (LCDB) and is now named the Agricultural and Cooperative Credit Bank (ACCB). The former LCDB made loans to agricultural cooperatives and to Local Development Associations (LDA). The latter borrow primarily for infrastructure (roads, power, communication, etc). Policies for the new bank (ACCB) are presently being formulated. There is no evidence that the loan policies for agricultural production will change.

The former ACB and present ACCB does not appear to be fraught with problems commonly associated with government owned agricultural credit banks

7/ Data presented in this section are taken from the Fifth Annual Report of the Agricultural Credit Bank (1980) and from personal interviews with Bank personnel.

in other LCD's. Repayment record is good with some 80 percent of the loans repaid on their first due date. Original capitalization and operating policies have been such to avoid any annual drain on government revenue. However, the ACCB has enjoyed an unusual source of funds. Fertilizer is given in kind at no cost by Saudi Arabia and thus funds are generated for bank use when it is sold to farmers.

The second function of the ACCB is acting as a farm supply input dealer. The ACCB handles virtually all of the fertilizer sold to farmers and a very high percentage (exact figures unknown) of seeds, insecticides, fungicides, agricultural machinery and equipment. The ACCB is not part of a conscious YARG policy to subsidize inputs to farmers to promote agricultural development. Sale prices to farmers are apparently not subsidized and there is no intent to keep private businessmen from developing the farm supply industry. In fact, the YARG welcomes private sector development and the ACCB's activities in acting as a farm supply business is expected to diminish over time.

Loans to the Fruit Industry

For farmers interested in fruit production that are without adequate capital, the ACCB is a source of credit. Minimum size loans are only YR1,000 which would service the 10-20 tree grower group. Short-term loans (up to YR20,000) are available to any grower (land owner or tenant) with no collateral pledging. The only collateral type requirement is that two guarantors must cosign the loan. The guarantors are not screened in any way but are usually known personally by the branch manager. Fruit growers could finance seedlings, sprayers, irrigation pumps, engines, pesticides, fungicides, and any operational cost. The ACCB (because of its farm input sale activity) prefers to make loans in kind to farmers.[8/]

The only item for which ACCB does not lend money is for well drilling costs. For the beneficiaries envisioned in the HITS Program, however, few would be faced with establishing a new well.

For medium-term loans, the collateral requirements are such that only land owning farmers could qualify. A recent policy change regarding tractors, pumps, engines, etc., reduces the down payment (or initial equity requirement) from 25 percent to zero.

In summary, ACCB policy does allow for providing credit in kind to small scale farmers and small fruit growers. With 11 branches and the number of agriculturists on its staff growing, the ACCB services are within reasonable access of any farmer in the YAR. The conclusion that the HITS Program will not be adversely affected by a lack of credit available to its beneficiaries

8/ There can be a problem with either a cash loan or an in-kind loan. Farmers receiving cash may use the money for purposes other than buying the farm inputs planned while for in-kind loans, farmers may sell the inputs rather than use them in production. In the case of Yemeni farmers, the latter does not seem to be a large problem. Branch managers do send a staff person to the farmer after a loan is made to see if any problems are being encountered.

seems to be justified. In fact, the availability of credit is a positive factor. Furthermore, the ACCB seems to be an efficient supplier of farm inputs at reasonable prices.[9/]

VI. COSTS AND RETURNS TO FRUIT GROWERS

Cost and return budgets were prepared by Asmon[10/] for seven fruit crops: oranges, limes, peaches, mangoes, bananas, papayas, and guavas (Table 13-19). From these budgets internal rates of return (IRR) are calculated followed by relative return comparisons. The budgets include all costs except land rent since fruit crops are typically grown on the farmer's own property. All labor costs are included at the average 1982 cost for agricultural labor of YR70 per day. Since the typical fruit grower uses almost exclusively his own and family labor, his cash revenue would be correspondingly greater than the net revenues reflected in the budget tables.

The budgets assume a 15 ha. farm of which one hectare is devoted to fruit. The farm is assumed to have a dug-well with pump operating and maintenance cost of YR3,500 annually. While few of the farmer beneficiaries outlined in the paper are expected to grow one hectare of fruit, the budgets are relevant to the extent there are no economies associated with the addition of a fruit enterprise added to an existing farm.[11/] The exception would be for a farmer who has no surface water source. In this case, the investment outlays and costs associated with a well would result in considerable economies of size regardless of the crop grown.

A. Internal Rates of Return

The measure of economic profitability suggested by Asmon and used here is the internal rate of return (IRR). For all fruits excepting papayas and bananas, a 20-year time period is assumed. The IRR calculations take account for all cash flows excepting any investment outlays for land or costs associated with land ownership. The budgets as presented by Asmon show cash outlays (excepting owner's labor) and cash returns as reflected by gross revenues. For purposes of calculating the IRR's, cash outlays for well investment, pump investment, and pump replacement are included. The summary table of IRR's (Table 20) is divided into two parts - calculations for both irrigation from well water and irrigation from surface water (thus requiring no investment outlays for the well, pump, or for pump operation and maintenance). To compare annual crops against fruit in which deferred income was involved, a 12 per cent annual discount factor was used.

9/ See VIII B regarding policy on input prices.

10/ I. Asmon, "YAR Horticultural Production, Extension, and Training Project, Interim Report, Ronco Consulting Corporation. June 1982. Exhibits A-G.

11/ Assuming that the fruit enterprise would be charged a percentage share of any existing well investment and associated operating costs based on hectarage of the farm used for fruit, there are no economics of size. For example, the IRR for a 10 tree peach enterprise would be 43 percent. If a further assumption is made that all the labor input is provided by the owner and his family (the typical case), the IRR increases to 57 percent.

Generally, the IRR's indicate a strong profitability across the fruits for which budgets were prepared. With irrigation by well water, the IRR's are between 31-43 percent except for bananas (21.8 percent), and papayas (95.2 percent). When surface water availability is assumed, the IRR's improve to extremely acceptable levels (43-66 percent) and up to 160 percent for bananas and 244 percent for papayas (Table 20). Comparing returns of this magnitude to those of traditional cross shows fruit to be a very attractive attentive (See Table 21).

Of the fruits for which Asmon prepared budgets, bananas, guavas, mangoes, and papayas would be grown in the Tihama, peaches in the Uplands and oranges and limes in certain parts of the Uplands. The recent Census of Agriculture published by the MAF indicates that 28.7 percent of the farmers (23.9 percent of the land area) irrigate crops by springs, pumps (wells), or spate. Nearly two thirds (62.3 percent) is totally rainfed but in the Tihama area, this rainfall would not be sufficient to support fruit crops.

In the upland areas, the Census data indicate 87.9 percent of all farms (82.5 percent of area) as totally rainfed with only 3.6 percent irrigated by springs, pumps (wells), and spate. However, in contrast to the Tihama, an estimated three fourths of farmers in the Ibb, Taiz, and Dhamar governorates and perhaps one fourth in Sanaa would be able to grow fruit crops from the rainfed water source.

B. Sensitivity Analysis

Sensitivity analysis evaluates the relative change in economic return associated with a change in a key variable affecting costs and returns. Deemed as the most important were price changes, yield changes, and complete loss of fruit from wind, hail, disease, or insect pests.

The results of the sensitivity analysis are summarized in Table 20. With well irrigation, a yield reduction of 50 percent will reduce the IRR for most fruit crops by 40-42 percent (coefficient of 0.80-0.84). Papayas and bananas, however, are extremely sensitive to yield reductions. A yield reduction of 28 percent for bananas reduces the IRR to zero. This greater sensitivity results from the 3-year tree replacement cycle for papayas and the relatively smaller margin between annual costs and returns for bananas.

Price reductions have a greater influence on the IRR than yield reductions since picking costs are reduced with yield reduction but not with price reductions. At a 50 percent reduction level, the IRR's are reduced another 2-3 percent except bananas and papayas.

Assuming complete wipe outs in 3 years (5, 10, 15) in a 20 year period reduced IRR's by 5-10 percent. When combining a 50 percent reduction in yield with 3 years of complete wipe outs, the IRR's fell to 14-20 percent under well irrigation and 21-31 percent under surface water irrigation (again excepting bananas and papayas).

In summary, returns to fruits are above alternative rates of return for most other agricultural crops (Table 21).

VII. IMPORT SUBSTITUTION CONSIDERATION

A. Balance of Payments

The overall balance of payments of the YAR has swung from a surplus YR 2,013 million in 1977/78 to a deficit of YR 1495 million in 1981 - becoming unfavorable in 1979/80. (Table 22). With relatively insignificant exports (YR 47 million in 1981) and imports increasing at an 18 percent annual compound rate (since 1977(78), the trade account deficit increased from YR 4,044 million in 1977/78 to YR 7,820 million in 1981 (Table 22). The latest quarterly report of the Central Bank (January-March 1982) indicates continued deterioration in the trade account and invisible account. Net private transfers have declined the past two years and net private capital movements hit a low in 1981. The future situation is difficult to forecast. Remittance from Yemeni workers abroad have levelled out and actually declined in real terms. This has a negative impact on the demand level for goods (including fruit) but acts as a positive force in lowering farmers' cost of production (through lower wage rates). However, the largest factor in a continued deficit in the overall balance of payments is the rising trade account deficit.

B. Import/Export of Fruits

From 1974/75 to 1978/79, the value (in current dollars) of fresh fruit imports increased sharply. The value of dried fruit imports, on the other hand, decreased. Preserved fruit imports rose. (See Table 23).

As a percent of the value of total foodstuffs imported, fresh fruits rose from 1.2 percent of the total in 1974/75 to 13.4 percent in 1978/79. Preserved fruits accounted for another 7.3 percent in 1978/79 and dates for 0.6 percent. Total fresh, dried and preserved fruit imports were 21.3 percent of the value of all foodstuffs imported in 1978/79.

In 1975/76 dollars, the value of fresh fruit imports are 11.65 times that of 1978/79, preserved fruits have more than doubled while dates fell by 60 percent (Table 23). The conclusion that the Yemeni consumer prefers fresh fruit over dried and preserved fruit seems clear. In the recent past, consumption has been increasing at a substantial rate. Mubashir estimated per capita fruit fruit consumption (excluding dates) at 21.1 kg in 1974-75.[12/] The 1981 estimate of 40.2 (Table 3) suggests a near doubling in six years (compound annual rate of 11.5 percent).

12/ L. K. Mubashir, the Role of Agriculture in Long-Term Economic and Social Development of the Yemen Arab Republic, UN, ECWA Report, October 1979, Table 7.4, Annex 7, page 5.

conditions found in the Tihama area. Over the years, imported materials over the years have been carefully selected so that the objective of the training station can be accomplished. Furthermore, many facilities already exist at Jarouba, thus reducing the costs of establishing the station as compared to costs of a completely new one. Since the station will deal with tropical and subtropical fruit improvement and training, the principal tree fruits that the station will deal with (but not be limited to), are bananas, citrus, dates, guavas, mangoes, and papayas.

The Al Irra Station, (an 8-hectare site in the Central Highlands north of Sana'a) is located upon relatively virgin soil as far as former fruit tree culture is concerned. The station is in a climatic zone representative of an area with great potential. The Al Irra Station will deal principally with deciduous tree fruits commonly found in the area, including, but not limited to, apricots, figs, grapes, peaches, pomegranates, and quince.

Station activities will include:

1. Improvement of Local Fruit Varieties

   a. Budding

The usual way to produce a uniform, high-quality fruit tree is by budding, a process which involves:

(1) Planting a seed and growing it for a few months (a seedling).

(2) After about 6 months, budding the seedling:

(a) A branch from a good variety (high-yielding, disease-free, high-quality fruit) is collected;

(b) One bud is taken from this branch and inserted into the bark of the seedling;

(c) The bud is then taped or tied in place to support it until it begins to grow;

(d) The growth of a new bud is then encourged by cutting off the seedling just above the inserted bud (forcing);

(e) The seedling becomes the roots for a superior budded tree (rootstock), and the inserted bud of the selected variety will grow into the fruit-bearing portion of the tree and be identical genetically to the tree from which it came.

The budding process is relatively simple and economical, and is used throughout the world to produce many kinds of quality, uniform fruit trees and ornamentals (roses for example). It requires training and practice to be performed successfully.

HITS will accomplish its purpose by:

(1) Establishing two horticulture (fruit) training and improvement stations in the MAF Department of Horticulture (one in the Tihama and the other in the Central Highlands).

(2) Training extension agents, horticultural (fruit) specialists, horticultural (fruit) technicians, agricultural inspectors, and nurserymen in fruit culture.

(3) Strengthening the Plant Protection Department in the MAF, and training personnel there and elsewhere in MAF in plant protection methods.

(4) Expanding the horticultural (fruit) information, production, and distribution program for farmers, nurserymen, and private horticulture (fruit) input suppliers and fruit merchants.

Each of the above four outputs will be addressed in detail giving complete justification and showing how the output is to be accomplished. Future references to horticulture will mean tree and vine fruits.

A. HITS Stations

Two horticultural stations are proposed. One is to be located in Tihama (Al Jarouba) and the second is to be located in the Central Highlands near Sana'a (Al Irra). The purposes of both stations are:

1. To determine which fruit varieties are most suitable to the region represented by the station;

2. To demonstrate effective and appropriate horticultural techniques of plant propagation, sanitation, planting, fertilization, irrigation, plant protection, and orchard or tree management suitable in the YAR;

3. To produce and distribute clean budwood, cuttings, and plants to nurseries of the MAF; and

4. To train extension agents, agriculture technicians, nurseryman, and, to a limited extent, farmers in techniques and methods targeted to their individual roles in increasing fruit production.

Owing to the diversity of climate and crops produced in the YAR, it is not possible to meet the varietal improvement and horticulture training needs for tree fruits and viticulture at any one location. With the exception of Jarouba, neither is it possible to locate these activities at any of the existing horticulture or nursery stations because of the already existing contamination.

The Jarouba Station (an 11-hectare site in the Tihama) is a carry-over station from the previously-funded AID (0024) project under the leadership of the Tuskeegee Institute. The climate is representative of

very serious problems. Some nurseries are knowingly distributing insect and disease-laden products to local farmers. Nursery personnel are generally untrained in identification of diseases and in the art of grafting, budding, and making varietal selection for achieving increased fruit production. The MAF goal of increased fruit production cannot be achieved without addressing the issues associated with increasing the supply of disease and pest-free budded trees, cuttings, and seedlings of improved varieties.

It is crucial for any program to increase production to recognize that all fruit varieties are not suited to the YAR. The climate, latitude, soils, water supply, and available technology will largely determine the range of fruit varieties that can be grown profitably. Varieties that require a high degree of sophistication in technology should be avoided and varieties that are presently grown in the YAR should be given highest priority if the yield and quality is satisfactory. Concentration should be made on improving and breeding varieties that are well adapted to local conditions.

It is within the above setting that the HITS Project was designed.

II. PROJECT DESIGN DESCRIPTION

Introduction

One of the major goals for the agriculture sector in the new Five-Year Development Plan for the YAR is to increase the supply, quality, and diversity of fruits produced in the YAR. The Ministry of Agriculture and Fisheries has taken significant action to achieve the goal. This was evidenced by two recent decisions at the top level of administrative authority, namely (1) to drastically increase (five-fold in 1982) the production of nursery materials for sale at the ten MAF-supported nurseries and (2) the establishment of a Plant Protection Department and the assignment of five personnel to it. These decisions by the Ministry may have been due, among other things, to: (1) Its participation in the final evaluation of the AID-sponsored project 0024; (2) the relationships developed with the CID/USAID horticulture subproject implementation plan carried out by CID/Core (0052); (3) anticipation of the follow-on, AID-funded HITS Subproject. In addition, the success of the CID team at Jarouba during the past year, where 20,000 budded citrus trees were produced, may have had an influence. The design team has focused upon the following project purpose: To institutionalize within the MAF an expanded capacity to support increased fruit production through extension, plant protection, and the delivery of disease-free planting stock of improved varieties to the fruit subsector.

The title of the project has been identified as the Horticulture Improvement and Training Subproject (HITS), even though the project will only deal with a small segment of horticulture (tree and vine fruits). The term "horticulture" has been used in the title because it is identified with the horticulture department in the MAF.[5] The project purpose fits precisely into the MAF Five-Year Development Plan strategy, and is totally consistent with USAID/Yemen and CID long-range goals for achieving agricultural development through institutional development.

Table M-1

Current Stock (1982) of Horticultural Fruit Nurseries

	CYDA[a]	Bir al Shaif[b]	Al Rawdah[b]	Gahanah[b]	Sadah[b]	Ibb[c]	Warzan[c]	Jarcuba[b]	Jarabo[d]	Al Irra[d]	Total
I. Pecidum											
Peach	-	6,000	1,000	-	-	20,000	-	-	-	-	27,000
Plum	-	6,500	7,000	-	-	-	-	-	-	-	13,500
Apricots	2,000	7,000	4,100	13,000	-	50,000	-	-	-	-	76,100
Pomegranates	6,000	20,000	1,600	8,400	40,000	10,000	-	-	-	-	86,000
Apples											
Subtotal											
II. Citrus	-	-	-	-	15,000	25,000	25,000	50,000	30,000	-	145,000
III. Tropical											
Papaya	-	-	-	-	-	-	3,000	-	-	-	3,000
Mango	-	-	-	-	-	-	-	-	-	-	-
Banana	-	-	-	-	-	-	-	-	-	-	-
Subtotal	-	-	-	-	-	-	3,000	-	-	-	3,000
IV. Other[e]											
Almond	2,000	9,000	-	8,000	-	40,000	-	-	-	-	59,000
Quince	1,000	3,500	3,000	-	-	-	-	-	-	-	7,500
Grapes	7,000	-	49,000	50,000	40,000	-	-	-	-	-	146,000
Figs	2,000	8,500	7,400	3,500	8,000	-	-	-	-	-	29,400
Subtotal	12,000	21,000	59,400	61,500	48,000	40,000	-	-	-	-	231,000
TOTAL	20,000	60,500	73,100	82,900	103,000	145,000	28,000	50,000	30,000	-	582,500

a/ Confederated Yemeni Development Associations
b/ Under auspices of Provincial Agriculture Office
c/ SURDP - under auspices of FAO/World Bank
d/ Under auspices of Consortium for International Development (CID)
e/ Excludes three coffee nurseries

Supplemental water supplies are a serious problem in the Central and Northern Highlands. Insufficient precipitation, complicated by its sporadic distribution in time and space, constitutes the root of this problem. (The rainfall in the Central Highlands, where it is believed fruit production is most likely to expand for the eastern escarpment, is about one-third of that occurring in the Southern Uplands where no supplemental irrigation is anticipated.) At the present time, most of the supplemental water required for fruit production comes from wells. It is not uncommon to see as many as ten farmers cooperate in the use of water from one well. This appears to be one fairly inexpensive alternative method to augment the supply of water received from precipitation and/or runoff.

1. Water Requirements

The following table shows the water required for a typical deciduous or citrus tree from age 1 to 5 years in the Central Highlands.[3]

Age of Tree	Citrus		Deciduous	
Yrs	l/Tree	m^3/ha	l/Tree	m^3/ha
1	2,654	796	1894	568
2	5,308	1,592	3,790	1,136
3	10,616	3,184	7,576	2,274
4	16,676	5,002	15,152	3,410
5	22,740	6,822	15,000	4,548

These data indicate that average rainfall in the Central Highlands may be adequate for the first few years to establish fruit trees. For mature trees, average rainfall in the Central Highlands is insufficient, and supplemental irrigation will be required.

2. Nursery Stock

There are presently ten government MAF (see Table M-1) operating nurseries in YAR which produce seedlings or cuttings. They are distributed according to the climatic zones shown below:

1 - Tihama - citrus and tropical
3 - Southern Uplands - citrus, subtropical, deciduous
5 - Central Highlands - deciduous, grapes
1 - Northern Highlands - deciduous

The nine nurseries in the uplands and highlands produced 117,000 seedlings last year. In addition, 40,000 lime seedlings were produced by the nursery in the Tihama. In the fall of 1981, the MAF began a massive campaign to increase fruit production. A goal of 500,000 seedlings, budded trees, and cuttings from all nurseries was set for 1982. The nearly five-fold increase in nursery stock distributed is the first step by the MAF to increase fruit production.

The nurseries are a critical resource, and the service they provide to the fruit industry is essential. However, the nurseries face some

Although there is a quarantine law in the YAR, it has not been implemented. Similarly, "The Bioregulants Act of 1981" (a pesticide law) has been formulated and submitted by Dr. B. Ashworth, et al, but it has not been ratified by the legislature. Ratification and enforcement is the first step in a plant protection program that will greatly impact fruit production.

3. Lack of Training, Experience, and Manpower in Fruit Culture

Fruit crops in the YAR have been, and continue to be, grown with little, if any, cultural inputs, e.g., fertilizers, pruning, pest control, or water management. In fact, often after a tree is planted, the only care it receives is some watering; as a result, overall fruit quality in the YAR is poor, and productivity is low.

There are about 250 extension workers in Yemen. Extension personnel have some training in other disciplines, but they have minimal training in fruit culture. They also have little training related to extension, research, or rural development.[2] A typical extension worker is between 18 and 25 years of age with 6 to 9 years of formal education. Typically, the extension agent is assigned 20 to 30 villages, depending upon conditions. The extension agents can interact with only a tiny share of the potential clientele on a one-on-one basis.

G. Other Factors

Fertilizers and pesticides are necessary inputs in order to maximize fruit production. The Agricultural Credit Bank (ACB) is a prime factor in making these inputs available to farmers, and credit is available. Also, since most families have a member working abroad or in a major city and these workers send money home, some cash is available. The design team does not believe these inputs constitute a problem that will seriously limit production. Once the farmer learns how to use the needed inputs effectively, it is believed supplies will be readily available. The farmer can get access to sufficient capital to procure them. (See Annex L for a discussion of these and other inputs.)

Water, either from precipitation in rainfed production or through irrigation, is a limiting factor in fruit production in the YAR, and problems associated with it need to be addressed. Its availability will have an impact upon production. Water, in proper quantities in the root zone, is the most important element in achieving high production. There are basically four sources of water supply for fruit production: (1) Precipitation, (2) perennial springs, (3) runoff from adjacent areas, and (4) ground water.

The distribution of rainfall in the prime fruit producing areas was discussed above in order to give the reader a feel for the available water supplies. The Southern Uplands, during most years, receive an adequate supply of water from precipitation, and supplemental irrigation is not necessary. Fruit production can be increased in this area with minimal effort in water resource development. In general, the Tihama farmers must rely upon runoff from the mountain watersheds and the relatively shallow groundwater for much of their supply of water. Numerous water development projects already exist, and the shallow ground water lends itself to hand-dug wells. Water is available in the Tihama for increasing production.

1. Varieties

Until recently, all fruit trees planted in the YAR have been seedlings, e.g., the trees are grown from a seed and therefore subject to the variability associated with sexual reproduction. If 100 seeds are planted from a tree, one can expect to produce less than 100 seedlings. From the trees that grow from the seedlings, possibly one-quarter will have fruit and fruit-bearing characteristics similar to the mother tree. The others will be quite variable and unpredictable. For plant breeding purposes, sexual reproduction and the variability it produces is useful for development of new, improved varieties, but for a farmer who wants good trees for his land, it is a potential disaster. The great amount of labor and investment he makes may result in very few good trees. Seedlings grown from seed of selected local varieties may be fairly uniform and produce fruit of acceptable quality in Yemen, but not by developed country standards.

In the past few years, much seed has been introduced from Syria (especially apricots and almonds), planted in nurseries, and sold to local farmers. The Syrian seedlings, unfortunately, require much colder winters than are found in the YAR, and, as a result, they do not perform well. The result is that many farmers have obtained trees that will produce no fruit. This is obviously not satisfactory, and will greatly discourage farmers from planting fruit trees in the future.

2. Diseases

Planting materials (trees, budwood, seeds) have been introduced into the YAR from many countries in the past few years. Many are infected with pests and diseases not previously found in Yemen. Local farmers are not capable of identifying, let alone controlling, the diseases and pests.

Because of the citrus trees, budwood, and seeds introduced to Yemen from many parts of the world, Yemen may be subject to a large variety of plant diseases, as well as insect and nematode pests, which probably did not exist previously there. To emphasize the need for regulation and enforcement, the following examples are offered. The Egyptian citrus trees recently imported were inspected by the German Plant Protection Group and the roots were found to be infested with the citrus nematode (Tylenchulus semipenetrans). Nevertheless, the trees were distributed to a number of nurseries throughout the country. Mangoes recently imported from India were infested with scale insects (Diaspidae). Citrus trees and budwood from Spain, Egypt, Italy, India, and California have been recently introduced and distributed. Since many citrus virologists feel that only California and Corsica have adequate certification programs at the present time, most of this citrus material should not have been imported.

It is apparent that the existing MAF horticultural program needs more input from horticulturists, entomologists, nematologists, herbicide specialists, and plant pathologists at the developmental stage. The planting materials that have been introduced from many countries without proper informaton and advice and a number of the diseases and pests that have been introduced into the YAR, especially in the last 5 or 6 years, are a great detriment to future production.

Tihama. Because of its high rainfall, this is the most intensive agricultural area in the country. The elevation of this region varies from 200m to 2500m above sea level.

The Central Highlands is the area that produces the majority of grapes for Yemen. This area, which includes Sana'a, the capital of Yemen, ranges in elevation from 1200m to 2250m, above sea level. It is characterized by mild temperatures and low rainfall (120-350mm annually). Irrigation is often required to achieve high grape production. These Central Highlands are ideally suited for some citrus, but mostly for deciduous temperate-zone crops such as figs, peaches, apricots, pomegranates, pears, apples, walnuts, and almonds, all of which are presently grown in small areas. Although irrigation may be required at certain critical times, depending upon rainfall, the climate is not a limiting factor. Low chill varieties of these deciduous fruits are required for high production since the region is essentially frost free.

The Northern Highlands and Eastern Slopes are less suited to fruit production because of insufficient water supplies. However, another aid donor is preparing to rebuild the ancient Marib Dam that impounded water during the time of the Queen of Sheba. The construction of such impoundment resources to store water during periods of peak precipitation and runoff offers tremendous opportunities for expanded agriculture in these two regions. Fruit trees are certainly a viable agricultural crop under conditions of adequate water supplies. The large flat valley that contains the main city of Sadah offers great potential production, if and when resources become available to utilize the ground water in that basin.

The areas that are presently used for producing fruit, i.e., the Tihama, Southern Uplands and Central Highlands, are most likely to be the areas where expansion of fruit production will occur under the proper technology and economic setting. Within those areas, the broad mountain valleys and the mild sloped wadis, where there is potential for irrigation from the wadi or from ground water, present the better opportunities to expand fruit production. It seems unlikely that fruit production will occur in regions that are presently void of fruit trees except by the more literate population who understand the technology required and are willing to take higher risks. Expansion in fruit production or fruit culture will take place within the largely illiterate subsistence farmers when they can see by demonstration the potential, either from their neighbors or from demonstration farms.

F. Contraints to Expansion of Fruit Culture

The expansion in fruit culture is likely to be extremely slow under the present conditions in all areas. The design team observed the following conditions, which presently limit the expansion of fruit production either from increased yields or greater acreage: (1) Low producing varieities; (2) the use of seedlings which do not produce true and give low yields and poor quality fruit; (3) disease-laden trees and vines at the time of purchase from nurseries; (4) little knowledge of proper cultural practices for maximum production; and (5) limited water for irrigation.

C. Demography

There are about 50,000 settlements in Yemen, scattered throughout the country in somewhat of a uniform density irrespective of climatic zones. The exception is on the eastern slopes where settlements tend to occur at a lower density. The total population at the end of the 1981 census was about 8.5 million persons. The population density is 35 inhabitants per square kilometer. About 88 percent of the population lives in rural areas, with 12 percent living in province centers or other urban settlements. In general, the tendency is for the rural population to live in villages where dwellings are spaced relatively close together. The village represents farmers who farm or own land in the immediate vicinity. The village is often located on the poorest land and/or on the land having the highest elevation of the area.

D. Agriculture

Depending upon rainfall which varies from year to year, the cultivated land in Yemen is estimated to range between 1.5 and 1.98 million ha. Cultivation occurs from the Tihama lowlands (bordering the Red Sea) to the highest mountain peak. Mountain slopes and steep wadis are terraced for cultivation. The individual terraced units are relatively small in area (the average is smaller than 1 ha.). The crops grown are mainly grains such as sorghums, millet, and maize and potatoes, vegetables, and fruits. Little fruit is grown on the upland terraces. Other crops include cotton (grown in the Tihama) and coffee (grown in the Central Highlands).

Grains accounted for about 90 percent of the total cultivated land from 1974-77, millet being grown in the arid Tihama, sorghum in the semi-arid uplands, and maize in the areas of higher precipitation. The rainfed lands comprise about 1,277,000 ha.; the spate and perennially spring-irrigated areas are estimated to cover 120,000 ha. and 73,000 ha. respectively. The pump irrigated land averages 45,000 ha. These data were obtained in 1976-77.[1*]

E. Tree Fruits and Viticulture

Land used for fruit production in 1981 amounted to 27,000 ha., about 40 percent being in grapes. The remaining 60 percent included tropical and subtropical, as well as deciduous temperate zone crops. The fruit crops accounted for approximately 3.6 percent of the total cultivated area.

The tropical fruits such as mango, papaya, banana, and dates are produced in the Tihama. This area ranges in elevation from sea level to 200m. It is basically the Red Sea coastal plane which is about 35 to 55 km wide and 1600 km long and where Hodiedah is the main city. The area is arid, having only about 76 to 200 mm of rainfall anually. However, the Tihama has a high potential for tropical fruit production because the irrigation potential is great in the numerous small wadis and it has an ideal tropical climate.

The Southern Uplands, where rainfall averages about 800mm annually, is an area ideally suited for production of subtropical fruits such as citrus, guava, and anona. This area, where Taiz is the main city, consists of mountain slopes and small valleys parallel to the Red Sea coast east of the

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[1*] Footnotes follow text.

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ANNEX M

Technical Analysis

I. BACKGROUND AND SETTING FOR PROPOSED PROJECT

A. Geography

The Yemen Arab Republic is located in the southwestern corner of the Arabian Peninsula. To the west, the country is bounded by the Red Sea; in the north, Yemen adjoins the Kingdom of Saudi Arabia, while in the south is the People's Democratic Republic of Yemen. The latitude range is 12.5 degrees to 17.5 degrees north.

The geographic features of Yemen and its proximity to the Arabian Sea, Red Sea, and Indian Ocean create a wide diversity of climate that ultimately affects its agriculture. The YAR is typified by three major escarpments to the west, east, and south. The western escarpment is the most precipitous where elevations change from sea level to 3700m within 175 km. The eastern and southern escarpments are characterized by more gentle slopes. The western escarpment has 50,900 square km. The greatest land area lies in the eastern escarpment (74,440 square km). The total area of these three escarpments is 135,200 square km with only 9,900 square km occurring in the southern escarpment. Within each escarpment, there are numerous broad flat valleys and narrow wadis that intermittently carry run-off water from rainfall.

B. Climate

The climate in the YAR is best discussed in terms of elevation and location within an escarpment. There are five geographic zones that are somewhat similar in climate that are agriculturally significant in terms of area. They are described as: (1) the Tihama; (2) the Southern Uplands; (3) the Central Highlands; (4) the Northern Highlands; and (5) the Eastern Slopes.

From March to September, the climate over the entire country is influenced by moist air masses of the monsoon circulation system in the Indian Ocean. This circulation produces upper air flow from the southwest toward the southern uplands and central highlands. This causes heavy precipitation on the mountain slopes exposed to the west or southwest. The precipitation amounts decrease as the air masses move to the northeast. The largest annual precipitation occurs near Ibb in the southern uplands (about 800 mm/year) while the smallest amounts occur in the northern reaches of the northern highlands (about 100 mm/year). From October to February, dry air masses originating in the Central Asian anti-cyclone cause a clear rainless winter season.

In general, two rainfall seasons can be distinguised: Two months of moderate precipitation in March and April, with two relatively low precipitation months, May and June, and the heaviest precipitation occurring from July to September. Most of the rainfall occurs from convection type storms of moderate to high intensity and short duration that are highly localized. The storms are weaker in intensity and shorter in duration on the eastern slopes of the mountains.

ANNEX M

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M-5 General Layout of the Al Irra Station

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2. Sources of Citrus Trees/Budwood

3. Diseases and Pests Found in the YAR

4. Deciduous Crop Diseases and Pests

5. Illustrative MAF Newspaper Article

ANNEX M

Outline

I. BACKGROUND AND SETTING

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C. Demography

D. Agriculture

E. Tree Fruits and Vitaculture

F. Constraints to Expansion of Fruit Culture

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C. Training and Extension

D. Communication and Use of Media

III. CONSTRUCTION PLANS

A. Al-Jarouba

B. Al-Irra

C. Certification

IV. DATA COLLECTION

b. Grafting

The process of grafting is similar to budding, but a portion of the selected branch (with two or three buds) is attached to the seedling and secured. Certain trees are easier to graft than they are to bud. Also, at certain times of the year, budding is not possible because the back of the seedling does not slip (separate easily from the wood). At this time, grafting is done instead.

c. Teaching Budding and Grafting Skills

Training of nurserymen and extension agents in the techniques of budding has been done on citrus seedlings at Jarouba. The process there will be continued and expanded to include other fruits presently grown in that area. Improved budding and grafting plant materials have been imported and distrubuted.

d. Varietal Selection

Native varieties of grapes and other fruits have evolved over a long period of time. Those best adapted to the environment have survived. Some of these local seedling trees produce fruit of good quality with high yields. Improvement of local fruits, therefore, will begin by surveying the areas and selecting budwood from the best fruit trees and vines, then asexually propagating these varieties and distributing trees to areas suited to production.

When it is evident that improved horticultural skills are being utilized and a plant protection program is in effect, it will be appropriate to introduce higher input, potentially higher-yielding varieties from the United States and other countries.

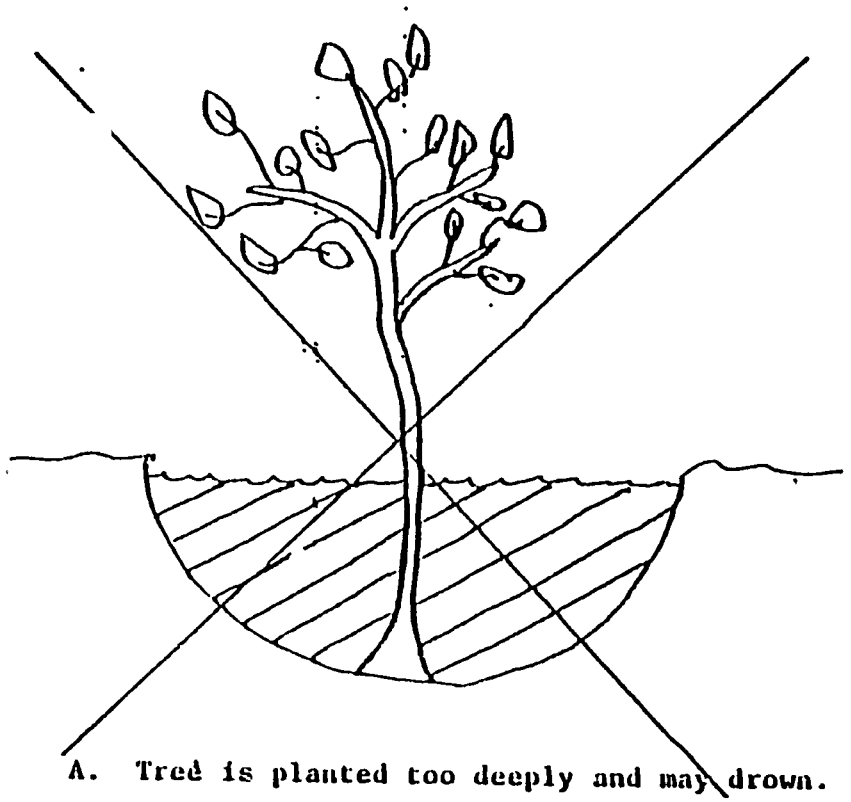
2. Demonstration of Improved Horticultural Techniques

In addition to demonstrations on propagation listed above, demonstrations of cultural practices suitable to the area represented by the station will also be carried out. Some of these will include; tree planting techniques, irrigation and water management, pruning, fertilization, and pest control. These are the most significant practices affecting fruit production.

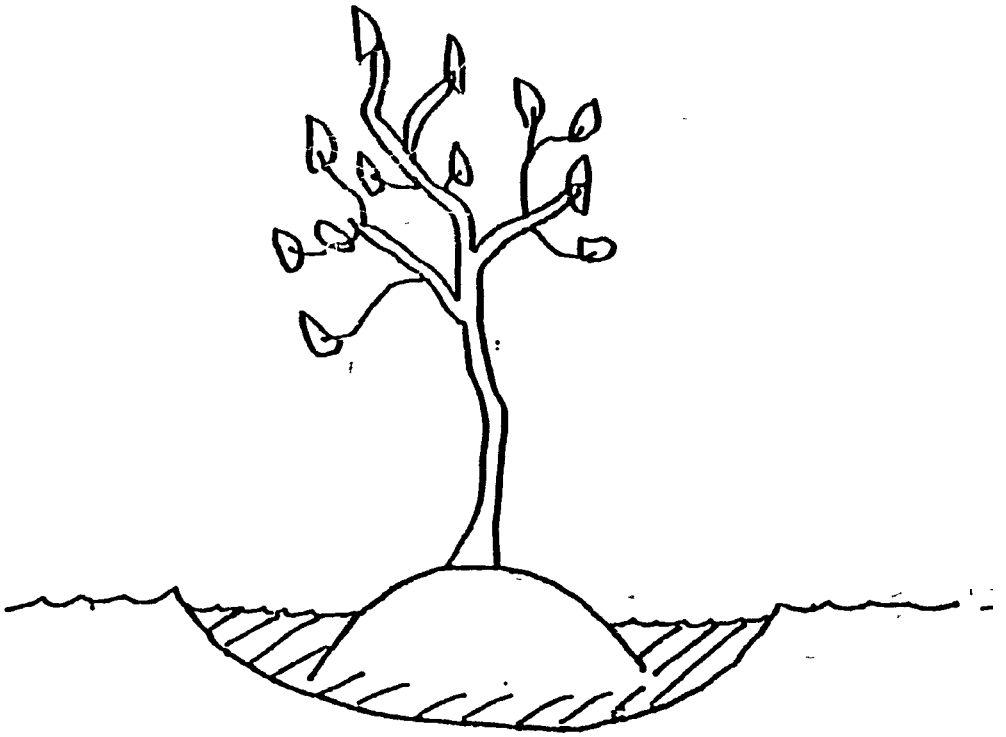
a. Tree Planting

Trees in the YAR are frequently planted incorrectly; therefore, the survival rate is very low. Extension of proper tree planting methodology is absolutely essential, and, fortunately, is relatively simple.

Extension agents, nurserymen, plant pest control personnel, farmers, and private input suppliers will be given demonstration training at the two horticulture stations. The training will be adopted to local needs. For example, for the farmers, a drawing similar to that in Figure M-1 could be wrapped around the trunk of each tree sold at a nursery. The pictures illustrate correct and incorrect planting procedures. A simple text in Arabic could also be included to fortify the illustration. A line could be painted



A. Tree is planted too deeply and may drown.



B. Tree is planted correctly for most soil and wate conditions.

Figure K-1 Tree Planting Diagram

around the trunk of the tree to indicate correct planting depth (any instructions such as this will need to be tested in the field to verify that they are being understood. This type of training and extension should increase the survival rate of young trees and encourage farmers to plant more of them.

b. Irrigation

Owing to the scarcity of water resources in some areas of the YAR, extension of efficient irrigation practices is essential. Many Yemeni farmers are already using efficient, low-volume irrigation by piping water from their wells to their fields. Rudimentary, gravity-fed irrigation systems are currently in use, especially by farmers who do not have access to a well, and they could be expanded to provide a low-cost, low-maintenance, water-conserving irrigation system which is technologically simple and within the financial reach of even the poorest farmer. Figure M-2 illustrates an inexpensive, gravity-fed irrigation system constructed of materials readily available in the YAR. Other types of appropriate systems may be developed during the life of the project. For example, the system of water harvesting which has been tested for 10 years on fruit production on the Page Ranch International Arid Lands Development Center may be economically and technically viable in the YAR.

c. Pruning

Most deciduous fruit trees require annual pruning to obtain maximum production. The pruning is normally done in the winter months when the trees are dormant (leaves have dropped and tree is in a state of rest or no growth). Pruning stimulates vigorous new growth, improves fruit size and quality, removes dead and diseased wood, promotes new fruiting of the tree, and promotes annual bearing (a good crop each year).

Pruning is generally not practiced in the YAR. This technology can be demonstrated to extension agents, farmers, nurserymen, and input suppliers at the deciduous horticulture station each winter through training sessions.

Removal of suckers (excess growth sprouting from the base of the tree) and dead, diseased wood should be emphasized.

d. Fertilization

Neither animal manure nor chemical fertilizers are used to any significant extent in the YAR. However, there is interest in fertilizer, and its use is increasing. As improvements in horticultural techniques begin to catch on, the economic feasibility for fertilization will improve. Demonstration plots at both the deciduous and tropical-subtropical stations will be developed to show the response to fertilization. Furthermore, on-farm fertility trails will be used to vividly demonstrate the costs and benefits of fertilization. Initial emphasis will be placed on composting and utilization of organic materials commonly available (e.g. manures, crop residues).

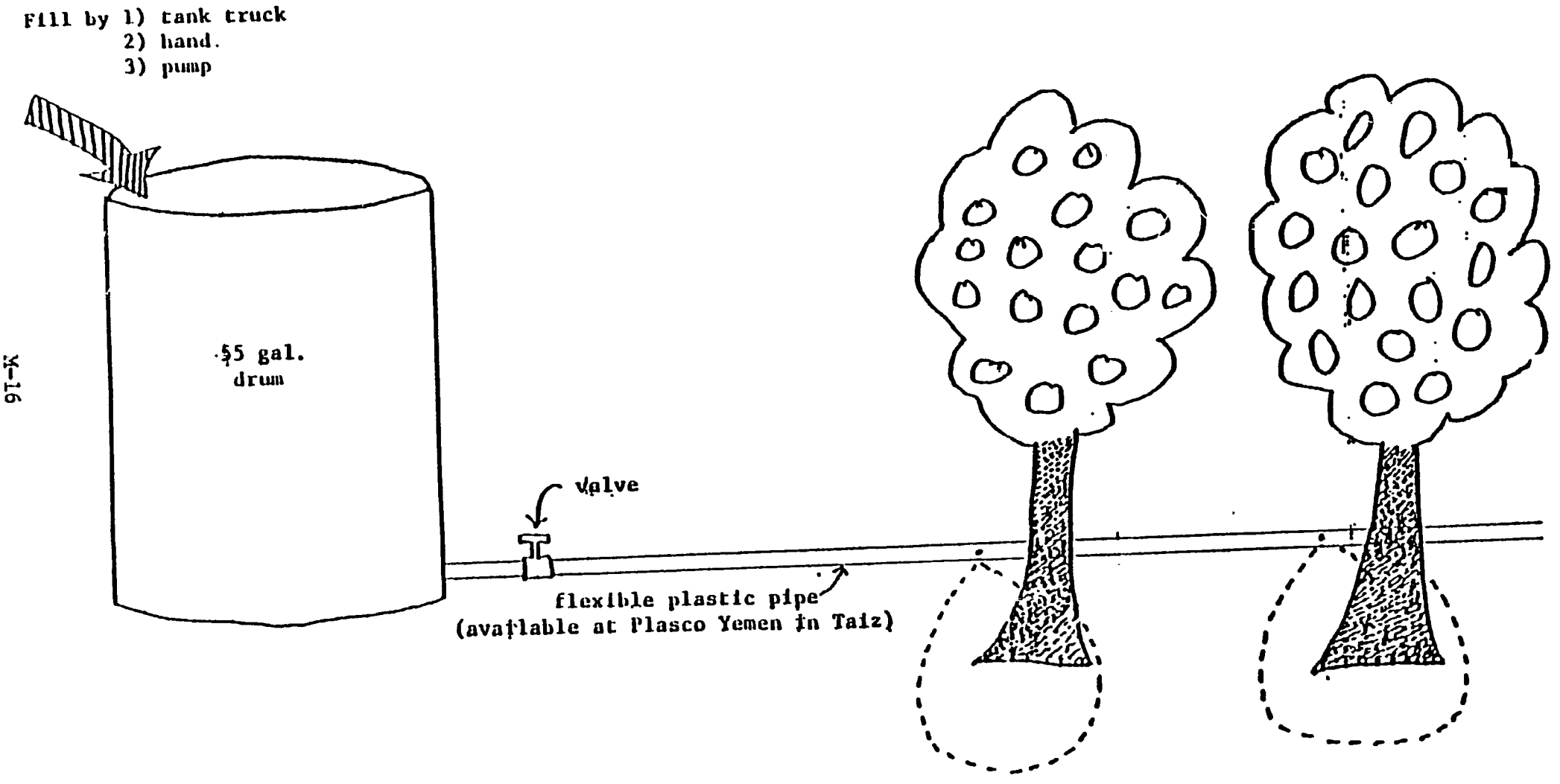


Figure M-2. Rudimentary gravity-fed "trickle" irrigation system.

e. Pest Control

Plant diseases and pests are a serious problem in MAF nurseries, as well as with the fruit producers, both subsistence and commercial. Principles of plant protection and pest control will be demonstrated at each station.

The demonstration program for inspectors, extension agents, and nurserymen will include: (1) Identification of diseases and pests on tropical fruits (bananas, mangoes, papayas, etc.); subtropical fruits (citrus especially); deciduous fruits (grapes, peaches, apricots, figs, etc.); (2) hazards of pesticide use to humans, honeybees, and other pollinators and the long-term effect on the environment; (3) Specific use of fungicides, insecticides, herbicides, and nematocides, including storage, container disposal, responsibility, effect on beneficial insects and mites, plant injury, temperature and compatibility warnings, and personal safety. Upon completion of training, they will be able to identify pests and diseases on nursery stock and mature trees.

3. Production and Distribution of Clean Budwood

A key objective of the HITS Stations is to produce and distribute clean budwood to the MAF-operated nurseries and, possibly, at a later date, to private nurseries. Some aspects of production have already been described in a preceding section dealing with variety improvement. The essential elements of how the clean budwood production and distribution system will be operated is developed here.

a. Production

A major objective of the HITS Stations is to produce the buds and scions needed by the nurseries in YAR. In principal, the process of producing budwood is to provide a block of mother trees that is protected from outside contamination. This is usually accomplished by selecting an area for the mother block that is isolated from other fruit trees or from vegetation that might carry disease. The block is then tested or indexed to assure the trees are disease free and then retested at regular intervals to insure that no contamination has been introduced. Buds are harvested from the mother trees. The targeted production from the two HITS Stations at the end of the project is 50,000 buds annually.

At Al Jarouba (T-SHS), mother trees from some citrus varieties were established under the previous AID-supported project (0024). The trees at this station are almost ready for obtaining budwood. In fact, some 5,000 buds were cut from these trees during early 1982. Therefore, the production of citrus budwood is well on its way at the T-SHS.

The Al Irra Station is presently sterile of vegetation. Since budwood is cut from mother trees of proven varieties, it will be near the end of the HITS Subproject before mother trees are established and producing budwood. At Al Irra, distribution of locally produced buds cannot take place for 4 or 5 years after project implementation. The procedures to be followed in the interim require further discussion and planning. Without Al Irra as a source of deciduous budwood for the nurseries in the Central and Northern Highlands, they will of necessity be limited to foreign sources.

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The Al Irra Station will initially require importation of budded trees or budwood that seem suitable for the YAR. Inasmuch as the HITS Horticulture Station has the responsibility for supplying budwood for the nurseries, it may be desirable to have the station act as agent for the MAF in acquiring clean budwood from foreign sources before production on the station can meet the need.

The MAF has a Committee for Fruit Improvement and Production in Yemen (CFIPY), which meets at irregular intervals to discuss production targets and problems relating to production of tree stock. Once these production targets are established with respect to quantities, varieties, and timing, it is up to each nursery to meet the targeted goal.

The HITS Stations must set their production targets so the nurseries can meet their goals. This can best be accomplished by having a representative from the HITS Stations on the Ministry committee (CFPY). It is proposed that the HITS station managers, in concert with the nursery managers, work together within CFIPY to assist in establishing production targets in terms of nursery outputs and station outputs. The committee should work out pricing policies for budwood and seedlings and procedures that pertain to the distribution of materials from the HITS station to the nurseries and from the nurseries to the farmers. (CID/Core advisors have participated in committee meetings in the past, and they feel their contribution was helpful. The advisors provided technical input pertaining to sources of supply for clean budwood and other advice.

4. Training at HITS Stations

Training at the HITS Stations is an important and integral part of the overall project design. This training will include both informal and formal training.

a. Informal Training

The objective of the HITS informal training programs are to provide basic horticultural and plant protection skills to all YAR extension agents, all nurserymen, and as many farmers and private sector input distributors as possible.

(1) Extension Agents and Horticulture Technicians

Training and demonstrations for extension agents will be targeted toward their role in providing technical advice and assistance to the farmers in their outreach areas. There are at the present time approximately 250 agriculture extension agents on the job in the YAR, and they are trained in the basic fundamentals of agriculture, including animal husbandry, farm mechanics, and agronomy. They are the individuals in MAF who are supposed to be in daily contact with the farmers. Unfortunately, they are not trained in the specifics of tree and vine fruit production and plant protection. HITS, through its horticulture stations, will initiate a series of seasonal short courses (1 to 2 weeks) designed to teach the hands-on basics of fruit production and plant protection. Some of the topics to be included have been discussed above under the demonstration function of the stations.

In addition to the extension agents, there are 200 technicians and 20-25 graduates of the Ibb Secondary Agricultural Institute and the Surdud Secondary School who would benefit greatly from short course training. These personnel will be offered special courses designed to meet their needs, as well as being afforded the opportunity to participate in the courses designed for extension.

Because of the push by the Ministry to have a targeted 500,000 seedlings and trees ready for distribution this year (end of 1982), the project will initiate this aspect of training immediately by using some of the MAF nurseries, including the proposed Al Jarouba Horticulture Station, Ibb Nursery, the Taiz Experiment Station, the Ibb School, and the German Plant Protection Facility at Sana'a, under the preimplementation authority of the Core Subproject (0052).

It is proposed that a series of four seasonal short courses be offered annually to 50 extension agents. At the end of 5 years, 250 agents will have been trained in the basics of horticulture and plant protection. They will also be taught where to find information for specific problems. Seasonal short courses should include the following:

Winter Course	Pruning, bare root techniques.
Spring Course	Planting, propagation, compositing, and fertilization.
Summer Course	Irrigation, cultivation, and pest identification and control.
Fall Course	Budding, dormant spray techniques

(2) Nurserymen

All nurserymen will be taught skills required for effective nursery operation and management, including budding, grafting, sanitation, pest control, and record maintenance. Nurserymen will also be encouraged to attend the series of short courses offered annually. The extension specialists trained by CID will hold demonstration training classes in propagation and pest identification and control at each nursery.

(3) Farmers

Farmers will be trained through extension agents and agricultural technicians, and each station will attempt to attract farmers, input supplies, and fruit merchants to the station on an annual basis by holding "field days." These field days will be used to show farmers and others in the fruit subsector the "fruits" of proper labor. The following might be demonstrated or observed during the field day:

- Properly pruned trees, pointing out essential characteristics;

- Fruit size and quality on trees that have been properly cared for, including insect and disease control;

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- Irrigation techniques and use of mulches for water conservation; and

- Impacts from fertilization.

As each station develops its program, farmers will be interested in seeing how station activities affect them. Field days can be used to show the farmers where he can go to get help. Additionally, the training received by the extension agent can be passed on to the farmer.

b. Formal Training

HITS proposes to have at least one horticultural extension specialist for each region of the YAR (there are ten regions) trained and on the job at the end of the project. In order to allow for inevitable loss of some personnel, HITS proposes to train four or five individuals annually for each of 5 years. These persons will be selected from among existing or proposed staff in the provincial agriculture office for more concentrated training in horticulture. They will provide technical backstopping to the work of extension agents and agriculture technicians in these offices. They will work with the local nurseries and private sector input suppliers and fruit merchants.

Individuals interested in specialized horticulture and/or plant protection[6] will be selected from the annual short courses and encouraged to pursue more in-depth training. This training will involve a 6 to 9 month internship at Jarouba or at Al Irra or both. During this period, individuals will receive short courses in U.S.-style classroom education at the horticultural station as well as practical experience in fruit production, nursery operation and management, and plant protection. From this group, five highly motivated individuals will be selected for formal training at the B.S. level in the U.S. where they will specialize in pomology, tropical fruit production, and/or plant protection (e.g., entomology, plant patnology, or virology).

5. Design and Improvement of Stations

The value and need for two horticulture stations has already been presented. This section describes the proposed physical facility, the necessary equipment, and staff needed to carry out the functions, including duties or job descriptions.

a. Al Jarouba (T-SHS)

This 11-hectare site is presently being operated under the presubproject implementation authority of the Core Suproject (0052). The preimplementation plan was to complete the work started by the AID-funded project (0024) of producing budded citrus trees for distribution in the YAR. Under project (0024), 100,000 seeds were planted in a shade house to produce seedlings for eventual budding. The transplanting of the seedlings and the budding was accomplished under the Core Subproject (0052). Budded trees are presently being distributed.

The T-SHS site consists of a small weather station, a large shade house for large seedlings planted directly in the soil, a smaller shade house for propagation and growing of seeds in pots, a bunkhouse for budders, two wells with pumps, water storage tank, unlined reservoir, a diesel generator for power, a small shop, and a house trailer for overnight visits. In addition, it has the following plantings of tropical, subtropical, and citrus trees in various stages of growth:

- Citrus (various varieties)-about 600 semi-mature trees
- Papaya - approximately 150 trees
- Mango - approximately 20 trees
- Anona - approximately 50 trees
- Banana - approximately 200 trees
- Lemon Guava - approximately 4 trees

A schematic of the facilities that presently exist and their location is shown in Section III of this annex.

(1) Proposed Facilities

The proposed facilities, from AID funding, are mimimum requirements for sustaining the functions intended for the station. They include:

(a) Permanent housing for a station manager and horticulture technician (two houses). These personnel and their duties are described later. This housing must be comfortable for year-round living with provision for air conditioners and other modern conveniences. There are several advantages to having two of the expatriate staff live at the station. First, since Al Jarouba is in a relatively remote location, too much time is lost in making a round trip between Hodiedah and Jarouba each day. There are no suitable housing accommodations in nearby villages or towns. Second, effective management of the station is not an eight-to-five job. Oversight of the station during times other than regular work hours will often be mandatory. Plants in critical stages of plant growth, irrigation, taking weather data, etc., may require attention during off-duty time.

(b) Improved shade house facilities. The previous shade house was blown down in a windstorm last year. It is presently being rebuilt under the authority of the Core pre-subproject activity. The hot humid summers make this facility necessary in order to protect small seedlings and plant materials from the sun.

(c) Renovate existing bunkhouse facility and develop it into an office-classroom complex that is also suitable for overnight housing of trainees. Space is needed for management and classroom-type training. During short-term and long-term training, overnight quarters are needed to house trainees due to the remoteness of the Jarouba Station.

(d) Storage Shed and Workshop

These buildings, although small, are needed for equipment repair and storage. The remoteness of Al Jarouba requires security for equipment and some independence from repair shops in Hodiedah. At certain times during station operation, timing of repairs may be critical and some capability in this respect must be available. Many of these recommendations and requests for station facilities have come through the experience gained in operating the Jarouba nursery during the presubproject implementation stage.

(e) Fumigation Shed

This is a very low cost structure and need not be very large. It will be used to clean up trees and other plant materials before sending off to the station. This structure is necessary to carry out the plant protection functions at the station as well as for training.

Additional information in the form of sketches and specifications for each of the above items are found in Section II of this annex.

(f) Proposed Equipment

- Small orchard tractor to be purchased locally. The tractor should be 20-25 hp that can be equipped with orchard fenders and modified for orchard use.

- Rototillers (walk behind model) to be purchased locally so that parts may be obtained easily.

- Insecticide spray equipment for controlling insects in the nursery area and for the mother trees.

- Irrigation equipment and supplies for developing irrigation type demonstrations in connection with training operations.

- Miscellaneous shop equipment and supplies.

All of the above equipment is necessary to carry out the functions of the station described earlier.

(g) Weather Station

A few instruments exist at this station for collecting weather data, but they need to be replaced so that consistent, accurate data is obtained. Weather data is essential in managing a nursery and in propagating plant materials. The components of the weather facility should be the same as that specified later in this report.

(2) Staffing

The following is a list of expatriate personnel, counterparts, and laborers needed for managing and operating the station. Their job descriptions and qualifications are provided in Annex N.

Minimum Staff Requirements at Jarouba

Job Title	Number Required	Supplied By
Tropical-Subtropical Horticulturist (Station Manager - Fruit Specialist)	(1)	CID
Horticulture Technician	(1)	CID
Station Manager Counterpart	(1)	MAF
Horticulture Technican Counterpart	(1)	MAF
Farm Mechanic (0.5 FTE)[7]	(1)	CID
Farm Mechanic Trainee	(1)	MAF
Guards	(2)	MAF
Laborers	(6)	MAF

(3) Project Implementation at Jarouba

Since most of the preproject implementation has been directed toward activities at Al Jarouba, they are discussed here. However, some of the activities were nationwide in scope.

The 1981-82 CID Core Subproject work plan proposed several significant outputs, but, in general, it proposed a smooth transition of the horticultural activities from Project 024 (terminating September 30, 1981) to Project 052 and continuation of new impact-oriented activities initiated under the Core interim work plan.

During this past work plan year, California State Polytechnic University at Pomona was approved as the lead university for the horticulture subproject. The CID Core staff, with advice and assistance from CSPU, hired several staff to administer and operate the transitional program. The staff hired or utilized to manage the preimplementation activities included the following:

- Horticulture Advisor
- Horticulture Specialist (manager of the Jarouba Station) who previously served on Project 0024
- Horticulture Technician
- TCN Horticulture Technicians (two individuals were hired who had served on Project 0024, one was assigned to Al Jarouba)

Local Labor (the staff was expanded at Jarouba

The horticulture advisor has worked very effectively within the MAF to establish relationships which will enable the subproject to function

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smoothly. The Horticulture Advisor, in concert with the CID Core Agriculture Advisor and the Agriculture Planning Advisor, developed a great deal of background information and made many contacts which were vital during the preparation of the horticulture subproject paper. Also, during this work plan year, the MAF provided counterparts for the Horticulture Advisor and all four of the technicians working on the preproject program.

A CID TDY specialist came to Yemen in August and September 1981 to assist in the implementation of the horticulture activities. After his arrival in Yemen, one of his responsibilities was to assist USAID in development of a horticulture SPID. A draft SPID was prepared in late September 1981, then revised and formally submitted to AID/Washington in March 1982.

During the summer of 1981, under the combined support of Projects 0024 and 0052, 15 extension agents were trained at Al Jarouba in the skill of grafting budwood onto citrus seedlings in anticipation that they would assist in the budding process at the Al Jarouba Station during the early months of 1982. During the fall of 1981, approximately 55,000 citrus seedlings were transplanted from the shade house to irrigated plots where they were established for the budding process. Fifty thousand buds were ordered from Valencia, Spain, in August 1981 to be used to graft onto the seedlings that had been planted. Due to delays in receiving the buds from Valencia, 5,000 buds were ordered from the U.S. and were taken to Jarouba in March 1982 where the budding process was initiated. The Ministry of Agriculture supplied 25 budders who were trained and began to graft the budwood immediately. Soon thereafter, an individual from AID/Y arranged to hand-carry the budwood from Spain to Yemen. Within 3 weeks after the arrival of the budwood from Spain, the trained budders and the Core/Y staff completed the budding process. Overall, there was excellent cooperation between the MAF and CID personnel to accomplish the difficult task of budding the citrus seedlings. The YARG Prime Minister and the Minister of Agriculture visited the Jarouba Station in March 1982 and were very pleased with the results they observed.

The Core/Y staff at Jarouba distributed about 1,500 non-budded citrus seedlings (YR 10 each) to farmers in the spring of 1982. Core/Y will work with the MAF staff in the distribution of all seedlings and budded trees grown at Jarouba. Improved distribution procedures will be developed during the next work plan year.

An underground pipeline was completed to link the two wells at the Jarouba Station to provide an efficient and effective underground irrigation system for the citrus plantings. An existing building at Jarouba was renovated and serves as housing for the budders and a workshop for the staff. Problems with the electrical generation systems were overcome and adequate electricity is provided for the out buildings and trailer home. A wind and hail storm ruined the shade house that had been constructed under Project 0024, and materials for a new shade house were assembled and rebuilding initiated.

b. Al Irra Deciduous Horticulture Station (DHS)

The 8-hectare site denoted by Al Irra (DHS) was assigned to the project during pre-implementation activity. The site is about 17 km. north of

Sana'a and about 2 km east of the Sadah Road. The site is ideal since no fruit trees have been previously planted there. It will be possible (with proper guidance and phyto-sanitary precautions) to establish a disease-free block of trees for most deciduous varieties of the YAR.

(1) Proposed Facilities

The facilities needed at Al Irra are similar to those requested for Al Jarouba (T-SHS), therefore, justification will be the same. Justification is not repeated herein. Items not requested at T-SHS are justified.

(a) One permanent house for station managers.

(b) One or two water wells with pumps as needed for supplying water for irrigation and portable use. (One well has already been drilled and it appears to have sufficient capacity for the station operation, however, more information will be available after the pump has been installed).

(c) An elevated water storage tank. This tank is maintained full under normal pumping operations. In the event of a pump failure, a sufficient supply is available to handle critical plant needs until the pump is repaired.

(d) Office-classroom-training building complex.

(e) Maintenance shop and generator.

(f) Equipment storage shed.

(g) Lathehouse, shade house facility.

(h) Fumigation facility.

(i) Greenhouse with heating, cooling, and humidifying capacity. A greenhouse facility was not needed at the T-SHS since the climate in the Tihama is similar to that found in a greenhouse. However, in the central highlands, winter nights are very cool, days are warm and dry, all of which are not conducive to optimum growth of seedlings, cuttings, and other plant materials. The greenhouse facility will allow full year round operation of the station regardless of weather conditions, thus increasing efficiency of operation.

(j) Weather Station. The station requires an area set aside for weather measuring instruments. These should include rain gauge, U.S. Weather Bureau open evaporation pan (Class A), relative humidity recorder, temperature thermometer, wet bulb temperature

thermometer, barometer, anemometer and net radiometer. The location of this station will be determined after consultations with a micrometeorologist.

Additional information about the above items is found in Annex H. A schematic sketch of the farm with the location of the proposed facilities is shown in Figure 4.

(k) Proposed Equipment:

- Small orchard tractor with cultivation attachments and orchard fenders
- Rototillers (2)
- Spray equipment
- Irrigation equipment and supplies.
- Miscellaneous tools, supplies and equipment.

The specifications for these pieces of equipment are the same as for those listed in the T-SHS.

(2) Staffing

(a) Minimum Staff Requirements at Al Irra

Job Title	Number Required	Supplied By
Deciduous Horticulturist-Station Manager-Team Leader (counterpart will be director of horticulture in the MAF).	(1)	CID
Horticulture Technician	(1)	CID
Station Manager Trainee	(1)	MAF
Horticulture Technician Counterpart	(1)	MAF
Farm Mechanic (0.5 FTE)	(1)	CID
Farm Mechanic Trainee	(1)	MAF
Guards	(2)	MAF
Laborers	(6)	MAF
Driver	(1)	CID

Job descriptions are contained in Annex N.

(3) Completed Presubproject Activities at Al Irra

An eight hectare piece of government land suitable for uses similar to those of Al Jarouba was identified by the MAF in late Summer of 1981. After considerable negotiations with adjacent land owners, the boundries of the site were firmly established in March 1982. Shortly thereafter, a fence was constructed around the boundaries and a small guardhouse placed at the entrance to the site. The land was leveled and a water well has been drilled. Preliminary estimates indicate the well will adequately serve the station. However, final well performance cannot be determined until the pump has been installed. Preimplementation authority was given to the Core Subproject (0052) to accomplish these activities.

B. Plant Protection Program (PPP)

1. Framework

An institution capable of implementing a plant protection program adapted to Yemen's needs, human resources, and institutional capabilities is of high priority if an effective tree fruit industry is to be developed. The problems of identifying and eradicating arthropod pests of citrus, and the diseases and pests of deciduous and some tropical fruits are many, but small, compared to the problems associated with certification of citrus trees and budwood. Therefore, a general plan for regulating movement of plant material in country, as well as importation of foreign material is proposed. In countries where similar plans have been implemented, the limiting factors are: The financial costs; the lack of institutional capability; the low level of trained human resources; the difficulty in training the available personnel; the tremendous difficulty in carrying out some of the necessary tasks, such as destruction of infected trees, enforcement of a spray or dip program for bare root deciduous nursery stock. and roguing of inferior or diseased nursery stock. The MAF, however, has proposed a forward looking program in the Second Five Year Plan for Agricultural Development. Support from the YARG for the HITS Plant Protection Program from should be excellent.

Revenues for operating a proper control program have been a problem. The means by which revenues could eventually be generated for such a program might include the following: Tagged duty from farm and food chemicals imported; fees for inspection of imported fruit and food materials; charge for certification of trees and budwood; and a plant protection tax imposed on all trees sold in country. HITS personnel provided by CID will advise and counsel the MAF on these issues.

The legal aspects of an adequate program have not yet been completely resolved. As indicated previosly, the quarantine law has not been enforced and the Bioregulants Act 1981 (a pesticide law formulated by Dr. de B. Ashworth et al) is still in the planning stage. Without both acts approved and enforced and adequate trained personnel and physical facilities (including laboratort backup), little can be accomplished. The HITS proposes that the YARG ratify a Bioregulants Act and begin enforcing the quarantine law. HITS includes a training program for agricultural inspectors and others to do the job.

The administrative oganization of the Plant Protection Program is shown in Figure M-3. It is to be a department under a director who administers two sub-departments: (1) Quarantine and inspection; and (2) pesticide and environmental standards. A committee of plant protection experts consisting of donor personnel and an MAF representative, act as the director's advisory group. The lines of authority and responsibility are outlined in Figure M-3.

The optimum plant protection group for the YAR would consist of: An entomologist; a nemotologist; an herbicide specialist; an organic chemist-toxicologist; and a plant pathologist. They would be a part of the Plant Protection Department (PPD) of the MAF, with its own director, and advised by a committee consisting of plant protection specialists from the MAF, USAID/CID, and the German project. The organization of the Plant Protection Department shown in Figure M-3 is a modification of the recommendation in the German Plant Protection Proposal and by de B. Ashworth, who proposed the law to control pesticides (1981).[8]

The procedures for carrying out inspection and quarantine can be divided into three components: (1) In-country nursery inspections; (2) movement of plant materials and pesticides; and (3) port and airport inspections of plant materials, fruits and pesticides.

As soon as possible, the PPD should establish policy relating to the labeling of all materials used on plants and plant products. Simplified labels, with warnings and clearly understandable dosages (e.g., the bayer spoon measure, widely used in many parts of the world for mixing chemicals), should be utilized.

The relevant target diseases and pests include: Bacteria, fungi, viruses; nematodes; insects; mites; and other animal pests which attack plants and plant products. Dr. Werner L. Gassert and his German Plant Protection Group, Dr. Joseph Bove, the French plant pathologist, and the horticulture design team have surveyed some of the citrus and deciduous plantings and nurseries in the YAR. The diseases and pests, which must be controlled, eradicated or kept from being introduced, have been summarized and are presented in Attachments 1-4 to this report.

Testing procedures for proper identification and diagnosis of plant pathogens and arthropod pests are needed. This entails not only the physical facilities and equipment (e.g., laboratory, insect proof screenhouse, microscopes, chemicals, indexing plants, autoclave, oven, incubator, etc.), but also (a) a laboratory director, who can call on an nemotologist to identify the nemotodes, (b) an entomologist, to identify all stages of the insects and mites and plant damage, and (c) a plant pathologist, to identify the plant diseases and index the citrus in-country to ascertain the presence or absence of citrus viruses, mycoplasma and viroids. Without the trained human resources, there cannot be an adequate plant protection program. A detailed description of informal and formal training needed in plant protection is presented in Section II C of this technical analysis.

One of the first actions of the PPD must be an in-country survey of pests and diseases. Following this, an eradication program for existing diseases and pests can be formulated. It may be that only control procedures

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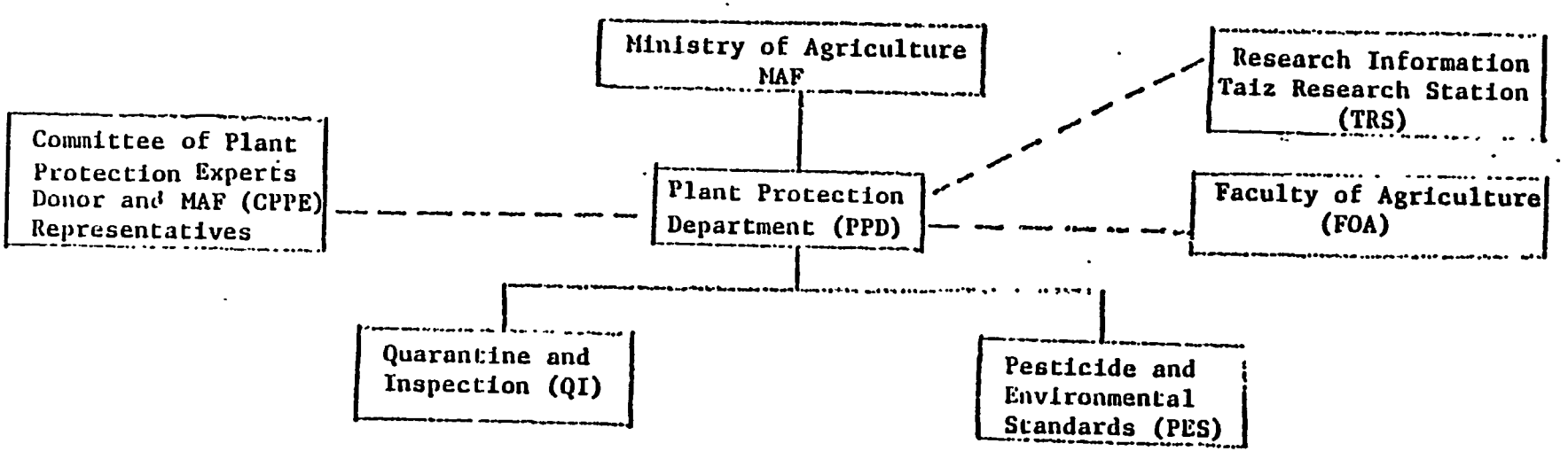

Figure M-3: HITS Proposed Organization of the Plant Protection Department (modified from models proposed by the German Plant Protection group and de b. Ashworth GTZ and FAO consultant).

(8)

should be initiated, because eradication may not be economically, or otherwise, feasible. Some pests and diseases can be economically controlled although eradication is not easily accomplished. After an evaluation of the in-country survey, a plant protection program for fruit crops can be initiated utilizing a publicity campaign to increase public awareness of the potential costs and dangers, and to request public support.

2. Goals and Objectives

The goals and objectives of the PPP are:

- To prevent future loss in agriculture by preventing the introduction of foreign diseases and pests.

- Increase crop production by the control and eradication of those problems already in the YAR.

The director of the PPD (under the advice and expertise of the CPPE) directs the two sub-departments.

a. Subdepartment 1: Quarantine and Inspection (Q.I.)

Duties:

(1) Continually upgrade and train extension agents and inspectors by utilizing field work, and the plant disease and pest diagnostic clinic and laboratory. The laboratory must be equipped with facilities to identify diseases and pests.

(2) Support domestic quarantine and inspection of nursery stock.

(3) Carry out inspections of pesticides, plants, soil, fruit, and nuts at airports and other ports of entry.

(4) Train on-the-job agents, teachers, inspectors, and nurserymen to be capable of distinguishing between major diseases and pests in-country, as well as to be aware of the major foreign diseases and pests which might be introduced.

(5) Inform all levels of the latest problems, and recommend controls which farmers and nurserymen should utilize.

b. Subdepartment 2: Pesticide and Environmenal Standards (PES)

Duties:

(1) Collect, interpret, and disseminate pesticide information for the YAR (maintain and keep current a library and laboratory).

(2) Inform public and farmers as to the hazards of pesticides used in-country, and those to be made available.

(3) Inform importers of chemicals about labeling requirements with regards to rating and hzards.

(4) Use and coordinate personnel in other subdepartments to help carry out publicity campaigns, including recruiting for all areas.

(5) Pass on to all subdepartments, information concerning human and environmental hazards associated with the use of certain pesticides.

3. Staffing Requirements

Job Title	Number Required	Supplied By
TDY Plant Protection Specialist	(1)	CID
Plant Protection Specialist	(2)	CID
Lab Technician	(1)	CID
Plant Protection Specialist-counterparts	(2)	MAF
Lab Technician Trainee	(2)	MAF
Agricultural Inspector	(5)	MAF

Detailed job descriptions are contained in Annex N.

4. Plant Protection Training Program

A training program for inspectors, extension agents, and nurserymen will be developed and implemented. It will include emphasis on: (a) Identification of diseases and pests on tropical fruits (bananas, mangos, papayas, etc.); subtropical fruits (citrus, especially); and deciduous fruits (grapes, peaches, apricots, and figs); (b) Hazards of pesticide use to humans, honey bees and other pollinators, and the long-term effect on the environment; and (c) The specific use of fungicides, insecticides, herbicides, and nemotocides, including storage, container disposal, responsibility, effect on beneficial insects and mites, plant injury, temperature and compatibility warnings, and personal safety. In order to attract and keep qualified personnel, radio and newspaper advertising for positions, salary, and training incentives may be necessary.

a. Informal Training

Training will emphasize practical, day-to-day activities.

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b. Formal Training

Training of inspectors, nurserymen and extension specialists will begin with short-courses at existing facilities. The Taiz Experiment Station and German Plant Protection facility will be utilized as well as the HITS stations. Five highly motivated individuals selected from the informal training courses will be sent to the U.S. for more extensive training in agricultural inspection. They will work for 6-9 months with an organization such as the USDA. Several of these individuals may also be trained at the B.S. level.

Formal education at the M.S. or Ph.D. level will be provided to two individuals in the areas of plant pathology, entomology, or plant nematology. CID will remain actively involved in the plant protection program until these individuals have returned, and are successfully incorporated into the program.

5. Activities

Quarantine and inspection work will occur primarily at the Port of Hodiedah and at airports, where most plant materials and chemicals enter the YAR. Spot inspections will also be made on the road out of Sadah as plant materials may also be coming into the country through Saudi Arabia. Inspection and regulation of nurseries will also be an important function of this program.

C. Training

Training is the fourth general type of output in the project design to achieve project purpose. Training has been recognized by CID and AID/Y as the greatest need within the YARG. Yemen's scarcity of adequately trained personnel at all levels is recognized, and the government is attempting to identify means by which it can overcome this problem. The YARG is making a great effort to upgrade its staff through both short- and long-term educational programs. Assistance is needed in carrying out the goal. Trained personnel are needed to achieve the project purpose of developing an expanded institutional capacity within the MAF.

Training in the YAR, through the horticulture stations and on-the-job training for plant protection work has already been addressed. The training in YAR will consist of informal (short- and medium-term) and formal training (short- and long-term).

1. Degree Training--U.S.

From all groups trained in the YAR under the HITS, eight highly motivated individuals will be selected to receive formal degree training at the B.S. level in the U.S. Three from this group will receive B.S. level training in Plant Protection, while the remaining five will be trained in horticulture (fruit production). Four additional participants will be selected for training at the M.S. and Ph.D. level, i.e., one at the M.S. level and one at the Ph.D. level in Plant Protection and horticulture. One of the horticultural advanced degree participants should be trained in Tropical-Subtropical fruits (preferably University of Hawaii), and the other in deciduous temperate-zone fruits at a CID university.

2. None-Degree Training--U.S.

In addition to the above, six participants from the informal and formal training program will be selected to receive short-course training in both horticulture and plant protection, three in each discipline. This training will complement the training received at the two horticulture stations, and will provide an excellent base from which YARG can supply the technical expertise in increasing fruit production.

All trained participants will return to key functional positions within the MAF.

D. Communications and Use of Media

The final aspect of the project design deals with an output that focuses upon the beneficiaries directly. As previously mentioned, considerable effort in the HITS is directed toward training and activities which will have an impact upon the beneficiaries through extension. Extension agents will be trained, horticulture extension specialists will be trained for each of the ten provinces, and HITS Horticulture Extension Specialists at the HITS Stations will backstop the overall extension program. The HITS Extension Specialists will, together with the horticulture extension specialists at the provincial level, provide the vital linkage between the extension field workers and research.

The the extension aspects of the HITS program, the direct beneficiary, namely the farmer, is not contacted directly by a HITS staff member. HITS will be working through an intermediary, i.e., the Extension Department. The extension agents are expected to rely heavily on personal contact and on group meetings to extend technology to the farmer. The differences between what is proposed in the HITS extension program, and some that have failed, are the inclusion of the Extension Specialists. The two Specialists located at the HITS Stations, and the ten Horticulture Specialists in the regions are expected to provide what has been missing in many LDC extension programs, namely something to extend. With the help of the specialists, the agents should be well trained, motivated and resourceful. They should be effective. However, the design team recognizes that there are still limitations to the approach. It is not likely that the HITS targets for fruit production will be achieved if this is all that is done in terms of outreach to farmers.

The HITS design includes reliance on an additonal approach that goes directly to the beneficiary. The key is to use mass media, especially TV and radio, as a means of communicating directly with the rural farmer. The MAF currently uses short, weekly TV programs and newspaper spots to provide information on improving on agricultural production. The response is reported to be good.

Mass illiteracy is a serious problem in the YAR. However, the situation is unique, because television is found in about 80 percent of the homes. This fact opens up the opportunity to make direct contact with fruit producers, both the subsistance and orchard producer, and others who can exert a good influence on them. Properly designed TV and radio programs will not only encourage farmers to venture into fruit production, but also encourage

them to adapt the technology needed to achieve high production levels. Use of TV partially solves the problem of communicating with the illiterate farmers.

The constraint to the MAF making more effective use of TV and radio is that specialists trained in TV and radio communications, are not available. To alleviate the constraint, the Core subproject work plan for 1982-83 requests a Communications Advisor to work with the Communications Department, under the Directorate of Extension in the MAF. This department has the responsibility of preparing weekly newspaper articles and TV programs on agriculture and agricultural production directed toward farmers. With this mechanism in place, and with some additional skilled inputs on programming and communications, this unit could be effective in getting extension-type information directly into the hands of the fruit producer. The HITS design calls for the following:

1. Developing a video tape file on the elements of good fruit tree management.

2. In concert with the CID and MAF Communications personnel, arranging for prime-time showings of this material during the proper season. This should coincide with, or proceed, fruit tree sales at the MAF nurseries.

3. Developing illustrated newspaper spreads regarding proper procedures for fruit husbandry. (This requires considerable ingenuity to get around mass illiteracy.)

4. Developing handouts for nurserymen to use when trees are sold. (The material should be in a form that does not require reading skill.)

Requirements to implement this aspect of the design are as follows:

1. One TDY Extension Specialist for an immediate impact before 1982 tree sales occur.

2. The two long-term (2 year) Extension Specialists working part-time with the MAF and CID/Core in developing materials for the above mentioned strategy.

3. Equipment

   a. Two portable video cameras

   b. Two video recorders

   c. Two TV sets for monitoring

   e. Accessories for developing video files for national TV.

III. CONSTRUCTION PLANS

The project design in the previous section deals with the establishment of two Horticulture stations: Al Jarouba (T-SHS) and Al Irra (DHS). All of the construction proposed in the HITS will be carried out on the station sites. The purpose of this section of the technical annex is to present the construction plans and proposed methods of construction.

A. Al Jarouba

A plan view of the 11 ha sites is shown in Figure M-4. The plan shows the locations of the proposed and existing buildings, well, proposed irrigation distribution line, plantings, weather station, and station boundaries.

1. Station Residences

Two two-bedroom residences will be constructed on an appropriate site of the Al Jarouba (T-SHS) station. For economy, the building will be of duplex type, where one structural wall will serve both residences. A concrete floor will be poured over footings and wall construction will be of cement (hallow core) block. The roof will be gabled at each end of the structure using high reflective corrugated sheet metal roofing. Adequate insulation against summer heat from the sun will be provided in the attic with ventilators to remove accumulated heat. Steel trusses must be used for the roof structure due to termites in the area. Exterior walls, including the common wall between the residences, will be insulated by filling the hollow core block with polystryrofoam or similar materials having high insulating characteristics. The insulation in the common wall is necessary for sound proofing to increase privacy. The building will be wired and plumbed using American standards as a code. One septic tank and drain field will be constructed for the duplex using a standard American code on size of tank and drain field according to the number of persons that will occupy the residences. Only one bathroom will be provided for each residence using back-to-back plumbing for economy. The structure will be built upon naturally occuring high ground or upon compacted fill that is two feet above the nearest natural drainage path. (On occasions, intense summer storms cause surface flooding in the area and some protection against such occurences must be provided.)

2. Renovation

An existing structure constructed by a previous donor will be renovated and modified for use as a classroom, office, and trainee dormitory. The size of this structure is 7.5 m x 24 m. The office and classroom facility will be constructed in one end of this rectangular structure, using cement block as material for the partition walls. These two rooms will have a stucco finished interior wall with adequate overhead lighting (fluorescent). The office room will have a toilet and basin with appropriate plumbing separated from the office by a partition.

The dormitory facility will be extremely modest, with a small kitchen, dining room and two bathrooms containing a shower, basin and commode. Three sleeping rooms will each sleep four persons and contain a built-in desk

JAROUBA STATION /11/

1. Weather station
2. Existing old shade house
3. Proposed dormitory-classroom office area
4. Trailer house (temporary)
5. Newly constructed shade house
6. Reservoir
7. Elevated water tank
8. Pump No. 2
9. Lime seedling plantation (old shade house)
10. Future residence
11. Pump No. 1

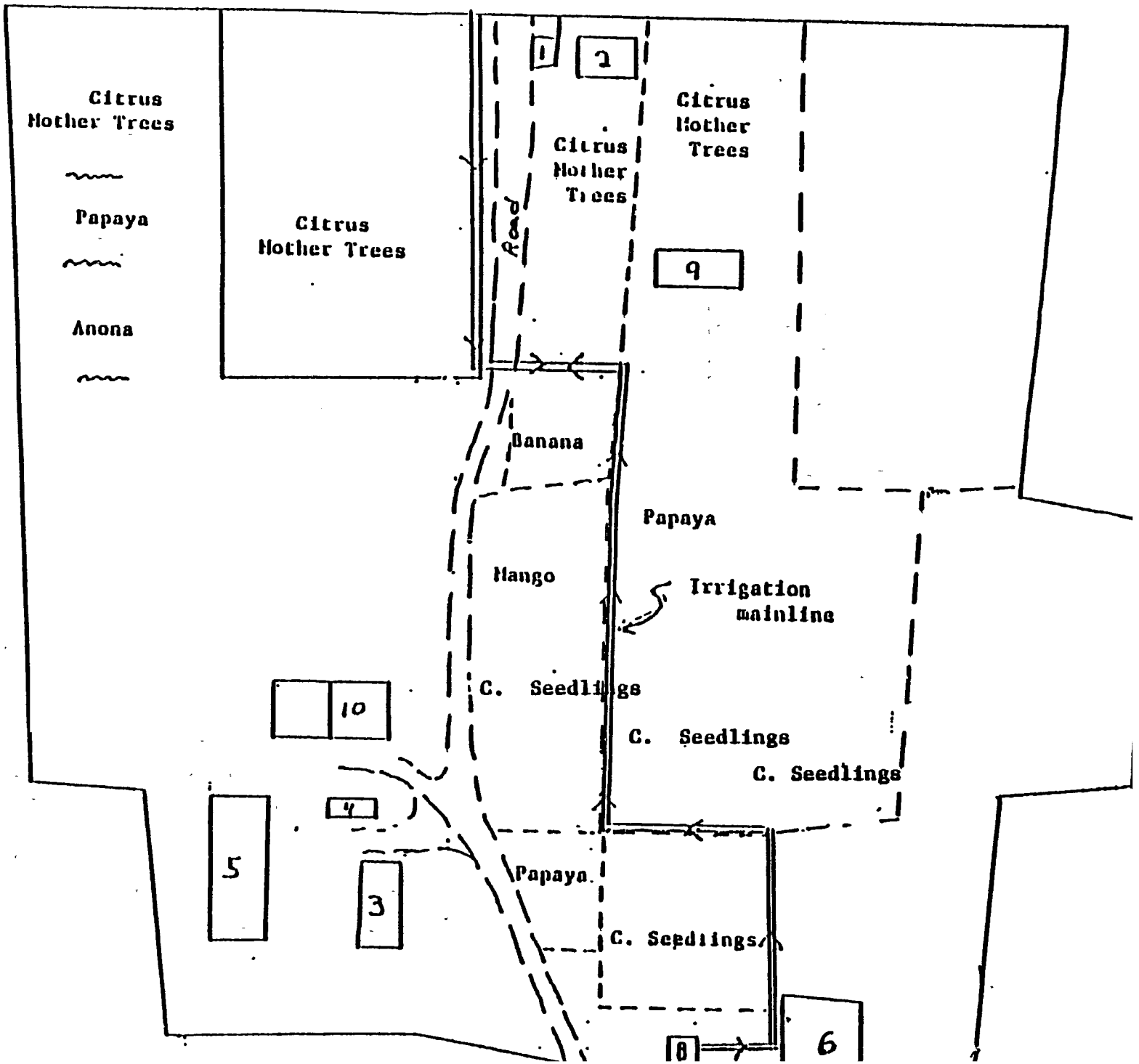


Figure M-4

to accommodate all four persons at the same time. A septic tank and drain field are already in place for this building.

3. Irrigation System

An irrigation system will be designed to carry water from the wells, through the station plantation plots, to supply water as needed for irrigation. The primary method of irrigation will be by a surface gravity system. Solid transite or plastic pipe will be used as the mainline as shown in Figure M-4. Alflafa type valves will be used to control the water at the distribution points. About 5,000 meters of pipe will be designed by an irrigation engineer on short-term TDY

4. Fumigation Shed

Even though this is a low-use building of minimum specifications, the construction must be of cement block above a concrete floor. Termites are a serious problem. It is not possible to use wood, as it will not last more than one year. This building will consist of four walls and a sloping metal roof. Some plumbing will be necessary so that plant materials can be washed and chemical solutions prepared. It must also be kept secure to prevent unauthorized contact with chemicals and fumigants.

5. Equipment Storage and Maintenance Shop

This structure will be constructed of cement block and concrete floor with single sloped roof of currugated sheet metal. The upper half of the front face of the storage section can be opened for air circulation, but covered with wire mesh to maintain security. The maintenance shop should be of four-wall cement block construction and can be part of the same roofed structure used for storage. There should be a large door for accomodating a tractor or vehicle. Overhead lighting will be necessary in the shop area, but minimal lighting is required in the storage area.

6. All construction will take place only after plans and blueprints have been made in consultation with local contractors and architects.

B. Al Irra (DHS)

The eight ha Al Irra (DHS) site is shown in plan view in Figure M-5. The plan shows proposed plot construction and the general area where buildings will be erected. Figure M-6 is an expanded plan view of the building area.

1. Residence Building, Office - Storage - Classroom, Equipment Storage and Maintenance Shop

These three buildings will be similar in appearance. Given the climatic differences between the Tihama and Central Highlands, some variance in construction from that described for the T-SHS at Jarouba will be necessary. The basic structural components will be similar to that described for Jarouba, i.e., cement block, concrete floors, but the roof trusses, rafters, and ceiling joists, can be constructed from wood since termites do not live in the central highlands. Every attempt should be made to have the exterior and roof lines blend into the existing Yemeni architecture. The

AL IRRA STATION
METHODOUS HORTICULTURE
8 HECTARE

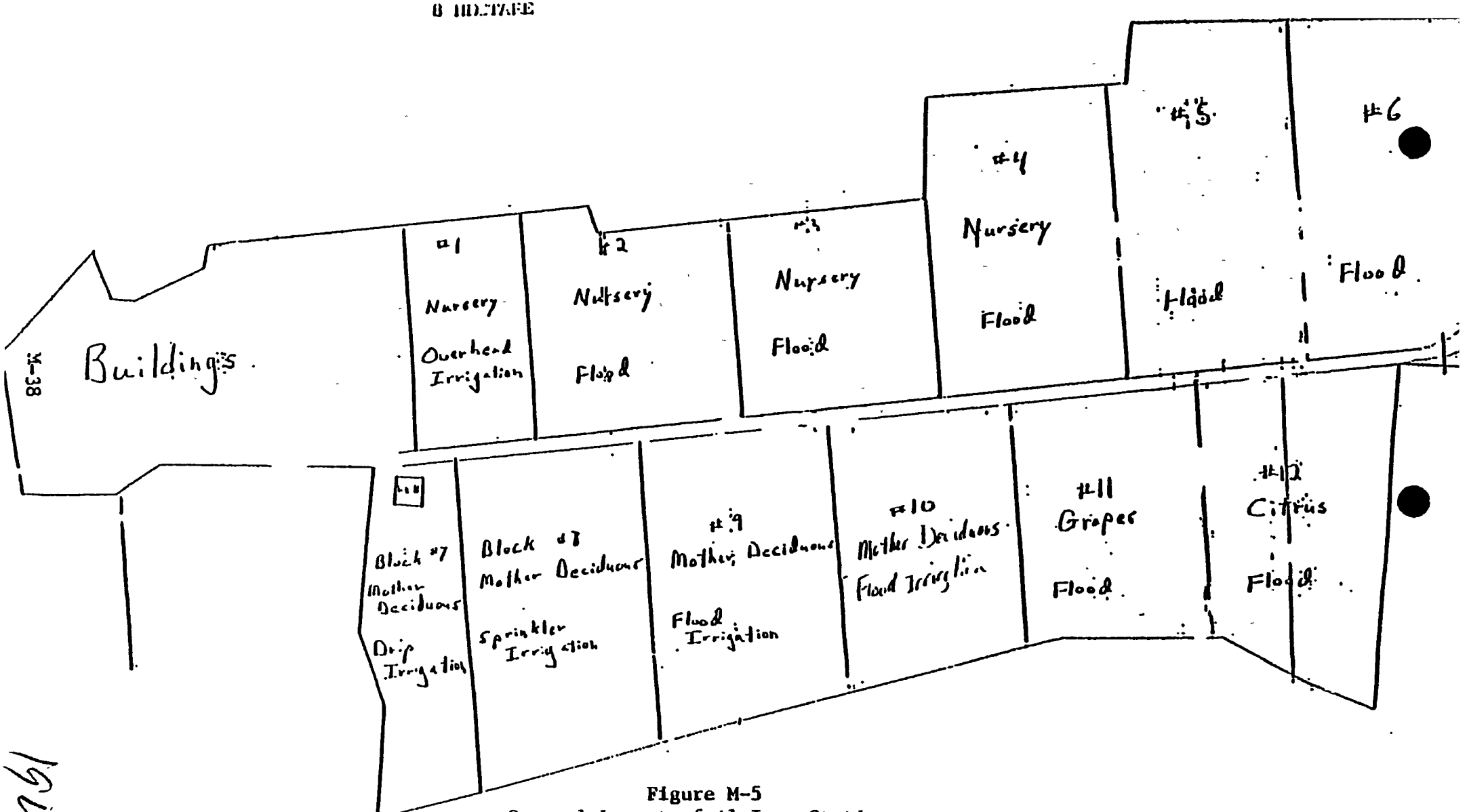
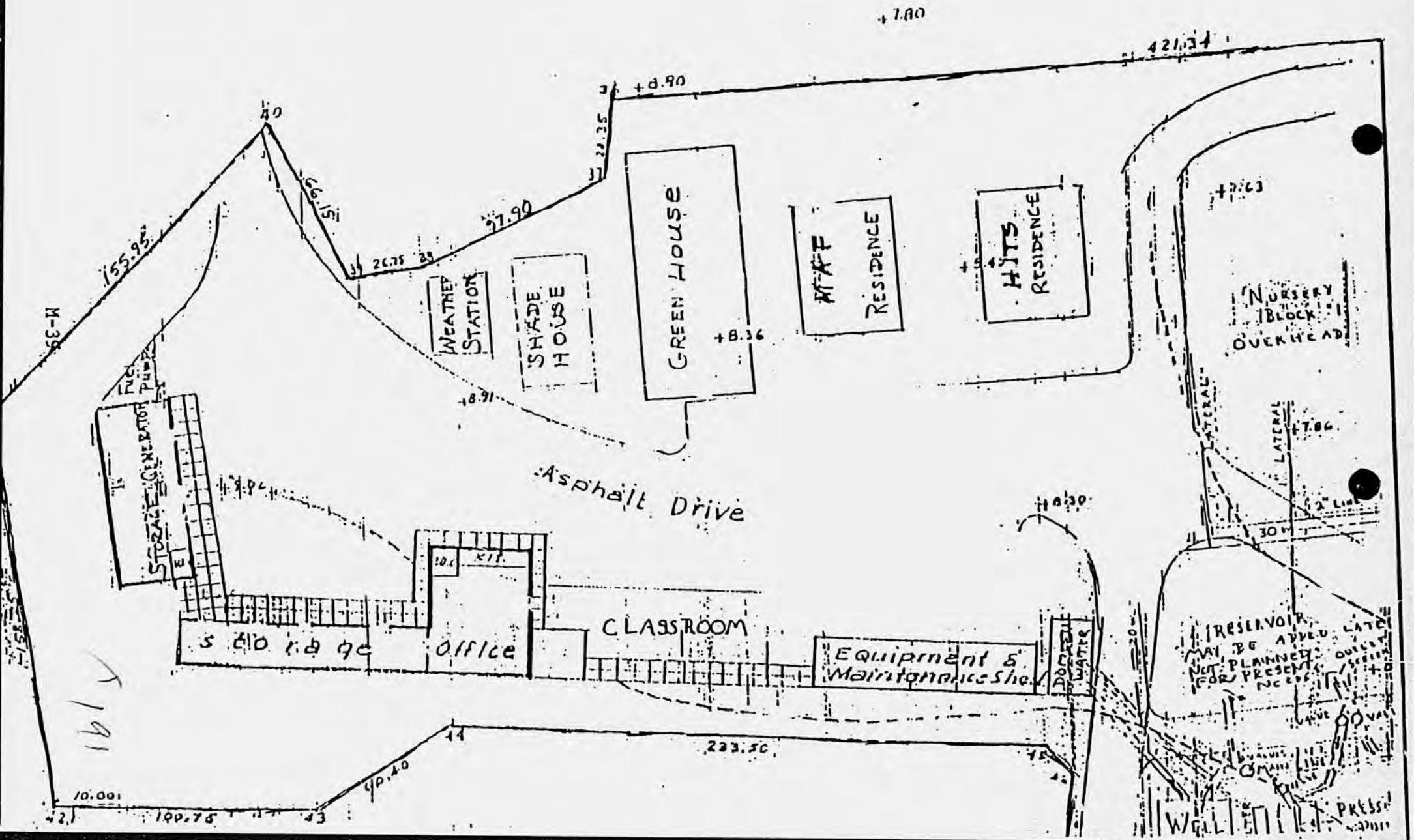


Figure M-5
General Layout of Al Irra Station

Al Irra Station

Building Layout



residence will not be required to have air conditioning, but some winter heating equipment may be necessary. Plumbing will be required for the office, such as a toilet and sink. Adequate overhead lighting will be required for the classroom, office and shop, but minimal lighting is needed in the storage areas. The classroom will require a toilet and sink. Outside or portable toilets should be provided for laborers in the nursery work area or in the maintenance shop. Septic tanks must be provided for these plumbed areas along with a drain field. It may be possible to design a single septic tank and drain field that will serve all plumbed buildings. In any event, human sanitation in the field or nursery areas will be important. The classroom facility should be adequate for 15 students.

2. Greenhouse

The greenhouse should be of standard U.S.-type construction consisting of a concrete floor, side walls of cement block up to a hight of 1.5 m. The frame work for the glass panes should be mounted upon the cement block sill. The frame should be prefabricated in the U.S. and disassembled for shipment to Yemen. Locally purchased glass should be used for the glass frames. The house should be equipped with heating and cooling equipment with humidifying capacity. This may be accomplished by proper design of the heating and cooling equipment through ventilation control.

3. Shade House and Housing for Generator, and Fumigation Shed

A shade house, consisting of pipe stands set in concrete to form a framework upon which to hang or attach shade cloth, will be adequate for this structure. The floor will be earth. The spacing of the vertical stands to support the horizontal cross members need to be of adequate size to support itself and wind forces that would be created against the shade cloth material. Local CID staff should be able to provide the guidance and design of this unit without outside consulation. The housing for the generator will be similar to that already described in subsection B-1 above, but it is important to establish a concrete slab outside the building to support the fuel tank for the diesel-powered generator. Standard U.S. Code should be followed. The fumigation shed needs only to consist of a cement block building, similar to that described for Al Jarouba (T-SHS). It must have a door and windows that can be locked and opened for ventilation.

4. Paving

The area immediately in front of the residences, shop, and office area as noted in Figure M-5 should be paved with asphalt. The asphalt can be no more than 5 cm thick since no through traffic occurs in this area and since traffic loads will be light.

5. Well and Irrigation System

The construction of the well has already been initiated under the preimplementation authority of the Core subproject (0052). The well has been terminated at 150 m in a good water-bearing aquifer. The well appears to be producing more than the average well for the area. A well test will be performed to establish the discharge-drawdown relationships. This information will permit installing a pump of proper size. The maximum available discharge

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will be obtained. Based upon an average water requirement of 5,000 m^3 per year per hectare, and 7.5 ha under full growth, the average water supply rate should be about 71 liters/min. If half of this amount is supplied by precipitation, an average of about 35 liters/min. would be required on the average. If the well produces less than this average computed flow, then an additional well will be required. The well should be cased with 30 cm casing down to about 100 meters. The size can be reduced to 20 cm thereafter with perforations in the water-bearing aquifer of size consistent with the well drillers' experience in the area.

An irrigation system will be required to supply water for the area shown in Figure M-6. Various types of irrigation methods are shown in the figure. An irrigation system should be designed that will carry water by an underground pipe line to each plot. Appropriate control valves are needed along with mainline for water distribution. In general, surface distribution methods will be used, but some trickle (drip) methods should be used to demonstrate watersaving methods. The system should be designed by an irrigation or agricultural engineer and specifications should be developed based upon types of demonstrations anticipated.

C. Certification

The USAID regional engineer, Mr. Jim Kasanos, was shown the Al Irra site well construction, and proposed building plans. He has agreed with the author of the technical annex, that these preliminary plans and estimates are reasonable, and costs are consistent with those in the local area. We agree that engineering plans and specifications should be developed in cooperation with a local A & E firm before any construction is initiated. All the above is in accordance with section 611(a) of the F.A.A.

Section 611(b) of F.A.A. applies to water development projects. However, since the water development aspects of this project are small, this section should not apply to the HITS.

Original signed by:

Royal H. Brooks, Ph.D., P.E.
Associate Program Director of
the Yemen Title XII Agricultural
Development and Support Program
and Agricultural Engineer,
Oregon State University

IV. DATA COLLECTION

In addition to the data collection scheme suggested in the economic analysis (Annex L), data collection procedures are to be established at each station. As a minimum, an accurate log is to be kept at each station showing quantities, locations, and types of incoming and outgoing materials. Logs of operating expenses should be kept also. Data should be recorded on all formal or informal experiments dealing with development of new stock, water experiments, fruit production from all trees, budwood developed, and volume produced. These are but a few illustrative requirements. Other requirements are the data needed for project evaluation.

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FOOTNOTES TO ANNEX M

[1]Water Policy Initiatives for Yemen, G. Bernhard, et. al., CID Yemen Report 052-1980-1, September 1980.

[2]Report Evaluations and Recommendations on Yemen Extension Services and Secondary Agricultural Institute Program by J. Clark Ballard, July 1980.

[3]Obviously, each variety of fruit tree will have its own characteristics with respect to water uptake and transpiration. But these data show at least the correct order of magnitude. The estimates were obtained from Isrealsen and Hansen, "Irrigation Principles and Crops," Third Edition.

[4]Table M-1 is a list of most of the nurseries in YAR and their estimated 1982 stock. Included in this table is the stock at the Core operated nursery at Jarouba.

[5]Pomology Improvement and Training Subproject would result in the acronym "PITS" producing a connotation that the team wanted to avoid.

[6]Training in plant production aspects of fruit production is discussed under Section IIB.

[7]Half-time at Al Irra also.

[8]See reference in Annex D (Environmental Analysis).

ANNEX M

Attachment 1

Citrus Diseases in the YAR

Following is a partial list of Citrus Diseases which may be in the YAR as a result of importation of trees and/or budwood.

	Name	Cause	Reported From
1.	Cristacortis	Virus	Algeria, Corsica, Morocco Sardinia, Sicily, Spain
2.	Exocortis	Viroid	Australia, Brazil, California, Florida
3.	Greening[1]	Mycoplasma	Southeast Asia, South Africa
4.	Impietratura	Virus	Argentina, most Mediterranean countries
5.	Stubborn (Safargali)	Spiroplasma	California, most Mediterranean countries
6.	Tristeza[2]	Virus	World Wide
7.	Xyloporosis	Virus	Mediterranean countries, U.S.

[1]Known also by the following names: greening diesback, Huang Lungbin, Leaf Mottling, Likvbin, Reticulateyellavi, Vein Phloem Degeneration, Yellow Shoot. One of the vectors, the citrus psyllid, Trioza erytreae, is widespread.

[2]Known also as: Seedling Yellows, Bud Union Decline, Quick Decline. Probable vector occurring in Yemen Aphis gossypii and other possible Aphis spp.

ANNEX M

Attachment 2

Sources of Citrus Trees/Budwood

Following is a partial list of countries from which citrus trees and/or budwood have been imported and some of the diseases which occur in those countries.

CALIFORNIA:	Citrus Nematode, Exocortis, *Phytophthora spp*, Psorosis, Stubborn, Tristeza, Xyloporosis
EGYPT:	Citrus Nematode, Cristacortis, Impietratura, *Phytophthora spp*, Psorosis, Stubborn, Tristeza, Young Tree Decline Xyloporosis.
FLORIDA:	Burrowing Nematode, Citrus Nematode, Exocortis, *Phytophthora spp*, Psorosis, Scab, Tristeza, Young Tree Decline, Xyloporosis.
INDIA:	Canker, Greening, *Phytophthora spp*, Psorosis, Tristeza.
ITALY:	Impietratura, Mal Secco, *Phytophthora spp*, Stubborn, Psorosis, Tristeza.
SPAIN:	Cristacortis, Impietratura, Exocortis, *Phytophthora spp*, Psorosis, Tristeza.

ANNEX M

Attachment 3

Diseases and Pests Found in the YAR

	Reported by
Shell Bark of Lemon: Taiz, Mauza, Surdud	1, 2
Cristacortis Mandarin on: Sour Haman Ali	1, 2
Phytophthora Gummosis: Mauza, Warazon,	1, 2
Sana'a	2
Xyloporosis: Mandarin Hamman Ali	1, 2
Greening Mandarin, Sweet Orange: Taiz,	1
Barakani-some Suspicious (?)	2
Gunny Bark, Sweet Orange: Mauza	1
Mal Secco Citrus: Haman Ali	3
Tristeza Suspicious on trees; from India and Japan at Taiz and Surdud	1, 2
Sweet Orange or Sour: Mauza	1, 2
Limes: Barakani	2
Citrus Psyllid Citrus Widespread	1, 2, 3
Citrus Black fly Citrus Widespread	2, 3
Aphis Citricola Citrus Limited distribution	3
Aphid population during June low to non-existent	2
Spider mite damage severe in most areas	2
Other insects on citrus see addition to this appendix	
Citrus Nematode Widespread	2, 3

Legend

1. Joseph Bove - France
2. J. E. Dimitman - California/CID
3. German Plant Protection Group in Yemen

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ANNEX M

Attachment 4

Deciduous Crops Diseases and Pests

Following is a partial list of diseases and pest found on deciduous crops in the YAR.

Almonds (Apricots and Peaches)

Powdery mildew, rust, Shot Hole[2]

Root Knot Nematode[2,3] Lesion Nematodes[3]

All above widespread in country and should be controlled in nurseries before sales of trees.

No viruses noted.

Grapes

Powdery mildew and root knot nematode

Widespread in Yemen

As indicated, an attempt to eradicate these two problems in nursery stock should be made. No grape viruses were observed and grape rooted cuttings should be quarantined so that viruses and their vectors are kept out of Yemen.
(Nematode vectors)

For other nematodes and pests on fruit trees, see attached survey of German Plant Protection Group.

Widepread spider mite damage in may crops.

Legend

1. Joseph Bove - France
2. J. E. Dimitman - California/CID
3. German Plant Protection Group in Yemen

ANNEX M

Attachment 5

ANNEX N

Detailed Job Descriptions

ANNEX N

Detailed Job Descriptions

I. TEAM LEADER

One of the specialists will be selected as the team leader. The person selected as team leader should have the following qualifications in addition to his technical specialty.

A. Required Qualifications

1. Experience in supervising personnel.

2. Experience in developing and implementing plans of work and budgets.

3. Working with government agencies.

4. Experience in administration.

5. Masters degree.

6. Experience developing formal and informal training programs.

7. Be able to use Arabic language at S-1, R-1 levels.

8. Position will be required for seven years.

B. Desired Qualifications

1. Previous experience in a developing country.

2. Ph.D. Degree

C. Scope of Work

1. Will work in the MAF with his counterpart.

2. Will include his counterpart in all decisions made relative to HIT's project.

3. Will develop an in-service and formal training program for his counterpart.

4. Will assist the MAF in the development of a long range fruit production strategy.

5. Will consult with MAF nurseries personnel when developing future fruit production programs.

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6. Will involve the MAF fruit advisory committee in the development of programs to be carried out by the project.

7. Will be responsible for the development of annual plans of work and budgets.

8. Will spend time working with his staff in all areas of Yemen.

9. Will consult with the COP of the CID/Core/Y project and keep him informed of subproject activities and progress.

10. Will develop a quarterly reporting system on subproject progress for use by the MAF, CID/Core/Y, USAID and YARG.

11. Will be responsible for designing and organizing the implementation of an appropriate data collection and analysis system for the project.

II. TROPICAL-SUBTROPICAL HORTICULTURIST

A. Required Qualifications

1. B.S. degree in horticulture.

2. Five years experience with tropical-subtropical fruit production.

3. Experience in fruit tree nursery management.

4. Willing to live at an isolated post.

5. Arabic language ability at the S-1, R-1 level.

6. Experience developing and implementing training programs.

7. Position will be required for four years.

B. Desired Qualifications

1. Foreign experience.

2. M.S. degree in tropical-subtropical fruit production.

3. Experience in supervising farm workers.

C. Scope of Work

1. Will be required to manage the Jarouba Station.

2. Will develop plans for the completion of Jarouba Station.

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3. Will work under the guidance and supervision of the team leader.

4. Will develop training programs for counterpart, station staff and extension agents in the tropical-subtropical areas of Yemen.

5. Will carry out and assist in the development of fruit management demonstration programs with farmers in the Tihama area.

6. Will develop a mother tree program for budwood production.

7. Will carry out testing of new fruit varieties under Yemen conditions.

8. Will hold four two-to-four week short courses and two in-depth technical courses for MAF extension agents and technicians.

9. Develop a data collection system for monitoring the tropical fruit industry.

III. DECIDUOUS HORTICULTURIST

A. Required Qualifications

1. M.S. degree in horticulture.

2. Five years experience with deciduous fruit production.

3. Fruit tree nursery management.

4. Arabic language ability R-1, S-1 level.

5. Experience in developing and implementing training programs.

6. Position will be required for four years.

B. Desirable Qualifications

1. Ph.D. degree.

2. Overseas experience.

C. Scope of Work

1. Will be required to manage the Al-Irra station.

2. Will develop plans for completion of the station.

3. Will work under the guidance of the team leader.

4. Will develop training program for counterpart station staff extension agents and farmers.

5. Will assist in development and carrying out of fruit management demonstrations programs with farmers in the upland areas.

6. Will develop a mother tree program for budwood production.

7. Will carry out testing of new fruit varieties under Yemen conditions.

8. Will hold four two-to-four week short courses and two in-depth technical courses for MAF extension agents and technicians.

9. Develop data collection systems for monitoring deciduous fruit industry.

IV. HORTICULTURE TECHNICIANS (2)

One to work with tropical-subtropical fruit production and one to work with deciduous fruit production. Technician at Jarouba will be required for three years and the one at Al Irra for four years.

A. Required Qualifications

1. B.S. degree.

2. Experience in propagation and pest management of fruit trees.

3. Experience as a nurseryman technician.

4. Willing to live in a remote area.

5. Experience in supervision of farm labors.

6. Ability in Arabic at R-1, S-1 level.

7. Be willing to live at the station.

B. Desired Qualifications.

1. Experience in irrigation development and management.

2. Experience in developing training programs.

3. Overseas experience.

C. Scope of Work

1. Will work under supervision of station manager.

2. Assist in development of plan for station.

3. Assist in training programs.

4. Supervise work at station.

5. Develop a training program for his counterpart.

6. Involve his counterpart in daily decisions of operating the station.

7. Maintain demonstration and improvement plots.

8. Assist in training programs held in various parts of Yemen.

9. Assist with off-station fruit production demonstrations.

V. FARM MECHANIC

A. Required Qualifications

1. Five years experience working with truck, tractor and other types of machinery.

2. Must be able to repair all types of machinery found on a fruit farm.

3. Willing to travel to remote areas and be away from home on extended assignments.

4. Experience in repairing equipment where limited supplies are available.

5. Experience in minor electrical wiring.

6. Ability in Arabic R-1, S-1 level.

7. Experience in supervising others.

8. Position required for four years.

b. Desirable Qualifications

1. Overseas experience.

2. Qualified electrician.

3. Experience in training of mechanics.

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C. Scope of Work

1. Will be required to maintain and service all subproject equipment at Jarouba and Al-Irra.

2. Will work under supervision of team leader.

3. Will develop a maintenance plan for both stations.

4. Will train his counterpart in the maintenance and repair of equipment at the stations.

5. Will keep an inventory of equipment and supplies and will order needed parts for equipment on a regular timely basis.

VI. PATHOLOGIST AND ENTOMOLOGIST (2)

A. Required Qualifications

1. M.S. degree in pathology and entomology.

2. Five years experience.

3. Experience developing and conducting training programs.

4. Willing to travel and be away from home.

5. Arabic language ability S-1, R-1 level.

6. Experience in identifying disease and pest of fruit trees.

7. Pathologist will be required for seven years.

8. Entomologist will be required for four years.

B. Desirable Qualifications

1. Ph.D. degree.

2. Overseas experience.

C. Scope of Work

1. Will be required to collect data and monitor plant disease and insect problems in Yemen.

2. Will work closely with plant protection advisory committee, German plant protection staff and MAF plant protection department.

3. Will develop a plant protection program for fruit sector in Yemen in cooperation with the MAF.

4. Will develop a training program for nurserymen, extension agents, horticulture techncians and MAF plant protection staff.

5. Will assist MAF in developing a program to assure farmers of clean disease and insect free fruit stock.

6. Will cooperate with two HITS stations in demonstrating the use of environmentally acceptable chemicals for insect and disease control.

7. Will develop a recommended labeling program for containers used for storing chemicals.

8. Develop public information awareness program.

VII. LABORATORY TECHNICIAN

A. Required Qualifications

1. B.S. degree in plant pathology, entomology or nematology.

2. Two years laboratory experience.

3. Arabic language ability at S-1, R-1 level.

4. Willing to travel to remote areas.

B. Desired Qualifications

1. Overseas experience.

2. M.S. degree.

3. Experience in developing training programs.

C. Scope of Work

1. Will work under the supervision of the plant protection specialist.

2. Assist in developing a plan for identifying and cataloging of plant diseases and insects for the fruit industry.

3. Assist in plant protection programs.

4. Develop a procedure for handling specimens brought to lab.

5. Develop training program for counterpart.

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VIII. EXTENSION SPECIALIST (S)

One in Tropical Subtropical fruits and one in deciduous fruits.

A. Required Qualifications

1. M.S. degree in Agricultural Discipline.

2. Minimum five years experience in developing Extension Training Programs.

3. Minimum of five years experience developing Training Programs for farmers.

4. Arabic Language ability at S-2, R-2 level.

5. Willing to travel and stay in remote areas.

6. Tropical-Subtropical specialist will be required to live in Hodeidah and the Decidious Extension Specialist in Sana'a.

7. Will work under supervision of HITS Team Leader.

8. Position required for two (2) years.

B. Desirable Qualifications

1. Overseas experience.

2. Degree in Pomology or Horticulture.

C. Scope of Work

1. Will work under the HITS Team Leader

2. Assist team in developing a Horticulture Training program.

3. Work closely with MOAF Extension Staff in Program development.

4. Assist HITS team in conducting training meetings.

IX. TDY - PLANT PROTECTION

A. Required Qualifications

1. Ph.D. Plant Pathology.

2. Experience in working with fruit diseases and insect pests.

3. Willing to travel in remote areas.

B. Desired Qualifications

1. Experience developing communication materials for developing countries.

2. Arabic speaking.

C. Scope of Work

1. Will be required to work with HITS in its early stages to develop a program for cleaning up disease and insect problems of seedlings to be sold the first year at Jarouba station.

2. Work with MAF to develop a plan to clean up diseased insect problems at YARG nurseries.

3. Will make an indepth analysis of disease and insects at the Jarouba station and make recommendations for cleaning up any problems that may exist.

4. Will be required to work 60 working days in-country.

X. TDY EXTENSION SPECIALIST

A. Required Qualifications

1. M.S. degree in Agriculture.

2. Minimum five years experience in developing Extension Training Programs for farmers.

3. Foreign experience in developing training materials.

4. Willing to travel to remote areas.

B. Desired Qualifications

1. Experience in developing extension programs in developing countries.

2. Arabic speaking.

C. Scope of Work

1. Will work with HITS technician developing training materials and conducting courses for extension agents, nurserymen and farmers.

2. Will assist in conducting training programs.

3. Will be required to work for 44 days in Yemen Arab Republic.

ANNEX O

Organizations and Agencies
Active in the Fruit Subsector

ANNEX O

Organizations and Agencies Active in the Fruit Sector

There has been much discussion of the fruit sector over the past several years by many institutions and organizations. Many of them have programs to promote its expansion. However, the programs have been on a piece meal basis and no institution or organization has addressed the total needs of/or the problems involved in changing the fruit sector from its traditional production pattern.

The following pages outline the roles that have been played by various institutions and organizations and discusses the contributions made by each.

I. USAID

USAID funded one previous project to develop a horticulture program (Tropical and Subtropical Fruit Improvement Project - 279-0024). This project failed to institutionalize the program and as a result was not especially successful, therefore the HITS program is being designed to carry on where it left off. The HITS program will succeed where the previous project failed because it avoids the problems the earlier project faced.

The USAID funded Title XII Core program has undertaken many preproject activities. The Agricultural Development Support Program strategy, approved on 12-20-1980 calls for institutional development in MAF of the type HITS envisions.

II. MINISTRY OF AGRICULTURE & FISHERIES (MAF)

The Ministry's involvement will, of necessity, be the key factor in the development of the fruit sector. MAF is the organization responsible for taking the lead in coordinating activities of all institutions involved. HITS can assist the MAF in achieving its goals by working through their counterparts to improve the relevant departments.

III. CONFEDERATION OF YEMENI DEVELOPMENT ASSOCIATIONS (CYDA)

CYDA has developed two horticulture nurseries and plans to sell seedlings and budded trees. It has the responsibility for the development of cooperatives in all areas of Yemen. Local Development Authorities located in various regions are members of CYDA. A farmer may join the local cooperative and become eligible for small loans. CYDA has asked if CID could assist it in providing training for their nursery staff and for their farmer clientele.

IV. AGRICULTURAL AND COOPERATIVE CREDIT BANK

This bank was established in 1982 through the merger of the Agriculture Credit bank and the Local Cooperation Development Bank. The bank provides short, medium and long-term loans to farmers and cooperative societies. In its five year plan it proposes to expand the banks services to all provinces of YAR. This will make available loans to small farmers and other that were not available in the past. (See Annex L, Economic Analysis for more detail.)

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V. WORLD BANK

The World Bank has financed the development of horticulture nurseries at Surdud, Ibb, Warzan, Zabeche, and Taiz. These stations have been involved in raising seedings and cuttings for sale to the private sectors. Production in 1982 has been increased to over 500,000 trees. World Bank funded personnel contracts will be terminated in the fall of 1982. The effort has been oriented primarily to station development with only a small input into the development, of the fruit industry as a whole. Management of the stations will be turned over to YARG in 1982.

The World Bank will be financing the development of a national research institution. HITS will work closely with the national institution.

VI. FAO

The FAO has been a subcontractor to the World Bank. It has provided the technicians for the development of MOAF nurseries. It has assisted in developing the irrigation systems used at nurseries in the Tihama. The FAO contracts are also being terminated in 1982. The FAO has done extensive work in developing a soils lab at Tiaz. This lab will be a valuable asset to the HITS project as it evaluates soils problems related to the fruit industry.

VII. UNITED ARABIC ORGANIZATION FOR AGRICULTURE DEVELOPMENT

The Organization provides technician assistance from Egypt and Sudan for stations at Jarouba, Hodeidah, and Ibb. These technicians also work with farmers in those areas. Most of their efforts have been in the area of crop and vegetable production, however, it has financed fruit tree seedling purchases from Egypt.

VIII. LOCAL DEVELOPMENT AUTHORITIES (LDAs)

Local Development Authorities located in various provinces, promote rural development. They work closely with the province agricultural offices and extension. They have not been involved directly in fruit development in the past. However, they are a potential source of funding for small farmers as they handle all the cooperative activities for the provinces. They are financed through CYDA. Farmers who belong to these cooperatives are eligible for assistance. LDAs will also be involved in the developing of future horticultural nurseries proposed by CYDA.

IX. YEMEN MARKETING COOPERATIVE

Formed in 1982 to promote exports of horticulture products this association will be a valuable asset to the fruit industry in the future. Current plans are to develop storage and handling facilities for all types of horticultural products. Also, plans are being developed to export potatoes, tomatoes, and grapes in the near future. Other items will be exported as they become available.

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X. TROPICAL PRODUCTS INSTITUTE

This British Organization has accepted a contract to assist the MAF in the development of a marketing department. This activity is currently experiencing some contractual problems. The HITS team will need to work closely with the new department,

XI. FOODIC

This organization was established to export food products to Saudi Arabia. It will be valuable to the fruit industry will be one avenue through which fruit products may be exported.

XII. EXTENSION

This organization is the main pipeline for the flow of technical information to farmers. To date the extension program has not been especially successful. HITS will be responsible for the training of extension agents and horticulture extension specialists. With HITS assistance, the Communications Division will expand its media outreach programs to farmers.

XIII. THE FEDERAL REPUBLIC OF GERMANY PROJECT

The West Germans have developed a plant protection laboratory and program for Yemen. Their project was designed to improve YARG's plant protection program in field crops. Although field crops are the main thrust of the program they have made recommendations on disease and insect problems of fruit trees. They do not have the funds or personnel to do this on a continuing basis. They have offered to share their laboratory and classrooms with the HITS program and to continue to serve on the MAF plant protection advisory committee.

XIV. RURAL DEVELOPMENT PROJECTS

The rural development projects have assisted in developing nurseries at Surdup, Kowlan, Sudah, and Hodeidah. They are part of the ten (10) regional nurseries to be supported by the HITS program. These projects were funded by the World Bank, FAO, Japanese and Islamic funds.

XV. PRIVATE BUSINESS SECTOR

The private business input subsector, composed of chemical, fertilizer, seed and horticultural supply companies is in the embryo stage. However, can have a valuable impact on the development of the fruit sector. They can be one of the key sources through which farmers receive information on fruit production. Information will be distributed to major companies for use by their many dealers scattered over Yemen in advising farmers.

The private business merchants who buy fruit have an important impact on farmers and consumers. The YARG plans to continue to rely on private enterprise.

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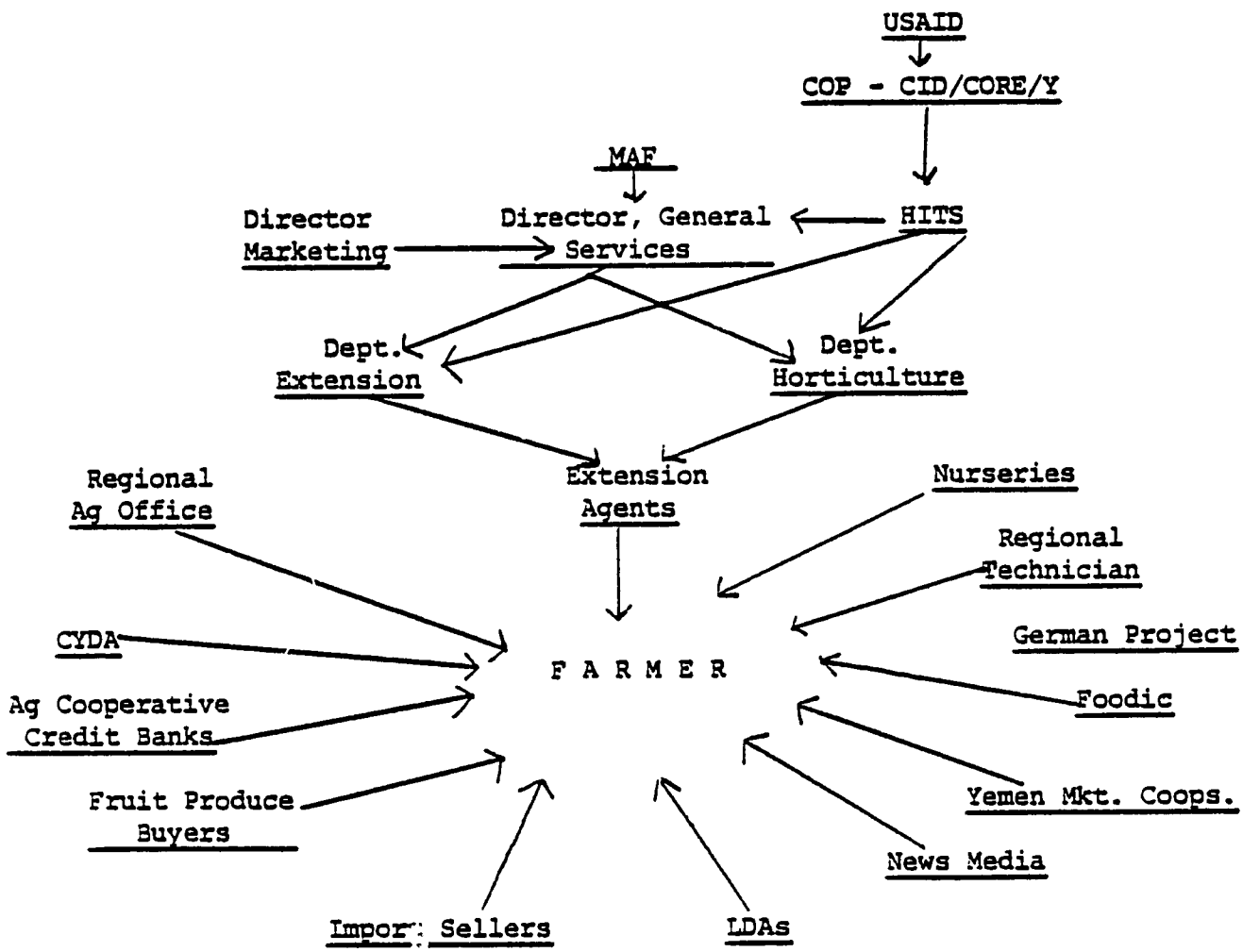
XVI. FARMER

This is the most important group of the fruit sector. They interact with many organizations and agencies. It is important that they receive information which will assist them in developing viable, profitable fruit enterprise. HITS will endeavor to develop all programs with the farmers interests in mind. Although HITS may work through many institutions in order to service the farmer, it is his best interest that must be kept at heart.

The following chart shows the relationship of the HITS program to the many institutions and organizations, and how the farmer will be reached with the proposed program. The chart is admittedly incomplete because of the wide range of organizations which impact on farmers.



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1. Potential Fruit Exports[13/]

The only fruit crop with a very high export potential in the next 20 years is grapes. A balance between domestic production and consumption is projected until near the end of the 1980's. A potential export of 10,400 tons by 1990 and 62,500 tons by the turn of the century holds hope that grapes can become an earner of foreign exchange in the future. (Table 7).

2. Potential Import Substitution[13/]

Self-sufficiency in other fruits in percentage terms is projected to stay at about 40 percent over the next 20 years (Table 7). The tonnage of fresh fruit imports will more than double 1981 imports by 2000 if projections are correct (Table 7). The greatest potential for import substitution is with bananas. While there are no current estimates of banana production, each ton of increase in domestic production should decrease import need by a like amount. The value of banana imports in 1980 was estimated at YR 107 million. One interviewee said that a private company was considering beginning a large-scale banana estate in the Tihama area. Each ton of production should save about YR 3,200 of foreign exchange at current prices.

As for other types of fruit production, it could be reliably predicted that Yemeni consumers will substitute some domestically grown fruit for imported fruit as production rises. However, it is impossible to estimate how much foreign exchange may be saved as a result of substitutions. For example, as peach production increases, how much less of imported apples might Yemeni consumers take?

VIII. POLICY CONSIDERATIONS

There is a wide array of price, trade, and income policies available to the YARG to give incentives to private enterprise in the fruit subsectors that will accelerate fruit production. The major classifications include import duties and embargoes, commodity price supports, input subsidies, and currency devaluation.

A. Import Duties

Import duties tend to raise the price of imported products to YAR based consumers. The present duty on fresh fruit is 27 percent. Theoretically, in a free enterprise economy like the YAR, an increase in the duty on fruits tends to increase internal price levels at all points in the marketing channel including the price domestic producers are able to receive. This presumably increases the return side of the farmers' cost-return relationship giving a greater economic incentive to produce larger quantities. In the Yemen cultural context, however, the conventional wisdom backed by some evidence (cereal, grains, almonds, eggs, broilers, honey, e.g.,) is that the Yemeni consumer will pay a price premium for domestically grown products over imported products. To the extent this is true for fruits, any duty increase will have less than the desired or expected effect on producer incentive.

13/ Assumes no impact from the HITS. See section X (H).

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A second constraining factor is the effect of increased duties on the amount of fruit smuggled into the country. Since fruit is perishable, smuggling is more difficult and, in the opinion of one interviewee, little fresh fruit now arrives illegally through Saudi Arabia. However, at some higher duty level, illegal transshipments by land from Saudi Arabia will likely occur. Of course, the primary factor influencing illegal imports is the price of imported fruit in Saudi Arabia - now presently higher than in the YAR.

In summary, it is recommended that YARG's existing policy be continued but that assessments continue regarding the value of raising the duty on fresh fruit above the current 27 percent. Unlike some other lesser developed economies, the YAR does not have a serious unequal distribution of income problem. As a result, increases in the price of food, while socially undesirable, have a lesser tendency to cause repercussions among the populace. Furthermore, fruit prices have not risen as fast as all foodstuffs in recent years (Section III above).

Import duties on agricultural inputs raise a different set of problems and are not recommended. With regard to fertilizer and pesticides, it is important to stimulate their usage and any duty would be a deterrent.

B. Input Subsidies

Input subsidies would reduce the cost of production for fruit growers and presumably catalyze greater production. However, they are not recommended. First, they are difficult to remove without engendering anti-government feelings after farmers become accustomed to receiving them. Second, they create distortions in relative input prices that produce negative long-term effects.

C. Adjusting Currency Values

It is generally believed that the Yemeni rial is currently over-valued. A devaluation of the rial would have some of the same effect as imposing higher import duties, i.e., it would make the price of imported goods higher to Yemen based consumers. The theoretical effect is that a rise in price would improve the cost/return ratio for Yemen producers and enhance import substitution. At the same time, exports would be encouraged as Yemen produced fruit becomes relatively cheaper in international markets. Exports are insignificant at the present time. Compared to import duties which are commodity specific, currency devaluation is general and cannot be effective in stimulating production of one commodity or even a set of commodities such as agricultural products.

In the YAR the inputs for a number of commodities in agriculture (e.g., poultry meat, eggs) are imported. Currency devaluation would drive up the cost of production and any advantages accruing from higher product prices be dissipated. Unless the value of the rial is substantially overvalued, a devaluation policy would be a mixed blessing to agriculture.

D. Import Embargoes

Embargoes have the same general effect as raising import duties. Selective embargoes could have a powerful impact on stimulating local production after consumer tastes are developed and there is no close substitute for the commodity embargoed. Fruit is a possible case in point. Embargoes tend to engender poor relations with other trading partners and are not to be recommended as a general policy.

E. Commodity Price Supports

Price supports for non-perishable commodities have been successfully used in the more developed economies to stimulate production. The cost return relationship is improved and a large incentive exists when prices are supported above their equilibrium level and the price risk is negated. However, such programs require an administrative organization and structure that does not exist in the YAR, nor could it be put in place without very high cost to the YARG. Therefore, such a policy is not recommended for the YAR.

F. Summary

In summary, the current price, trade, and income policies appear to be supportive of the HITS plan to assist the fruit industry. YARG's basic position of non-interference in the private sector is favorable for the HITS.

IX. DEMAND FOR SEEDLINGS AND BUDDED TREES

The demand for seedlings and budded trees is a derived demand - derived from the demand for fruit at the retail level. Because of the lag time between planting and production of fruit, the projected demand for fruit (Table 3) cannot be used as an indicator of seedling and budded tree demand. Demand for seedlings and budded trees can be expected to be greater than the demand for fruit in the earlier years of HITS and less than the demand for fruit in later years.

The current data base does not allow any estimates of the number of trees by individual fruits. Such data will be planned for collection over the life of the HITS. One set of MAF estimates is that there are 12,500 hectares planted to grapes, 10,000 hectares to dates, and 14,500 hectares planted to other fruit in 1981 (Table 1). Projections of future production (Table 3) are not detailed as to what part of the increases are expected from yield increases and what part from hectarage increases.

In 1981, it is estimated that 120,000 seedlings were distributed to fruit growers. In the current year (1982) the MAF estimate is 582,500 seedlings and budded trees. About a fourth (145,000) are citrus (oranges and limes) of which 50,000 seedling were budded. Of the 50,000, perhaps 15,000 will be available for sale in 1982 as budded orange trees. Another 35 percent are deciduous seedlings comprised of pomegranates, apricots, peaches, and plums, Only 3,000 are tropical plants (all bananas). Another fourth are grapes and

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the remaining 15 percent are figs, quince, and almonds (Table M1, Annex M). The design team plant pathologist determined that the 1982 nursery stock was ravaged by disease and insects. Thus, the mortality rate of the 1982 stock is expected to be high - estimates as high s 80 percent. Others, however, estimate that losses will be as low as 20 percent if farmers can receive assistance on how to plant, how much to water, and other simple technologies.

The output of 582,500 seedlings in 1982 was a result of a decision made by the Minister of Agriculture who has received pressure from farmers for even larger quantities of seedlings in the future.[14/] Budded orange trees for Yemeni fruit growers are available for the first time this year (1982). In future years, budded trees will become a larger proportion of total sales. Generally speaking, the demand for seedling is such that the amount produced by the nurseries is the amount sold to farmers. Nurseries have experienced significant losses during production as a result of poor management plus insects and diseases.

At a planting rate of about 300 trees to the acre (except for mangoes, papayas, and bananas), 300,000 budded trees and seedlings, as an example, will plant about 100 hectares. At this annual rate, it will tak. only a few years to saturate the demand. Within five years, it would appear that three to five nurseries can serve the entire country. A very rough calculation suggests that a private sector nursery would have production costs in the neighborhood of YR 5-10 for a seedling and YR 20-30 for a budded tree. In 1982, the government nurseries are getting YR 10 for a seedling and YR 25 for a budded tree. From an economic point of view it does not appear to matter much whether the nurseries are private or public enterprises. The important point is the nurseries must not be allowed to sell low production stock contaminated with diseases and insects.

X. PROJECT BENEFITS

The HITS beneficaries include all farmers who grow fruit, consumers who eat fruit, farm input suppliers, fruit marketing businessmen, extension agents and horticultural technicians whose knowledge is upgraded, participant trainees who receive formal degrees, the MAF as an institution, and YARG through import substitution (saving of foreign exchange).

A. Fruit Growing Farmers

Farmers who grow fruit will benefit directly from higher incomes associated with increased fruit production. In some cases, as yields of existing trees increase, subsistence farmers will have enough quantities to commercialize a larger part of their production. The effect is the same as a new cash crop. The quantitative value to farmers is captured in the macro impact analysis (See Section H that follows).

14/ There is no statistical basis in the MAF to confirm the Minister's decision.

B. Consumers

Consumers who eat more fruit have their nutritional status enhanced. Fruits contribute to nutrition primarily by supplying larger amounts of vitamins - particularly Vitamins A and C. This is particularly important for children. Children in families that plant trees will likely have their fruit consumption increased substantially. The opportunity for subsistence farmers to have a few trees will impact importantly on their children. These are more likely to be families who cannot afford to buy fruit. If the production targets of SFYP are met, per capita consumption of fresh fruit (excluding grapes) will increase to 39.1 kg in 2000 from 28.37 in 1981, a 38 percent increase in nineteen years. It is not likely this can be achieved without the HITS.

C. Farm Input Suppliers

Presently, farm inputs are generally provided by the ACCB (See V above), although a few private sector businessmen are beginning to enter the market. To the extent farmers enter fruit production and learn to use greater quantities of fertilizers, pesticides, etc., private businessmen will benefit from the HITS. A quantitative estimate is impossible to make but is generally included in the macro impact analysis (See Section H that follows).

D. Marketing Businessmen

As fruit production rises, the opportunity for traders to buy, sell, and transport fruit will increase at a fairly rapid rate. The result will stimulate investment and employment providing national economy benefits. Without any empirical estimates of marketing margins, it is impossible to quantitatively assess the benefits, but they are generally included in the macro impact analysis (See Section H that follows).

E. Upgrading Human Resources

The HITS has a heavy component of training (in-service and/or formal) for fruit grower farmers, extension agents, horticultural technicians, horticultural specialists and nurserymen. The impact of upgrading these human resources on the fruit industry (quantitatively) in particular, or the total economy, in general, is not attempted. However, general research in the area of human resources would support a hypothesis that the returns will be substantial.

F. Institutional Enhancement

The MAF is and should continue to be an important YARG institution to promote development of the fruit subsector. One test of whether the institutionalization purpose of HITS is achieved is whether the MAF can carry on a development program after the HITS has terminated. Another is whether there is a continuing demand for MAF services from the private sector businessmen (including farmers). Without trained personnel, an adequate budget, institutionalization cannot occur for any public sector agency. The HITS is designed to promote institutionalization, but this objective can not be fully

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validated within seven years. Furthermore, techniques for a reliable quantitative assessment of institutionalization are not available.

G. Foreign Exchange Savings

Within the life of HITS, the maximum foreign exchange saving estimates is $8.5 million based on 167,500 tons of fruit at $550 a ton. This assumes a 50 percent margin for all marketing costs and a full substitution of domestic fruit for imported fruit. The actual saving will be less than $8.5 million but there is no way to estimate how much less. As a new earner of foreign exchange, grapes have potential after 1986. If the HITS has an impact on production as outlined in Table 24, the self-sufficiency rates for other fruit increases from the 32.2 percent estimated for 1990 (Table 7) to 42.2 percent in 2000. For grapes, the potential exports rise from 10,400 tons (Table 7) to 62,500 tons in the same period.

H. Macroeconomic Impact

Several approaches were tried to quantitatively appraise the net value of increased production accruing to fruit growing farmers that could be expected from the HITS. One approach began by trying to determine production forthcoming from new seedlings and budded trees planted over the life of the project. This approach was abandoned since much of the impact over the life of the project would be on raising the yields of trees on existing hectarage. Furthermore, the wide variation in opinions regarding tree mortality rate (e.g., 20-80 percent) precluded making any kind of logical judgment.

A second approach attempted to identify the number of fruit growers that might be expected to have a five to ten tree planting and the number expected to have a 100 tree or more orchard. Since current data does not permit estimating existing growers by fruit type or location and the numbers of trees by grower, the effort to build up a macro picture from macro data again failed.

Finally, it was decided to use a very simple model. The impact of HITS is expected to be primarily through influencing yields per hectare. In the SFYP, the MAF projected other fruit production for 1990 at 101,500 tons and for grapes at 111,900 tons. Using these estimates with the estimated production in 1981 (Table 3), other fruit production would increase at 2.6 percent per year from 1981-1990 and grape production 6.4 percent.

Regarding the yields utilized in the analysis, experts estimate that fruit yields (excluding grapes) can be increased by 50-100 percent through the application of simple improved cultural practices such as proper planting, proper watering, pruning, use of fertilizer, and simple insect and disease control procedures. For grapes which are already in a more developed state, an increased yield increment of 25 percent is judged reasonable.

Assuming that the HITS impact would be to increase other fruit production 65 percent by 1990 and grape production 25 percent, the 1990 production would be 177,625 instead of the 101,500 estimated by the MAF without HITS. For grapes, a 25 percent increase by 1990 would result in a 1990 tonnage of 139,875 tons instead of the 11,900 projected by the MAF

without HITS. The average annual compound growth rate reflected in this increase is 9.3 percent for other fruit and 9.0 percent for grapes. However, given a time lag between full project implementation and results, no impact for other fruit will be assumed for 1983, a four percent per year average impact for 1984 - 1986, and a 15.3 percent average impact for 1987-1989. The final result is a 75 percent increase by 1990 over MAF present expectations. For grapes, no impact is assumed for 1983, and a 9.4 percent annual increase for 1984-90.

To estimate the added gross production value to the total economy, the differences between production level with and without HITS was multiplied by an average gross value of $241.75 per ton for other fruit and $395.60 per ton for grapes. The gross value benefit at the end of the seven project years is $48 million (Table 24).

1. Internal Rate of Return

An IRR was calculated using HITS costs (both AID and YARG contributions - Annex G) as cash flow out and a net value (gross value from Table 21 less 25 percent for costs of production) as cash flow in. The resulting net cash flows for the seven project years would be:

Year	Net Cash Flow[15/] (000$)
1	-3362.0
2	- 812.4
3	900.6
4	2470.9
5	7102.2
6	12268.9
7	18360.2

The estimate of the IRR for the HITS using the assumptions made is 64 percent. These benefits accur within the life of HITS which makes them conservative since the HITS will have a sustained impact on the fruit subsectors. Furthermore, not all the benefits are included such as those in Sections B, E, and F above.

If the project is viewed as an initial investment of $3362 million (same as Year 1 in budget) and the next six years of net cash flows are discounted at 12 percent, the net present value of HITS might be viewed as $40 million which yields a benefit/cost ratio of 11.9. The conclusion is that the HITS is an economically viable project.

XI. RECURRENT COST ANALYSIS

The YARG contribution to the HITS is budgeted at 21.2 percent of the total - see Annex G. Budgets within the YARG are both general and specific. Recurring costs of salaries and wages, travel and per diem, office space, and

15/ The ratio of costs per hectare to gross value per hectare at full production was determined for seven fruits (Tables 13-19) and for grapes (Table 21). An average indicated net value was about 75 percent of gross value.

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office utilities and maintenance for professional and nonprofessional staff related to the HITS is YR 1,248,000 annually. Additionally, recurring costs for utilities and maintenance at Al-Irra and Jarouba (YR 20,000) road maintenance (YR 5,000) farm supplies (YR 22,900) office supplies (YR 5,000) and irrigation supplies (YR 5,000) total YR 57,900 annually. The grand total recurring costs related to the HITS is thus YR 1,305,900.

To cover these costs, YARG has several budget categories. General type budgets cover the annual YR 1,248,000 costs for salaries, wages, travel per diem, office space, and office utilities and maintenance. Other YARG budgets that are available to cover HITS activities include the Fruit Section of the Horticultural Department, the Plant Protection Department, and the Agricultural Extension Department. For the SFYP (1982-86), these three budgets total YR 13,893,000 on an annual basis. Added to the YR 1,248,000 (previous paragraph) available from general funds, the total is YR 15,141,000 available on an annual basis. With total HITS recurrent costs of YR 1,305,900 annually, HITS represents 8.6 percent of YARG's various budgets available. Given that HITS is the most comprehensive donor assistance to the fruit subsector, the design team and USAID/Yemen conclude that 8.6 percent is a reasonable proportion of MAF budget to be allocated for HITS recurrent costs.[16/]

XII. JUSTIFICATION FOR SELECTING (HORTICULTURE)

While the paucity of data make it impossible to answer many relevant economic questions accurately, data and information available strongly support the USAID program giving priority to activities such as are envisioned in HITS.

1. The YARG is strongly committed to increasing fruit production, therefore, full support and cooperation can be expected. This should increase the probability for success.
2. With the exception of qat, fruit crops are more profitable than other alternatives whenever the water requirements are met. The water requirements can be met by normal precipitation in vast areas, and by simple, low cost means in many other areas.
3. It is believed the demand for qat has topped out, therefore, it will have a lesser comparative advantage in the years ahead.
4. Demand for fruit has been rising rapidly, and will continue to rise.
5. Fruit imports require a significant amount of foreign currency.
6. The physical resources (climate, soil, water) needed for increasing fruit production are available.
7. Current constraints to increasing production can be ameliorated by a reasonable simple program of increasing the supply of disease free budwood to nurseries improving pest and disease control, and making extension more effective.
8. The problem is primarily institutional. The MAF does not have the institutions required to ameliorate the constraints. Trained personnel are badly needed. The United States is a logical source for the training and technical assistance needed to strengthen the relevant MAF departments.
9. The YARG policy environment is favorable.

16/ The percentage is actually smaller than 8.6 percent since more of the general budget goes towards horticultural activities than the YR13,893,000 identified specifically for HITS. Without more detail, the exact percentage cannot be calculated.

XIII. DATA COLLECTION AND ANALYSIS

To assist project managers in monitoring project activities and to provide necessary information for evaluation teams, several lines of investigation are recommended.

A. Farmers' Costs and Returns

The budgets prepared by Asmon are preliminary in nature and need to be refined based on actual Yemeni experience. It is planned that farmers will be asked a few questions when they buy trees at a nursery or apply for credit at the ACCB regarding their farm location, fruit production plans and willingness to cooperate in answering additional questions at a later date. A random stratified sample of these farmers can then be drawn to be used for organizing a study estimating costs and returns for production of individual fruit crops. In the process, technical coefficient information can also be acquired which will assist project managers in making cultural practices and other recommendations. The first step is the initial identification of fruit producers as to location, type of fruit enterprise, and size of operation.

B. Marketing

The SPID indicates that the design team will review the fruit marketing system and make recommendations for fruit marketing and processing studies which should be undertaken as the program develops. Part IV above describes the present state of knowledge on fruit marketing. It is clearly deficient in providing any detail on the marketing structure for domestically grown fruits. The numbers of buyers and sellers, how fruit is transported, nature of price determination, costs of marketing activities, etc. are unknown.

It is recommended that market structure studies be undertaken for each of the fruits of concern in the HITS program. This will necessitate a survey of local markets in fruit growing areas. From the farmer sample outlined in (A) above, fruit can be followed from the farm gate into the marketing channels. Of particular interest will be the degree of fruit commercialization by farmer type, size and for individual fruits. After describing the marketing structure, marketing costs (margins) for various functions and for types of middlemen can proceed.

Since grapes are the most likely candidate for export in the future, a study should be initiated within two years that would yield information to facilitate entering into the international market. Complementary with the above recommendations is the collection of price information for fruits in local markets throughout the country.

C. Implementation Plans

The HITS design team recommends that the needed research and studies should be performed elsewhere. Two recent developments will be of great value to HITS in meeting the research needs. One is the establishment of a new Directorate of Marketing in the MAF. The other is the recent appointment of a person to be head of the Department of Agricultural Economics in the

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Directorate of Planning and Statistics, in the MAF. The Core Agricultural Planning Advisor works directly in the Directorate of Planning and Statistics and his counterpart is the Head of the Department of Agricultural Economics. HITS personnel will work together with the CID/Core Agricultural Planning Advisor and MAF personnel in accomplishing the required tasks needed in data collection and analysis. Such an arrangement directly serves the purpose of the HITS project regarding institutionalization.

XIV. OTHER ISSUES

A. Comparative Advantage of YAR in Fruit Production

The question of the comparative advantage of the YAR in the Mid-East and world fruit markets was not addressed as it would entail an extensive investigation of the costs of production in other fruit producing countries. Judgment analysis suggests that no comparative advantage presently exists, but neither is there a great comparative disadvantage.

TABLE 1

Area, Yield and Production of the Main Fruit Products

1970/71-1981

	Grapes			Other Fruit Trees		
Year	Prod. (000T)	Yield (Kg/Ha)	Area (000Ha)	Prod. (000T)	Yield (Kg/Ha)	Area (000Ha)
1970/71	30	4286	7.0	25	5556	4.5
1971/72	35	4667	7.5	28	5600	5.0
1972/73	35	4667	7.5	60	6000	10.0
1973/74	31	3875	8.0	60	6000	10.0
1974/75	40	4706	8.5	60	5000	12.0
1975/76	42	4773	8.8	65	5284	12.3
1976/77	47	4700	10.0	72	5373	13.4
1977/78	45	4412	10.2	77	5540	13.9
1978/79	49	4804	10.2	73	5252	13.9
1979/80	55	4783	11.5	76	5352	14.2
1980	56	4828	11.6	77	5310	14.5
1981	64.3	5144	12.5	80.7	5566	14.5

Source: CPO, Statistics Department, Statistical Yearbook, 1981, Table 1/3 pp. 86-87.

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TABLE 2

Domestic Fruit Production by Area

Yemen Arab Republic

1976/77-1979/80

Area	1976/77	1977/78	1978/79	1979/80
		Grapes		
		(000Tons)		
Sanaa	37.6	35.7	39.5	43.5
Hodiedah	-	-	-	-
Taiz	-	-	-	-
Ibb	-	-	-	-
Hajjah	4.8	4.6	4.7	4.7
Dhamar	-	-	-	-
Others	4.7	4.5	4.5	6.8
Total	47.1	44.8	48.7	55.0
		Other Fruit Trees		
Sanaa	6.5	6.2	6.5	6.8
Hodiedah	28.0	29.0	28.0	28.0
Taiz	19.5	22.0	21.8	22.9
Ibb	15.0	16.8	13.4	14.8
Hajjah	1.8	2.4	2.5	2.5
Dhamar	.5	.6	.6	.6
Others	.5	.4	.4	.5
Total	71.8	77.4	73.2	76.1

Source: Central Planning Organization, Statistical Yearbook, 10th Year, 1979-80, Table 5/3, pp. 86-88.

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TABLE 3

Production and Consumption Estimates for Fruits

Yemen Arab Republic

1981-2000

	Domestic Production (000 tons)[a]				Annual Compound Growth Rate (%)
	1981	1986	1990	2000	1981-2000
Grapes	64.3	80.4	111.9	220.1	6.7
Dates	6.3	7.3	7.6	12.4	3.6
Other Fruits	80.7	96.8	101.5	199.7	4.9
	Total Consumption (000 tons)				
Grapes	64.3	83.2	101.5	157.6	4.8
Dates	13.2[b]	16.8	20.1	30.3	4.5
Fresh fruits[d]	205.7[c]	261.3	314.0	473.8	4.5
Preserved fruits[e]	21.8	27.7	33.3	50.2	4.5
	Per Capita Consumption[f] (kg)				
Grapes	8.87	9.97	10.94	13.01	2.0
Dates	1.82	2.01	2.17	2.50	1.7
Fresh fruits	28.37	31.33	33.84	39.12	1.7
Preserved fruits	3.00	3.32	3.59	4.14	1.7

a/ Figures used by YARG in preparation of Second five Year Plan.

b/ Assumes imports of 6.9 thousand tons.

c/ Estimate assumes imports of 125.0 thousand tons which is approximately 25,000 above 1980 CPO import figures and approximately 107,000 tons below Ministry of Supply and Trade 1981 import figures (SEe Table 5 in Annex L).

d/ Including juices.

e/ All imported. Includes juices. Assumes half of fruit and vegetable juice imports are fruit juices.

f. Population estimates as follows: 1981 (7,251,160), 1986 (8,340,974), 1990 (9,278,944), 2000 (12,111,635. Annual population growth rates assumed: 1980-90 (2.9%), 1990-2000 (2.7%). Per capita growth in real income assumed at 4% per year. Income elasticity of demand coefficients assumed:

	1980-90	1990-2000
Grapes	0.6	0.450
Dates	0.5	0.375
Fresh fruits	0.5	0.375
Preserved fruits	0.5	0.375

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TABLE 4

Resident Population Estimates

Yemen Arab Republic

1975-2000

	FAO[a/]	DYDA[b/]	SYFP[c/]
		(000)	
1975	5,282	6,386	5,892
1976	5,395	6,520	6,099
1977	5,518	6,670	6,314
1978	5,648	6,830	6,536
1979	5,785	6,994	6,766
1980	5,926	7,162	7,005
1981			7,251
1982			7,469
1983			7,685
1984			7,900
1985			8,122
1986			8,341
1987			8,566
1988			8,797
1989			9,035
1990			9,279
1991			9,529
1992			9,787
1993			10,051
1994			10,322
1995			10,601
1996			10,887
1997			11,181
1998			11,483
1999			11,793
2000			12,112

a/ Based on 1975 census by Central Planning Organization.

b/ Based on 1981 census by Confederation of Yemeni Development Associations.

c/ Estimates used in preparation of Second Five Year Plan. Estimates beyond 1986 are based on an annual growth rate of 2.7% per year. A rate of 3.4% per year was assumed for 1975-81; 3.0% for 1982; 2.9% for 1983; and 2.8% for 1984-85.

TABLE 5

Imports of Major Fresh Fruits

Yemen Arab Republic

1979-81

	1979		1980		1981	
	CPO	MST	CPO	MST	CPO	MST
			(000 tons)			
Apples	10.1	39.7	35.8	52.4	n.a.	46.5
Bananas	51.7	63.3	33.0	74.1	n.a.	90.0
Oranges	n.a.	24.6	24.4	50.0	n.a.	81.0
Lemons	0.1	0.6	0.4	n.a.	n.a.	0.3
Mandarins	0.4	0.2	0.7	1.5	n.a.	n.a.
Mangoes	n.a.	n.a.	0.8*	0.2	n.a.	3.8
Pineapple	n.a.	n.a.	0.5	n.a.	n.a.	3.0
Apricots	n.a.	4.4	n.a.	6.1	n.a.	n.a.
Store Fruit	n.a.	n.a.	0.3	n.a.	n.a.	n.a.
Grapefruit	n.a.	n.a.	0.1	n.a.	n.a.	n.a.
Other	n.a.	n.a.	2.0	n.a.	n.a.	n.a.
Totals	62.3	132.8	98.0	184.3	n.a.	224.6

Data source:

CPO - Central Planning Organization

MST - Ministry of Supply and Trade

*Includes avocadoes and guavas.

n.a. - Not available.

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TABLE 6

Selected Price Information Related to Fruits

Yemen Arab Republic

Indexes of Retail Prices in Sanaa (1975-76 = 100)

	1973/74	1974/75	1976/77	1977/78	1978/79	1979/80	1980/81
All Commodities	65	86	126	147	179	198	212
All foodstuffs	69	89	123	143	167	181	197
All fruits	56	76	113	119	127	131	126

Retail Prices (file per unit) - 100 fils = YR 1.0

				1980		1981	
		1978	1979				5-City[a/]
	Unit	Sanaa	Sanaa	Sanaa	5-City[a/] Average	Sanaa	Average
Red apples	kg	600	700	686	706	708	718
White apples	kg	588	733	708	695	708	717
Oranges	kg	600	667	532	598	588	598
Bananas (imported)	kg	571	600	600	603	600	600
Grapes (raziki)	kg	1650	1449	1300	1695	1950	1922
(asimi)	kg	1717	1425	1717	1782	2050	1929
(white)	kg	1600	1278	1533	1767	2000	1922
(black)	kg	1400	1057	1300	1463	1475	1453
Watermelon	kg	300	300	362	360	308	302
Sweet melon	kg	200	250	355	364	400	400
Apricots	kg	900	1250	1613	1408	1150	1242
King mandarin	kg	-	1050	1200	1377	1000	1073
Lemons (local)	kg	-	-	1681	1606	2000	1924
Canned peaches	425 gr can	300	300	330	342	350	350
Canned pears	425 gr can	325	325	329	320	300	300
Canned pineapple	425 gr can	350	350	353	352	350	350
Canned apples	425 gr can	300	300	307	323	300	300

Wholesale Prices

		Sanaa		5-City Average[a/]	
		1980	1981	1980	1981
Apples	kg	600	572	600	572
Oranges	kg	333	350	328	344
Bananas	kg	364	386	371	386

a/ Dhamar, Ibb, Hodeidah, Taiz, Sanaa.

Source: Central Planning Organization, Statistical Yearbook, 1978/79, 1979/80, 1981.

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TABLE 7

Self-Sufficiency Ratios and Import Requirements for Fruits

Yemen Arab Republic

1981-2000

	1981	1986	1990	2000
Grapes				
Production (000T)[a]	64.3	80.4	111.9	220.1
Consumption (000T)	64.3	83.2	101.5	157.6
Export/Import (000T)	-	-2.8	10.4	62.5
Self-Sufficiency Ratio (%)	100.0	96.6	110.3	139.7
Dates				
Production (000T)	6.3	7.3	7.6	12.4
Consumption (000T)	13.2	16.8	20.1	30.3
Export/Import (000T)	-6.9	-9.5	-12.5	-17.9
Self-Sufficiency (%)	47.7	43.5	37.8	40.9
Other Fresh Fruits				
Production (000T)[a]	80.7	96.8	101.5	199.7
Consumption (000T)	205.7	261.3	314.0	473.8
Export/Import (000T)	-125.0	-164.5	-212.5	-274.1
Self-Sufficiency Ratio (%)	39.2	37.1	32.3	42.2
Preserved Fruits				
Production (000T)	0.0	0.0	0.0	0.0
Consumption (000T)	21.8	27.7	33.3	50.2
Export/Import (000T)	-21.8	-27.7	-33.3	-50.2
Self-Sufficiency Ratio (%)	0.0	0.0	0.0	0.0

a/ Estimate of MAF in SFYP - assumes the HITS does not occur.

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TABLE 8

Estimates of Disposable Income

Yemen Arab Republic

1970/71-1981

Year	At Current Prices (M.1. YR)	Growth Rate (%)	At Constant 1975-76 Prices (M.1. YR)	Growth Rate (%)	At Constant 1975-76 Prices (YR)	Growth Rate (%)
1970/71	1,774	-	3,591	-	720	-
1971/72	2,195	23.7	4.202	11.9	780	8.3
1972/73	2,816	28.3	4.701	16.9	882	13.1
1973/74	3,499	24.3	4.901	4.3	889	0.8
1974/75	5,090	45.5	5,588	14.0	981	10.4
1975/76	7,584	49.0	7,584	35.7	1,287	31.2
1976/77	10,838	42.9	8,663	14.2	1,420	10.3
1977/78	13,780	27.2	9,385	8.3	1,486	4.7
1978/79	15,600	13.2	9,170	-2.3	1,403	-5.6
1979/80	17,810	14.2	9,438	2.9	1,395	-0.6
1980/81	17,575	-1.3	9,120	3.4	1,302	-6.7
1981	18,142	3.2	9,294	1.9	1,282	-1.5

Source: Central Planning Organization, Statictical Yearbook, 1981, Tables 27/12 and 18/12, pp 340-341.

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TABLE 9

Duties Levied on Imported Fruits and Vegetables as of September 10, 1981

Commodity	Customs	Type of Duty: Defense	Statistics	Total
	-----Percentage ad-valorem c.i.f.-----			
Vegetables, fresh	100	5	2	107
Vegetables, canned	25	5	2	32
Apples, fresh	20	5	2	27
Bananas, fresh	20	5	2	27
Grapes, fresh	20	5	2	27

According to the official interviewed by the mission; (i) the overriding objective of the tariff is the provision of revenue; however, subject to favorable application, customs' duty may be raised to protect national production against imports - the customs' duty level for fresh vegetables is an example; (ii) the law provides for total prohibition of any import; (iii) to express the c.i.f. value in Yemeni rials, a conversion rate is US$1 = 5.00 YR is used; consequently, the rates of duty tabulated above are increased by a factor of 10.00 and (iv) the tariff is reviewed at six-month intervals.

1/ Some of the duties listed differ from those appearing in Annex 2, page 3 of "The Marketing of Livestock and Animal Products in the Yemen Arab Republic" by the Advisory Team to Central Planning Organization, Sanaa, 1981.

Source: An official of the Customs' Office. As reported by John Allechin, "Agricultural Sector Study," International Bank for Reconstruction and Development, November 17, 1981, Annex I, Table 6.

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Table 10

Wholesale and Retail Prices for Selected Fruits for Five Cities
Yemen Arab Republic, 1980-81

Fruit/Year	Dhamar		Ibb		Hodiedah		Taiz		Sanaa	
	W	R	W	R	W	R	W	R	W	R
	(YR per kg)									
Bananas (I)										
1980	3.71	6.00	3.71	6.17	3.64	6.00	3.93	6.00	3.64	6.00
1981	4.00	6.00	4.00	6.00	3.64	6.00	3.71	6.00	3.86	6.00
Oranges (I)										
1980	3.33	6.29	3.11	6.22	3.33	6.08	3.39	6.00	3.33	5.32
1981	3.33	6.00	3.61	6.00	3.33	6.00	3.50	6.00	3.50	5.88
Red Apples (I)										
1980	5.89	7.25	6.39	7.32	5.94	6.72	5.67	7.15	6.00	6.86
1981	5.83	7.36	5.72	7.00	5.61	7.00	5.67	7.45	5.72	7.08
Apricots (D)										
1980	-	12.00	-	15.00	-	14.50	-	12.75	-	16.13
1981	-	11.75	-	12.50	-	15.00	-	11.33	-	11.50
Raziki Grapes (D)										
1980	-	18.25	-	18.25	-	18.00	-	17.35	-	13.00
1981	-	20.80	-	17.30	-	19.50	-	19.00	-	19.50
Lemons (D)										
1980	-	14.92	-	16.44	-	14.51	-	17.64	-	16.81
1981	-	16.73	-	19.55	-	20.00	-	19.91	-	20.00
Lemons (I)										
1980	-	11.00	-	10.80	-	11.40	-	11.00	-	11.50

W - Wholesale; R- Retail; I - Imported; D - Domestic

a/ Whole sale prices based on following weights per carton: apples and oranges, 18 kg; bananas, 14 kg.

Source: Central Planning Organization, Statistical Yearbook, 1981, Table 3/6, pp. 142-143.

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TABLE 11

Market Trading for Fruits

Yemen Arab Republic

Commodity	Percentage (by weight of total production) traded via market channels		
	1976/77	1980/81	1986
Grapes, fresh	85	90	95
Grapes, as raisins	80	80	80
Dates	80	80	80
Other Fruits	50	60	70

	Percentage (by weight) of Marketed Production Traded by Producers at Different Locations, 1980/81		
	On farms	At Local Centers	At urban centers
Grapes, fresh	15	15	70
Grapes, as raisins	0	10	90
Dates	25	55	20
Other fruits	40	50	10

Source: Allechin, John, "Agricultural Section." International Bank for Reconstruction and Development, November 17, 1981, Annex I, Tables 3.4.

TABLE 12

Retail Prices of Domestically-Produced and Imported Fruit in Frequent Demand at Taiz Municipal Market - MOnthly 1980[1/]

FRUIT	AVERAGE MONTHLY PRICE TO CONSUMER (YR/KG)												Yr. Ave.	Maximum Price Variation
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.		
Oranges (I)	5.83	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	0.17
Apples (I)	6.42	6.42	6.25	7.00	7.50	7.50	8.00	7.00	7.50	7.50	7.50	7.50	7.20	1.75
Bananas (I)	5.57	6.20	5.67	6.00	5.00	5.00	6.00	6.00	6.50	5.00	5.00	5.00	5.60	1.50
Papayas (D)	5.83	-	-	-	-	-	-	-	8.00	5.00	-	-	5.3	3.00
Grapes (D) (Raziki)	-	-	-	-	-	20.00	18.00	18.00	18.00	20.00	-	-	18.8	2.00
Grapes (D) (Black)	-	-	-	-	-	18.00	14.00	14.00	15.00	15.00	-	-	14.8	4.00
Dates	8.00	9.00	9.20	8.00	-	-	-	-	-	-	-	-	8.7	1.20

I - Imported; D - Domestic

1/ Adapted from Allchin, J., "Marketing and Related Topics," Agricultural Sector Study, International Bank for Reconstruction and Development, Yemen Arab Republic, November 1981.

TABLE 13

Cost and Return Budget for Oranges
Yemen Arab Republic
(One Hectare - 280 Trees)

Item/Year	1	2	3	4	5	6-7	8-20
				(YR)			
Plowing:							
(Oxen)[a]	800	800	800	600	400	400	400
(mechanized)	(400)	(400)	(400)	(300)	(200)	(200)	(200)
Leveling							
(oxen)	200	-	-	-	-	-	-
(mechanized)	(200)	-	-	-	-	-	-
Fertilizer[b]	120	200	400	400	400	400	400
Manure	200	200	200	200	200	200	200
Hole digging[c]	980	-	-	-	-	-	-
Budded trees[d]	12,600	-	-	-	-	-	-
Planting[c]	980	-	-	-	-	-	-
Replanting[c]	-	2,240	-	-	-	-	-
Irrigation labor[f]	2,800	2,800	2,800	2,800	2,800	2,800	2,800
Pump O&M cost[g]	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Cultivation:							
Hand[h]	2,350	2,350	2,350	1,180	1,180	1,180	1,180
Mechanized	(500)	(500)	(500)	(250)	(250)	(250)	(250)
Picking[i]	-	196	588	1,372	2,550	5,100	7,640
Other[j]	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Total Expenses:							
(oxen)	26,030	13,786	12,138	11,552	12,530	15,080	17,620
(mechanized)	(23,780)	(11,536)	(9,888)	(10,332)	(11,400)	(13,950)	(16,490)
Gross Revenue[k]	-	2,400	8,400	19,600	36,400	72,800	109,200
Net Revenue							
(oxen)	(25,030)	(10,986)	(3,738)	8,048	23,870	57,720	91,580
(mechanized)	(23,780)	(8,736)	(1,488)	9,268	25,000	58,850	92,710

a/ At 200 YR/day for oxen team.

b/ At 80 YR/bag.

c/ 20 units per man day at 70 YR wage/man day.

d/ At 45 YR each. Nursery production cost estimated at 30YR plus 15YR for transport, wholesale and/or retail margins.

e/ At 25% of hole digging, trees, and planting costs.

f/ 20 irrigations per year at two man days each.

g/ 15,000m^3/ha/yr with a 10 liter/second pump = 417 hr/ha/yr at 7.2 YR/hr (4 liter/hr diesel fuel at 1.5 YR/liter plus 20% lubricants) = 300 YR/ha/hr, plus 500 YR/ha/yr pump reparations.

X 2/1

h/ Six per year. In years 1-3, 50 trees per man day; for all other years 100 trees per man day.

i/ 100 fruit per man day, Yields assumed per tree: Year 2 (10), Year 3 (30), Year 4 (70), Year 5 (130), Years 6-7 (260), Years 8-20 (390).

j/ Guards, transport, interest on investment and operating expenses, other.

k/ At 1.0 YR per fruit. See yields in footnote (i).

Source: Modified from budget prepared by I. Asmon, YAR Horticulture Production, Extension and Training Project, Interim Report, June 1982, Exhibit A.

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TABLE 14

Cost and Return Budget for Peaches
Yeman Arab Republic
(One Hectare - 280 Trees)

Item/Year	1	2	3	4	5	6-7	8-20
					(YR)		
Plowing:							
(oxen)[a]	800	800	800	800	800	800	800
(mechanized)	(400)	(400)	(400)	(400)	(400)	(400)	(400)
Leveling							
(oxen)[a]	200	-	-	-	-	-	-
(mechanized)	(200)	-	-	-	-	-	-
Fertilizer[a]	120	200	400	400	400	400	400
Manure	200	200	200	200	200	200	200
Hole digging[a]	980	-	-	-	-	-	-
Budded trees[a]	12,600	-	-	-	-	-	-
Planting[a]	980	-	-	-	-	-	-
Replanting[a]	-	1,540	-	-	-	-	-
Irrigation labor[b]	1,680	1,680	1,680	1,680	1,680	1,680	1,680
Pump O+M cost[c]	2,300	2,300	2,300	2,300	2,300	2,300	2,300
Cultivation:							
(hand)	2,350	1,180	1,180	1,180	1,180	1,180	1,180
(mechanized)	(500)	(250)	(250)	(250)	(250)	(250)	(250)
Picking[d]	-	-	980	1,960	2,940	6,860	8,820
Other	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Total expenses:							
(oxen)	23,710	9,400	9,040	10,020	11,000	14,920	16,880
(mechanized)	21,460	8,070	7,710	8,690	9,670	13,590	14,550
Gross Revenue[e]	-	-	9,800	19,600	29,400	68,600	88,200
Net Revenue							
(oxen)	(23,710)	(9,400)	760	9,580	18,400	53,680	71,320
(mechanized)	(21,460)	(8,070)	1,730	10,910	19,730	55,010	72,650

a/ See Table 13, footnotes.

b/ 12 times per year at 2 man days/ha x 70 YR/man day each.

c/ 9000m^3 per year. Sam calculation base as in Table.

d/ 1000 fruit per day. Yields assumed per tree: Year 3 (50), Year 4 (100), Year 5 (150), Years 6-9 (350), Years 10-20 (450).

e/ Price assumed of 0.7 YR per fruit.

Source: Modified from budget prepared by I. Asmon, YAR Horticulture Production, Extension, and Training Project, Interim Report, June 1982, Exhibit G.

TABLE 15

Costs and Return Budget for Limes
Yemen Arab Reputlic - 1982
One Hectare-280 Trees)

Item Year:	1	2	3	4	5	6-7	8-20
Ploughing							
(by oxen)[a]	800	800	800	600	400	400	400
(mechanized)	(400)	(400)	(400)	(300)	(200)	(200)	(200)
Levelling							
(by oxen)[a]	200	-	-	-	-	-	-
(mechanized)	(200)	-	-	-	-	-	-
Fertilizer[a]	120	200	400	400	400	400	400
Manure[a]	200	200	200	200	200	200	200
Digging of holes[a]	980	-	-	-	-	-	-
Seedlings[b]	4,200	-	-	-	-	-	-
Planting[a]	980	-	-	-	-	-	-
Replacing (25%)	1,540	-	-	-	-	-	-
Irrigation labor[a]	2,800	2,800	2,800	2,800	2,800	2,800	2,800
Pump O&M cost[a]	3,500	3,500	3,500	3,500	3,500	3,500	3,500
Cultivation							
(by hand)[a]	2,350	2,350	2,350	1,180	1,180	1,180	1,180
(mechanized)[a]	(500)	(500)	(500)	(250)	(250)	(250)	(250)
Picking	-	-	-	2,940	4,900	7,840	9,800
Guard, transport, other expenses	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Total expenses							
(with oxen)	19,170	11,350	11,550	13,120	14,880	17,820	19,780
(mechanized)	(16,920)	(9,100)	(9,300)	(11,890)	(13,750)	(16,690)	(18,650)
Gross revenue[e]	-	-	-	29,400	49,000	78,400	98,000
Net Reveune							
(oxen)	(19,170)	(11,350)	(11,550)	16,280	34,320	60,580	78,220
(mechanized)	(16,920)	(9,100)	(9,300)	17,510)	35,250	61,710	79,350

[a]As in Table 13.

[b]At YR 15 each.

[c]1,000 fruit/md. Year 4: 300 fruit/tree. Year 5: 500 f/t. Year 6-7: 800 f/t. Year 9-20: 1,000 f/t.

[d]At 0.35 YR/fruit.

Source: Budget prepared by I. Asmon, YAR Horticulture Production, Extension, and Training Project, Interim Report, June 1982, Exhibit G.

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TABLE 16
Cost and Return Budget for Mangoes
(Yemen Arab Republic - 1982
(One Hectare-100 Trees)

Item/Year	1	2-4	5-9	10-20
Ploughing (by oxen)[a]	800	800	800	800
(mechanized)	(400)	(400)	(400)	(400)
Levelling (by oxen)[a]	200	-	-	-
(mechanized)	(200)	-	-	-
Fertilizer[a]	160	160	160	160
Manure	100	100	100	100
Digging of holes[a]	350	-	-	-
Seedlings[a]	2500	-	-	-
Planting[a]	350	-	-	-
Replanting[a]	800	-	-	-
Irrigation Labor[a]	2800	2800	2800	2800
Pump O&M cost[a]	3500	3500	3500	3500
Cultivation (by hand)[a]	840	840	420	420
(mechanized)	(500)	(500)	(250)	(250)
Picking[b]	-	-	1400	7000
Guard, transport other expenses	1500	1500	1500	1500
Total expenses (with oxen)	13900	9700	10680	16280
Total expenses (mechanized)	(13160)	(8960)	(10110)	(15710)
Gross revenue[c]	-	-	20000	100000
Net Revenue (with oxen)	(13900)	(9700)	9320	83720
(mechanized)	(13160)	(8960)	9890	84290

[a] Same calculation base as in Table 13.

[b] At 1000 fruit/md. Straight-line increase assumed from year 5 to 10.

[c] At 1 yr/fruit Straight-line increase assumed from 200 fruit/tree (year 5) to 1000 fruit/tree (year 10).

Source: Budget prepared by I. Asmon, YAR Horticulture Production, Extension, and Training Project, Interim Report, June 1982, Exhibit C.

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TABLE 17

Cost and Return Budget for Bananas

Yemen Arab Republic - 1982

(One Hectare - 1,300 Plants)

Item/Year	1.	2 and following
Ploughing/cultivating		
(by oxen)[a]	800	800
(mechanized)	(400)	(400)
Levelling		
(by oxen)	200	-
(mechanized)	(200)	-
Fertilizer[b]	400	400
Spreading of fertilizer[c]	280	280
Manure	200	200
Preparation of side shoots[d]	1820	910
Preparation of holes and planting[d]	1820	910
Irrigation labor[e]	2800	2800
Pump O&M cost[e]	3500	3500
Harvesting[f]	-	910
Guard, transport, other expenses	1500	1500
Total expenses (with oxen)	13320	12210
(mechanized)	(12920)	(11810)
Gross revenue[g]	-	18200
Net Revenue (with oxen)	(13320)	5990
(mechanized)	(12920)	6390

[a] Twice a year, 2 days each at 200 YR/day

[b] 5 sacs/ha at 80 YR/sac

[c] 4 md/ha at [illegible] YR/md

[d] 50 shoots/day; 50% replaced annually

[e] As in Exhibit A

[f] 50 bunches/day; 50% harvested annually

[g] 650 bunches/ha/yr, 80 fingers each at 8.35 YR/finger

Source: Budget prepared by I. Asmon, YAR Horticulture Production, Extension and Training Project, Interim Report, June 1982, Exhibit D.

TABLE 18

Cost and Return Budget for Papayas

Yemen Arab Republic - 1982

(One Hectare-500 Trees)

Item/Year	1	2	3
Planting/cultivation (by oxen)[a]	800	800	800
(mechanized)	(400)	(400)	(400)
Levelling (by oxen)[a]	200	-	-
(mechanized)	(200)	-	-
Fertilizer[a]	400	400	400
Spreading of fertilizer[b]	280	280	280
Manure[a]	200	200	200
Seedlings[c]	5000	-	5000
Preparation of holes and planting[d]	1400	-	1400
Replacement (25%)	1600	-	1600
Irrigation labor[a]	2800	2800	2800
Pump O&M cost[a]	3500	3500	3500
Picking[e]	-	2800	2800
Guard, transport, other expenses	1500	1500	1500
Total expenses (with oxen)	17680	12280	20280
(mechanized)	(17680)	(11880)	(19880)
Gross Revenue[f]	-	45000	60000
Net revenue (with oxen)	17680	32720	39270
(mechanized)	(17280)	33120	40120

[a] As in Table 13.

[b] 4 md/ha at 70 YR/md

[c] YR 5 each (imputation of farmer's own seedling production cost)

[d] 50 per-man day

[e] 20 times at 2 md/ha each

[f] At YR 3 each. Beginning of year 2: 30 fruit/tree. Beginning of year 3: 40 f/t. (Replaced at year 3.)

Source: Budget prepared by I. Asmon, YAR horticulture production, extension and Training Project, Interim Report, June 1982, Exhibit E.

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TABLE 19
Cost and Return Budget for Guavas
Yemen Arab Republic - 1982
(One Hectare - 280 Trees)

Item/Year	1	2	3	4	5	6-7	8-2
Total expenses except picking (with oxen)[a]	19870	11350	11550	10180	9980	9980	9980
(mechanized)	(17620)	(9100)	(9330)	(8950)	(8850)	(8850)	(8850)
Picking[b]	-	-	-	-	980	3920	7840
Total expenses (with oxen)	19870	11350	11550	10180	10960	13900	17820
(mechanized)	(17620)	(9100)	(9300)	(8950)	(9830)	(12770)	(16690)
Gross revenue[c]	-	-	-	-	11200	44800	89600
Net revenue (with oxen)	(19870)	(11350)	(11550)	(10180)	1220	30900	71780
(mechanized)	(17620)	(9100)	(9300)	(8950)	1370	32030	72910

[a] Production costs assumed equal to those of limes (Table 13).

[b] 1000 fruit/md. year 5: 50 fruit/tree. years 6-7: 200 f/t. years 8-20: 400 f/t.

[c] At 0.80 YR/fruit.

Source: Budget prepared by I. Asmon, YAR Horticulture, Production, Extension and Training Project, Interim Report, June 1982, Exhibit F.

TABLE 20

Internal Rates of Return with Sensitivity Analysis

	Internal Rate of Return				
		With 50% Reduction:			
Well Irrigation[a]	Initial	Yield	Price	With Wipe Out[b]	With Wipe Out[b] and Yield Cut
Oranges	40.9	24.0	22.5	35.4	19.6
Peaches	39.3	23.3	20.6	34.7	19.1
Limes	43.1	25.0	22.2	36.0	19.7
Papayas[c]	95.2	-11.2	-18.5	n.a.	n.a.
Bananas[d]	21.8	f/	f/	3.9[g]	n.a.
Mangoes	30.5	18.3	16.9	24.3	13.5
Guavas	34.0	19.8	17.7	29.9	16.2
Surface Water Irrigation[c]					
Oranges	58.7	37.0	35.4	51.3	31.6
Peaches	50.9	30.5	24.9	44.5	25.5
Limes	66.0	42.2	38.7	55.0	33.8
Papayas[c]	244.0	68.0	56.4	n.a.	n.a.
Bananas[d]	160.0	16.8	3.7	61.7[g]	n.a.
Mangoes	42.9	28.5	26.4	33.6	21.3
Guavas	45.1	29.5	27.3	39.8	24.6

[a] Assumes a well investment of YR100,000 for papayas, bananas, mangoes and guavas. Assumes a YR200,000 well investment for peaches, limes and oranges. Estimated well life of 20 years. Assumes a pump set investment of YR42,000 for papayas, bananas, mangoes and guavas. Assumes a YR84,000 pumps set investment for limes, peaches and oranges. Assumes a 10-year life for pump sets. Fruit is assumed to grow on one hectare of a 15 ha farm, therefore, capital investment outlays are assumed to be 1/15 of total for the first enterprise. Pump is assumed to be replaced in year 11. Assumes oxen cultivation.

[b] Assumes complete loss of crop in years 5, 10 and 15

[c] Nine-year period assumed. Three tree cycles.

[d] For 10-year period.

[e] Annual costs reduced by YR3,500 (pump and O&M cost) and no well investment outlays.

[f] All net cash flows are negative.

[g] Wipe out years 4 and 9.

Source: Calculated from budgets presented in Tables 13-19, Annex L.

TABLE 21

Gross and Net Returns Per Hectare for Selected Crops

Yemen Arab Republic[a]

Crop[b]	Years to Full Production	Gross Return	Net Return
Oranges	8	109200	91580
Mangoes	10	100000	83720
Limes	8	98000	78220
Peaches	8	88200	71320
Guavas	8	89600	71780
Papayas	3	60000	39720
Grapes	5	48000	39596
Bananas	2	18200	5990
Alfalfa	1	53230	43875
Tomatoes	1	31875	19125
Maize	1	5040	3240
Coffee	7	14000	3120
Wheat	1	3640	2420
Sorghum	1	3480	2280

[a] Calculated from World Bank, 1979, Tables 15, 16, 39: CPO, 1981. See J.B. Wyckoff and James M. McCullough, Agricultural Sector Analysis, YAR, C.I.D. October 1981, Table III, 19.

[b] Crops for which estimates can be found. The conventional wisdom is that returns to qat are significantly higher than for any other crop grown in the YAR. Chaudry reports a gross return to qat of YR 1494000 per hectare based on retail prices. (See Chaudry, M.A., "Economic Potentials and Import on Cereals, Fruits and Vegetables in YAR," MAF, ARS, February 1981). The same report shows gross returns to fruits several times higher than those reported above. However, the World Bank source referenced in (a) above indicates only a YR 79500 gross and a YR 52150 net for qat. Judgment would suggest the World Bank figures are too low while Chaudry's are too high.

TABLE 22
Balance of Payments
Yemen Arab Republic
1977/78-1981

Item/Period	1977/78	1978/79	1979/80	1980	1981
			(Millions of YR)		
Current Account	1531.4	-621.3	-1480.4	-3110.5	-2989.4
Trade Account	-4044.0	-5613.2	-6925.5	-8562.0	-7820.4
Exports	31.8	13.2	32.1	57.5	47.4
Imports	-4075.8	-5626.4	-6957.6	-8619.5	-7867.8
Private Sector	-3529.2	-4419.1	-5570.7	-6295.7	-6229.5
Government	-546.6	-1207.3	-1386.9	-2323.8	-1638.3
Invisible Account	5575.3	4991.9	5445.1	5451.5	4831.0
Receipts	7401.7	7995.2	8147.4	8248.9	7567.4
Against Services	589.7	997.6	1525.9	1549.6	1606.8
Private Transfers	6350.7	5595.0	6118.4	6034.1	4444.2
Official Transfer (cash)	409.3	1350.6	451.1	613.2	1464.4
Official Transfers (kind)	52.0	52.0	52.0	52.0	52.0
Payments	-1826.3	-3003.3	-2702.3	-2797.4	-2736.4
Against Services	-371.0	-1158.4	-1572.4	-1642.9	-1838.6
Private Transfers	-1446.3	-1844.9	-1174.9	-1154.5	-897.2
Official Transfers	9.0	-	-	-	-0.6
Capital Account	287.5	932.5	1301.8	2678.7	1483.8
Errors & Omissions[a/]	193.8	452.8	169.4	109.0	10.4
Overall Balance of Payments Position	2012.7	764.0	-9.2	-322.8	-1495.2

a/ Including net private capital movement.

Source: Central Bank of Yemen, Annual Reports.

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TABLE 23

Value of Fruit Imports to the Yemen Arab Republic

1974/75-1978/79[a]

Current Value	1974/75	1975/76	1976/77	1977/78	1978/79
			(000 YR)		
Fresh fruits	4,920	11,781	37,157	89,975	174,261
Dried fruits	16,250	16,251	11,757	11,973	8,279
Preserved Fruits	14,098	34,581	116,226	93,257	95,307
Total	35,268	62,613	165,140	195,205	277,847
Total Foodstuffs and Animals	418,361	741,589	868,352	981,594	1,304,830
			(Percent of total foodstuffs and animals)		
Fresh fruits	1.2	1.6	4.3	9.2	13.4
Dried fruits	3.9	2.2	1.4	1.2	0.6
Preserved fruits	3.4	4.7	13.4	9.5	7.3
Deflated Value[b]					
			(000 YR)		
Fresh fruits	6,474	11,781	32,882	75,609	137,213
Dried fruits	21,382	16,251	10,404	10,061	6,519
Preserved fruits	18,550	34,581	102,855	78,367	75,045
Indexes of Deflated Values (1975/76 = 100)					
Fresh fruits	55.0	100.0	279.1	641.8	1164.7
Dried fruits	131.6	100.0	64.0	61.9	40.1
Preserved fruits	53.6	100.0	297.4	226.6	217.0

[a]Data insufficient to permit detail total foodstuffs and animal imports were YR 1894 million for 1979/80 and YR 2213 million for 1980.

[b]Deflated by retail price index for all fruits in Sana'a (see Table 6)

Source: Central Bank of Yemen, Annual Reports, 1975/76-1980/81.

TABLE 24

Gross Value Impact of the Horticultural Improvement and Training Subproject on Fruit Growers

Yemen Arab Republic

	Year	Project Year	Without HITS[a]	With HITS[b]	Tonnage Difference	Gross Value[c]
			(000 Tons)			(000$)
Other	1981	--	80.7	80.7	--	--
Fruits:	1982	--	82.8	82.8	--	--
	1983	1st	85.0	85.0	--	--
	1984	2nd	87.2	88.4	1.2	290
	1985	3rd	89.4	91.9	2.5	604
	1986	4th	91.8	95.6	3.8	919
	1987	5th	94.1	110.2	16.1	3,892
	1988	6th	96.6	127.1	30.5	7,373
	1989	7th	99.1	146.5	47.4	11,459
	1990	--	101.5	168.7	67.2	--
Grapes:	1981	--	64.3	64.3	--	--
	1982	--	68.4	68.4	--	--
	1983	1st	72.8	72.8	--	--
	1984	2nd	77.5	79.6	2.1	831
	1985	3rd	82.4	87.1	4.7	1,859
	1986	4th	8717	95.3	7.6	3,007
	1987	5th	93.3	104.3	11.0	4,352
	1988	6th	99.3	114.1	14.8	5,855
	1989	7th	105.6	124.8	19.2	7,596
	1990	--	112.4	136.3	23.9	--

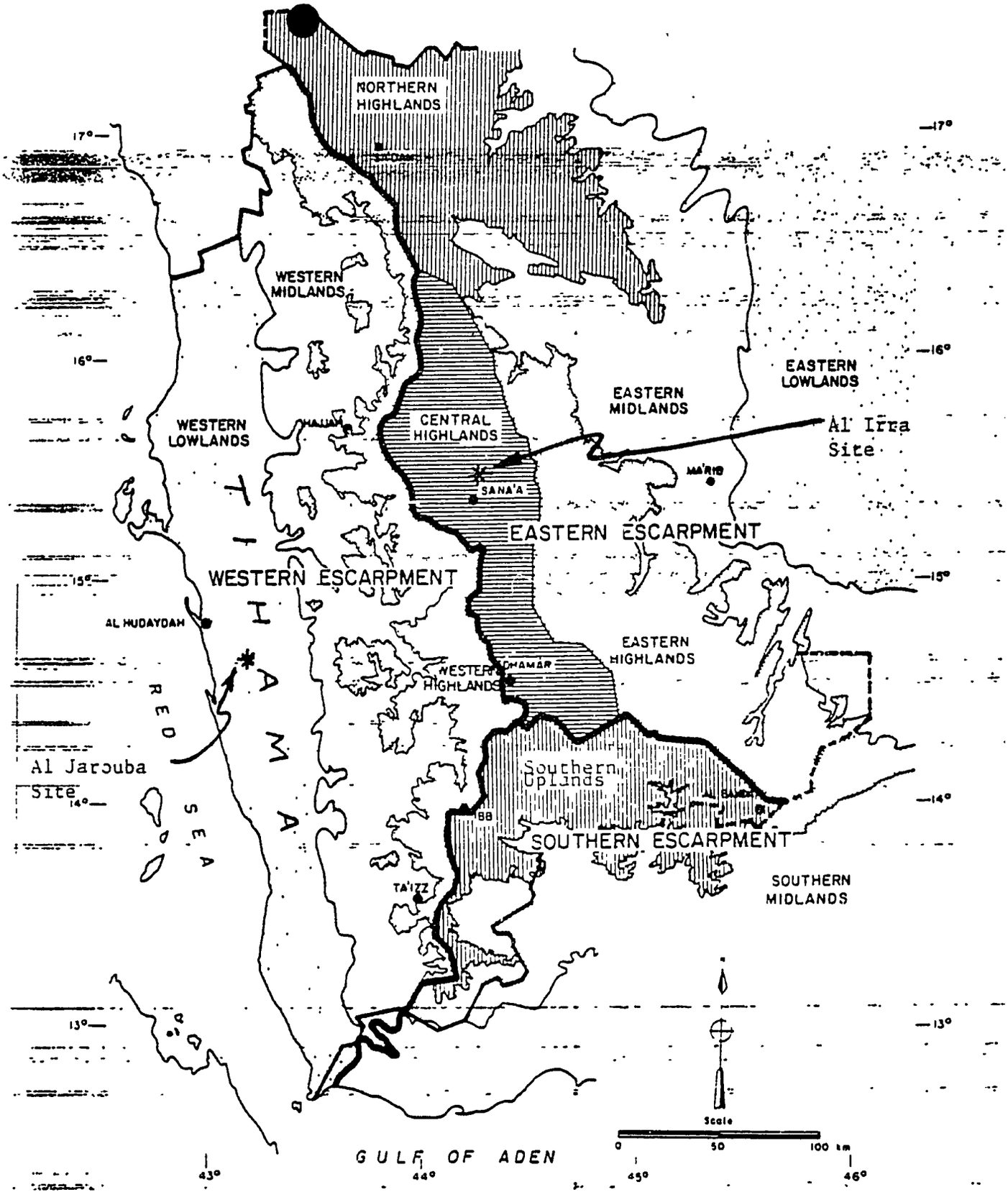
[a] Annual compound growth of 2.6 percent for other fruit and 6.4 percent for grapes.

[b] Annual compound growth rate of 9.2 percent for other fruit and 9.0 percent for grapes. These rates incorporate the expected impact on yields from HITS of 65 percent greater production in 1990 for other fruit and 25 percent greater for grapes.

[c] A figure of YR 18 per kg for grapes which was the five city average price for grapes in 1981 (see Table 6). For other fruit a value of YR 11 per kg was used (average of five city retail prices for oranges, bananas, apricots, lemons, and mandarins). These were the only prices available to use as a proxy for all other fruits. Rials converted to dollars at YR 4.55 equal to $1.00. Per ton value is thus $241.75 for other fruit and $395.60 for grapes.

ANNEX M

Technical Analysis



Yemen Arab Republic
Showing Physiographic Regions

76,4