HORTICULTURE IMPROVEMENT AND TRAINING SUBPROJECT EVALUATION

Contract No. 279-0052-C-00-7012

Submitted to
USAID/Sana'a, Yemen Arab Republic

by
Chris Hermann
and
Labat-Anderson Incorporated

Labat-Anderson Incorporated
1111 19th Street North
Suite 600
Arlington, Virginia 22209
Phone (703) 525-9400
Telex 5106005227 LABAT AND

PREFACE

The evaluation of USAID's Horticulture Improvement and Training Subproject took place in two parts: an initial field-work and data-gathering phase in the Yemen Arab Republic; and a report-preparation phase at LABAT-ANDERSON Incorporated's company headquarters in Arlington, Virginia, USA.

The first phase took place in Yemen during January and February 1987 and was carried out by a six-member evaluation team composed of the following specialists:

Chris Hermann	Team Leader/Evaluation Specialist, USAID/PPC/CDIE
Bruce Kratka	Institutional Development Specialist
Fouad Basiouny	Horticultural Specialist, Tuskegee Institute
Mohammed Abdel-Rahman	Plant Protection Specialist
Richmond Allen	Agricultural Economist
Andrew Duncan	Extension Outreach Specialist

The report-writing and editing phase of the work took place in the Research and Publications Division facilities of LABAT-ANDERSON Incorporated in Arlington, Virginia. Principal contributors to this phase were:

Chris Hermann	Chief Writer and Reviewer
Jean Fiore	Chief Editor
Bruce Kratka	Contributing Editor
Richmond Allen	Contributing Editor
Felipe Tejeda	Project Manager
Victor Labat	Final Review and Approval

LABAT-ANDERSON Incorporated would like to thank John Riffenbark, Project Officer, USAID/Sana'a, for his support and guidance; the Ministry of Agriculture and Forestry for providing counterparts and hospitality; and the staff of Cal Poly/Pomona in Yemen for all their assistance.

LABAT-ANDERSON Incorporated would also like to acknowledge the high-quality effort of Dr. Chris Hermann of USAID's Center for Development Information and Evaluation, Bureau for Policy and Program Coordination. His efforts were instrumental in bringing this assignment to a successful conclusion, and in producing an excellent evaluation report.

Special thanks go to Jean Fiore for providing a "single voice" in the editing process, and to all the staff of the Research and Publications Division at LABAT-ANDERSON Incorporated for the word processing and publishing support.

This report completes contract No. 279-0052-C-00-7012 between LABAT-ANDERSON Incorporated and USAID/Sana'a, Yemen Arab Republic.

A final review of this report was conducted by Victor Labat, President of Labat Anderson Incorporated.

BASIC PROJECT IDENTIFICATION DATA

1. Country: Yemen Arab Republic

2. Project Title: Agricultural Development Support, Horticulture Improvement and Training

3. Project Number: 279-0052

4. Project Dates:

   a. First Project Agreement: December, 1982
   b. Final Obligation: FY 90 Planned
   c. Project Assistance Completion Date (PACD): December 31, 1989

5. Project Funding:

   a. AID Bilateral Funding Grant: $14,385,000
   b. Other Major Donors: None
   c. Host Country Counterpart Funds: $4,430,000

   TOTAL: $18,815,000

6. Mode of Implementation: Collaborative agreement between USAID/Sana'a and the Consortium for International Development (CID)

7. Project Design: The Ministry of Agriculture and Fisheries of the Yemen Arab Republic Government, USAID/Sana'a, and the Consortium for International Development

8. Responsible Mission Officials:

   a. Mission Director: Charles D. Ward/Mission Director, and C.F. Weden/Acting Mission Director

   b. Project Officer: Tracy Atwood and John Rifenbark

9. Previous Evaluation: January, 1984 (overall)

10. Cost of Present Evaluation:

	Person Days	Dollar Costs
a. Direct Hire AID/W TDY:	30	
b. Contract:	178	$104,350

TABLE OF CONTENTS

Page

EXECUTIVE SUMMARY

Project Evaluation
Horticulture Improvement and Training Subproject (279-0052)

The progress and performance of the Horticulture Improvement and Training Subproject (HITS) is evaluated in this report. The project was authorized in February 1983 for $14,385,000 with completion scheduled for December 1989. The California State Polytechnical University at Pomona (CP/P) has designed and implemented HITS thus far. Approximately $8 million have been spent as of the date of the evaluation--February 1987. Additional funding or extension of the project authorization completion date (PACD) is not planned, nor is any recommended by this evaluation.

The original objective of HITS was to institutionalize within the Ministry of Agriculture and Fisheries (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. HITS has supported the construction of two horticulture stations, training for MAF staff, technical assistance, and dissemination of horticultural information to achieve project objectives. The principal beneficiaries of HITS were to be all farmers of Yemen, but with special emphasis on small farmers.

OVERALL PERFORMANCE

HITS has suffered major setbacks resulting from technical and managerial mistakes. Most important are:

- The destruction of approximately 180,000 citrus trees at Al Jarouba (the HITS tropical horticulture station) necessitated by citrus canker.
- The project's introduction of crown gall disease at Al Irra (the deciduous station).
- The consequent loss of credibility of HITS from the perspective of the MAF.
- The current lack of adequate communication and understanding among HITS, USAID/Sana'a and the MAF.

The project has provided useful technical assistance in the areas of plant protection, extension, and short-term training. Little progress has been made in developing a capacity within the MAF to manage adequately the HITS stations after project completion, and it is unlikely that such a capacity can be developed during the remainder of HITS (approximately 34 months) given limited MAF staffing and budget. In short, the overall performance of HITS has been unsatisfactory to date.

ECONOMIC ANALYSIS

Available data suggest that the area under fruit production is increasing but that productivity (that is, yield) is decreasing, resulting in minimal (1.6 percent per annum) production increases. The number of large commercial fruit farmers is increasing and it is likely that this will continue into the 1990's, hence, they will produce an increasing proportion of marketed fruit in Yemen. The MAF attempts to meet demand for fruit trees through its nursery operations and imports; current demand for trees exceeds supply. The MAF's tree distribution system reaches a broad range of farmers; however, this involves significant inefficiencies and costs for the MAF. Low tree prices set by the MAF preclude private-sector entry into the tree production market.

With regard to HITS' economic impact, the early shift from research to production, the general unavailability of agricultural inputs (fertilizers and pesticides), and the ineffectiveness of the MAF extension service have interfered with achieving project objectives and anticipated effects. HITS' extension activities (production of TV tapes, farm demonstration plots, and farm visits) have benefited producers of deciduous and tropical fruits (other than banana growers). Given projected MAF budget and staffing, it is doubtful that the HITS stations will be sustained if the current strategy is followed--that is, MAF assumes total responsibility.

Current market conditions favor private-sector fruit production and involvement in associated activities. However, the lack of credit, water, and agricultural inputs constrain this development, particularly for small and medium farmers. Based on the economic assessment of HITS and trends in the subsector, it is recommended that:

- o HITS and CORE collect horticultural data.
- o HITS terminate technical assistance to large commercial growers.
- o USAID undertake policy dialogue with the MAF concerning private-sector involvement in nursery development.
- o The project return to supporting applied research.
- o HITS expand its extension activities.
- o HITS find an alternative agricultural organization to assume station management and research activities.
- o HITS develop an integrated agricultural program that addresses basic production constraints.

PROJECT MANAGEMENT

CONTRACTOR PERFORMANCE--CP/P

Beginning in 1985, improvements in project management have been made in the areas of the direction of project staff and resources, commodity procurement

procedures, communication between the field and CP/P, and the working relationship between HITS and USAID/Sana'a. But these improvements have come late to the project and much remains to be done to improve the project's relationship with the MAF. Moreover, these improvements have resulted largely from the individual efforts of the current project manager and the USAID project officer, hence, staff changes could reverse what has been accomplished.

A major factor accounting for HITS' unsatisfactory performance is CP/P's inability to recruit and field technical and managerial staff with the necessary skills and development experience. The Consortium for International Development (CID) has provided little assistance to CP/P in this regard. CP/P's lack of prior experience in Yemen and in the region has further complicated the situation.

CP/P's staff problems have resulted in project implementation delays and in serious technical and managerial errors. Credibility has been lost--MAF officials doubt CP/P's and HITS' ability to provide sound technical advice. Financial accounting by CID and support from CP/P to the project are also problematic.

Recommendations include:

- The costs and benefits involved with replacing CP/P as a basis for improving HITS management and implementation by USAID/Sana'a should be assessed.
- Current staffing should be reviewed in light of the redirection of the project recommended by the evaluation.
- More control must be exerted over future staffing decisions by the mission and the MAF.
- A more active role must be taken by the mission in HITS and ADSP management.
- The project must be audited thoroughly.

USAID/SANA'A MANAGEMENT

The collaborative assistance arrangement with CID offered the mission an expedient solution to limited staffing--two agriculture officers--at a time when the agriculture portfolio was being expanded. However, the mission and AID/Washington had made no thorough assessment of the administrative capabilities of participating CID universities. The contractual arrangement with CID to obtain CP/P's services actually impeded the mission's ability to directly influence project implementation--that is, the mission's input was channelled through the CID/Agriculture Development Support Program (ADSP) chief of party. The managerial and administrative support services to be provided by ADSP/CORE to HITS were inadequate.

The imposition of substantial tree production goals by the MAF on the HITS stations and plans to build a third station in Marib diverted project resources and further impeded the project. The mission's acquiescence in

these matters is indicative of its weak management of HITS. In effect, the mission abrogated its management responsibilities to CID and CP/P. In light of AID/Washington's strong support for the collaborative assistance mode, the ANE Bureau shares with USAID/Sana'a the responsibility for such serious mismanagement.

In mid-1984, the mission tried to push CP/P to resolve major implementation problems, but these efforts met with resistance from CP/P and were only partially successful. Moreover, the mission has yet to address contractual problems via a direct contract with CP/P to assume necessary control over project implementation. Nor has the mission taken a sufficiently active role in the overall management of ADSP.

The unsatisfactory performance of HITS requires a fundamental questioning of AID's reliance on Title XII institutions to perform project design and management activities for which AID is ordinarily responsible. Major recommendations concerning USAID management of HITS include:

- Establish a direct contract with CP/P or another contractor for HITS.
- Clarify management systems and requirements under direct contracting and the reorganization of ADSP (that is, CORE) as a subproject to the MAF and contract staff.
- Work more closely with the MAF concerning HITS' future management.

MAF MANAGEMENT

The MAF's demand for major production goals for the HITS stations, and USAID/Sana'a's willingness to comply, increased costs and staff time, diverting project resources from HITS' original goals. Limited tree production increases certainly could have been accommodated, and HITS could have assisted the MAF with its legitimate need for more trees in other ways as well; however, the magnitude of production goals ultimately defeated the establishment of an applied research program. Consequently, the MAF still lacks the types of information it needs for production and important decisions. Imposition of substantial production goals contributed to a concentration on citrus at Al Jarouba and the devastating results due to citrus canker.

The MAF's dissatisfaction with HITS is well justified; however, continued recriminations will not improve the project. Better communication and understanding are needed among the MAF, the mission, and HITS. Recommended actions include more frequent and regular discussions about project implementation among MAF, USAID, and HITS managers.

APPLIED HORTICULTURAL RESEARCH

SUSTAINING AL JAROUBA AND AL IRRA

Current staffing and budget constraints of the MAF make it very unlikely that the stations will be managed and maintained at their current levels after HITS is completed. This would defeat HITS' efforts to support an applied horticultural research program. The evaluation concluded that an alternative to turning full responsibility for the stations over to the MAF was needed. The best option available at this time is the Agricultural Research Authority (ARA), which has responsibility for all agriculture research in Yemen. The ARA has developed its research capabilities with Food and Agriculture Organization (FAO) and World Bank assistance in recent years and has trained horticulturalists on its staff. Discussions between the MAF and ARA directors were facilitated by the evaluation. The MAF and ARA officials agreed to work cooperatively at the stations. The ARA will have responsibility for applied research and station management in support of its program at the HITS stations. Use of the station facilities for production and associated costs are the responsibility of the MAF. The evaluation recommends that HITS support the involvement of the MAF and ARA at the stations by providing technical assistance and limited funding for research operating costs.

RESEARCH ACTIVITIES

Because of the imposition of production goals on the HITS stations, the project's applied research program is far behind schedule. The Al Jarouba station concentrated on citrus from 1982 until mid-1986 when destruction of trees due to citrus canker was completed. Emphasis was placed on production rather than applied research. Consequently, no information has been generated on tropical and subtropical varieties appropriate for Yemen. Some information on papaya, mangoes, banana, and passion fruit is expected before HITS is completed in 1989.

Preliminary results on deciduous varieties has only recently become available from testing at Al Irra. A range of deciduous fruit trees is currently grown at the station. A principle objective is to identify varieties whose chill unit requirements can be accommodated by environmental conditions in the Sana'a area. Some limited information on such appropriate varieties has been produced. Tests are under way on breaking dormancy, delaying flowering, horizontal limb training, and pruning. Fertilizer trials have been impossible due to the lack of fertilizers. In short, much work remains to be done on cultural practices and suitable varieties for Yemen's various microclimatic environments.

The principal conclusion drawn about HITS' applied research activities is that the project has been prevented from generating information for the MAF needed for production and importation decisions and for extension activities. Management decisions concerning production goals account for this.

The major recommendation concerning HITS' future support of applied horticulture research is that the project should terminate its own independent program and redirect its technical assistance to support the ARA in developing and implementing its research agenda at both Al Irra and Al

Jarouba as soon as possible. The report provides recommendations concerning specific applied research activities HITS should support.

PLANT PROTECTION

HITS has provided useful assistance in the areas of integrated pest management, publications, extension activities, and coordination with other organizations involved with plant protection. However, the disease problems that have occurred at both HITS stations suggest that the project would have benefited from adhering to sound technical advice concerning plant protection issues. Stronger guidance from a qualified plant pathologist might have reduced or even prevented the major setback HITS suffered as a result of concentrating on citrus production at Al Jarouba. Similarly, HITS is responsible for the introduction of crown gall disease at Al Irra, which resulted from a failure to follow advice provided by HITS plant protection staff. The MAP has provided counterparts, but salary, communication, language, and motivational problems have led to a high rate of staff turnover.

The evaluation concludes that:

- Overall management problems of HITS have adversely affected plant protection activities.
- The project has suffered from either a lack of sound plant protection advice or failure to heed such advice when it was available.
- Failure to resolve the crown gall problem to the satisfaction of the MAP interferes with improving relations with the MAP.
- Better coordination among plant protection organizations and activities is needed.

Major recommendations call for continued support by HITS to strengthen Yemen's plant protection system. Additional emphasis should be placed on facilitating coordination in this area and improving the quarantine and inspection system via short-term training and short-term technical assistance. The report provides detailed recommendations to accomplish thi

EXTENSION OF HORTICULTURAL INFORMATION

HITS has provided assistance for horticultural extension in the following areas:

- Ten demonstration plots to teach farmers proper tree management practices.
- Field days at HITS stations involving farmers and MAP extension agents.

- o Publications and a set of videotapes on tree planting and care televised during the past 3 years.

- o Direct outreach activities to farmers on a limited scale.

Tentative estimates of the effects of HITS' extension activities are made (see Section 2--Economic Analysis). The MAF's extension service is relatively new and suffers from a lack of trained staff. Overall, its efforts have been ineffective in improving horticulture practices and production, which in turn impedes HITS' extension efforts. Coordination among the MAF extension activities, area development authorities (DA's), and other development projects is lacking, as is well-packaged information on horticultural practices for farmers.

The major conclusion drawn about HITS' extension activities is that this constitutes a promising effort to disseminate much needed horticultural information. Interest and receptivity by small farmers to HITS extension activities reflects their willingness to adopt improved tree management practices.

Key recommendations include:

- o Hire an additional Yemeni agriculturalist to work with the present HITS Extension Specialist.

- o Expand the number of demonstration plots and outreach activities.

- o Obtain additional MAF counterparts to work with the HITS Extension Specialists.

- o Expand mass media efforts.

- o Continue current training activities.

- o Improve coordination of activities among development projects and organizations involved with extension work.

TRAINING/INSTITUTION-BUILDING

HITS' short-term training is on schedule and has been useful to those receiving it. However, the number of trainees is comparatively small in proportion to the MAF's training needs. HITS' long-term training program is far behind schedule and it is virtually impossible for the project to meet its objectives in this area before project completion. The original long-term training plan was unrealistic from the start and received inadequate attention from the CORE training advisor. A major impediment to long-term training has been the English language requirement despite special instruction at the Yemen American Language Institute (YALI). The slow progress of HITS candidates through YALI suggests that the faster learners have been attracted to other ADSP subprojects.

Limited progress has been made toward overall institution-building objectives. Greatest progress has been made in the area of plant protection; HITS has assisted the MAF in implementing programs in inspection

and quarantine, and in integrated pest management. However, the German Technical Cooperation (GTZ's) assistance has also contributed significantly to this development, hence, improvements cannot be attributed solely to HITS. Little, if any, significant progress has been made toward developing the MAF's capability to properly manage the HITS stations, and it is not likely that this will be accomplished within the time remaining for the project.

The lack of MAF counterparts and frequent staff turnover has impeded institutionalization of an expanded capacity within the MAF to support increased fruit production. However, institution-building efforts have also suffered from the emphasis placed on technical skills with too little attention given to developing managerial and organizational skills. The lack of an overall institution-building plan for ADSP complicates HITS' efforts in this area.

Major recommendations include:

- Refocus HITS' training program on short-term training in Arabic conducted either in-country or in Arabic-speaking countries to meet the more immediate needs of the MAF.

- Given the proposed role of the ARA in the use and management of the HITS stations, make project training available to ARA staff.

- Develop an integrated institution-building plan for ADSP to which HITS' efforts can contribute.

ECONOMIC ANALYSIS

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
Fruit Industry: Available data with regard to fruit production remain confusing and seemingly unreliable. Official data for 1982-85 greatly understate the increase in fruit-growing area, but overstate the increase in yields.	The fruit-growing area expanded by 5,500 hectares, or 21 percent, during 1982-86. Yields declined, partly because the new plantings have not yet produced fruit, but also for lack of agricultural inputs. Production increase has been about 1.6 percent per annum.	Proceed with the CORE-funded effort to produce a statistical survey of the agricultural sector.
A rapid increase is under way in the share of fruit production accounted for by large-scale farmers with 20 to several hundred hectares in production.	Large-scale farmers, relatively unconstrained by shortages of technical know-how, credit, water, and fertilizer, will account for 10 percent of fruit production by 1990.	AID cannot reverse the large farm trend. However, HITS should stop providing technical assistance to large farmers.
The MAF controls virtually all nursery operations. Nurseries operate at a loss because of the MAF policy of selling trees at or below cost. Trees are distributed on a first-come first-served basis. Demand for trees at nursery sales is heavy but only 60 percent of trees are actually sold. Average lot size is 15-25 trees and survival rate is 75 percent.	Nursery distribution is fair in that small farmers can obtain trees, but appears inefficient. Private-sector entry is precluded by the MAF policy of subsidizing tree sales. The MAF is not likely to agree to conversion of its nurseries to private ownership.	AID should not press for sale of MAF nurseries. It should encourage an end to the policy of subsidizing tree sales as a prerequisite to private-sector participation in nursery operation.

ECONOMIC ANALYSIS
(Continued)

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
Economic Impact of the Project: Redirection of the project away from research and toward tree production, and the ineffectiveness of the MAF extension service, precluded any chance of reaching project goals.	Redirection of the project was a mistake from the standpoint of economic impact.	Return the project to its ori purpose of research and train
The only economic impact to date has come through the work of the Extension Specialist in production of tapes and direct work with farmers through demonstration plots and pilot farmer programs. These programs have benefited growers of deciduous trees and tropical fruits other than bananas. Grape and banana producers have largely been left out.	HITS' efforts have resulted in yield increases for the affected growers of 15 percent greater than would have occurred in the absence of a project. The increase calculated on the basis of all fruits (considering that grape and banana producers have not benefited) has been 6 percent, or 1.15 percent per annum. The project paper had projected an increase of 24.1 percent, or 4.4 percent per annum, for the first 5 years of the project.	Hire additional third-country Yemeni personnel who can assi and help further the work of Extension Specialist.
Project Sustainability: The MAF met about 52 percent of its budgeted costs during project years 2 through 5. Its dollar contribution through FY87 is estimated at US$1.7 million, budgeted for the entire project.	The MAF is not likely to sustain a HITS project on anything like the present scale or design.	Proceed with the redirection and consolidation of activities along mutually agreed lines, as discussed elsewhere in this report.
Private Sector: Fruit growing remains highly profitable, but small and medium farmers are constrained from expansion by shortages in credit, water, and agricultural inputs.	Given existing constraints, production by small and medium farmers will increase slowly at best. Yields per hectare could decline if the situation is not relieved.	AID can best assist small and medium growers through an integrated program that addresses constraints facing all farmers in areas of credit, water, and agricultural inputs.

MANAGEMENT ISSUES

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
CP/P: A major factor accounting for HITS' poor performance has been CP/P's inability to recruit and field well-qualified staff with the necessary technical skills and development experience on a timely basis. This problem is complicated by the general difficulty of recruiting such individuals for long-term assignments in Yemen, CP/P's lack of prior experience in Yemen, and its limited number of horticultural faculty. CP/P staffing problems have resulted in implementation delays and serious technical and managerial errors. The current team leader in cooperation with the USAID project officer had improved the internal management of HITS, but much remains to be done to improve the working relationship with the MAF. Because of these problems, HITS and CP/P have lost credibility with the MAF.	Action is needed to improve contractor performance, particularly in regard to future staffing, and to regain credibility with the MAF.	Consider replacing CP/P as the HITS contractor. Require that CID consider alternative institutions for the project. Review current staffing in light of recommended project modifications. Exert more control over the HITS contractor by direct contracting.

MANAGEMENT ISSUES
(Continued)

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
USAID/Sana'a: The serious problems with HITS require a re-assessment of the mission's and AID's reliance on Title XII institutions to perform tasks that are ordinarily the responsibility of Agency staff. The mission's own staff weaknesses and limitations during a period when the decision had been made to expand the agriculture portfolio contributed to viewing the collaborative assistance mode as an expedient solution. However, this expediency has been obtained at considerable cost to the performance of HITS. The contractual arrangement through CID interfered with the mission's direct input into project management. No action has been taken to ensure AID's continued control through contractual mechanisms. The mission's efforts to improve CP/P's performance in 1985 met with resistance and were only partially successful. The mission's acquiescence to the MAF's demands for substantial tree production at the stations diverted project resources, imposed new objectives on HITS without an amendment, and interfered with original applied research objectives.	Responsibility for serious mismanagement problems is shared by USAID/Sana'a and ANE Bureau senior managers. Direct contracting with the implementing institution is necessary to ensure that the mission can exert management control as it is required.	For USAID/Sana'a: a) implement a direct contract with the HITS implementing institution; b) take a more active and direct role in ADSP and clarify its management system; and c) work more closely with the MAF on future staffing, station use and management, and HITS objectives.

MANAGEMENT ISSUES
(Continued)

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
MAF: The MAF's limited managerial capabilities and technically qualified staff have contributed to unanticipated negative effects on the project and impeded the MAF's larger objectives. The MAF's demand for substantial tree production at the stations constituted an important management decision that adversely affected HITS' achievement of original objectives. HITS could have assisted the MAF to meet its legitimate tree production needs without imposing large production goals at the stations.	The MAF has contributed to the management problems of HITS, though the MAF's overall dissatisfaction with the project is well-justified. Communication, cooperation, and understanding among HITS, mission, and MAF staff are poor.	The mission and the MAF need to meet more frequently and routinely to establish channels of communication.

HORTICULTURE

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
New varieties were planted at Al Jarouba in 1986; more will be planted in early 1987. Varieties were planted at Al Irra in 1983 and 1985. It takes 6-10 years to obtain information to make decisions on new varieties.	Few additional recommendations other than banana, papaya, and passion fruit can be given before December 1989.	HITS and ARA develop a system to continue to evaluate varieties on trial using "agreed to" criteria.
Farmer requests for trees have been several hundred thousand per year. The MAF expects to furnish farmers 7 million trees during the TFYP. The MAF does not have a plan leading to the production of all trees in Yemen.	The MAF will continue to import trees to meet farmers' request at considerable expense until they can be produced in Yemen.	HITS should assist the MAF to develop a plan that will produce all budded trees, rootstock, and quality cuttings and seedlings.
Some budwood of peach, nectarine, and plum and apple budwood and rootstock is available at Al Irra. There are now 24 government nurseries. Varieties have only been tested in two areas of Yemen. There is no decision on the amount of budwood and rootstock needed.	Additional amounts of budwood and rootstock available in Yemen are needed. Geographic-climatic areas in Yemen, other than Sana'a and Al Jarouba, have not been tested.	Decisions need to be made on amount of budwood needed yearly for varieties recommended. Rootstock sources for each variety need to be developed in Yemen. Specific nurseries should be given yearly quotas.
Some climatic-geographic areas in the world have not been reviewed for varieties adaptable to Yemen. Local trees have not been screened to identify trees of high yield and good quality. Rootstock sources in and out of Yemen have not been adequately reviewed.	Reviews of other areas similiar to Yemen could identify trees adaptable to one of the many geographic-climatic areas of Yemen. High-yielding trees could have developed in Yemen over the years from sports, chance crosses, or mutations. Trees adaptable to local conditions could provide good rootstock.	CP/P and CID in U.S. should review all areas with climates similar to Yemen for varieties suitable for trials using criteria developed by HITS. A search should be conducted by HITS/ARA and the MAF during fruiting season in Yemen for trees with either fruit and rootstock qualities.

HORTICULTURE
(Continued)

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
The MAF has not developed the capabilities to manage the adaptive research of trials on new varieties, rootstock identification, and trials on cultural practices. ARA at present has Yemeni Ph.D.'s (10) M.S.'s (20) and many B.S.C.'s working in agricultural research.	To maintain the standards of research at the stations, persons educated and trained in this area are needed. ARA should be responsible only for research and station management in support of its research program. The MAF should be responsible for production of fruit trees and associated costs.	AID/HITS should ensure the transfer of the research responsibilities from the MAF to ARA by June 1987.
Cultural trials on irrigation and fertilizer have not been started. Limited pruning trials have been done. Some trials with chemicals to delay flowering, break dormancy, and develop flowering at one time are in progress.	The correct application of certain chemicals or practices can improve fruit yield and quality. It often takes several years to identify the appropriate practice.	HITS needs to meet with ARA to determine the trials that should be conducted at Al Jarouba and Al Irra, and to set standards for results.
While the Marib area is suitable for citrus production, the HITS project has less than 3 years left, and USAID has a reduced budget worldwide. ARA wants a research station in the Marib-Jawb area.	From the project's experience to date, HITS will not have time to complete the Marib station even if P.L. 480 funds were available immediately. ARA and the MAF may want to work together to develop facilities that will meet the needs of both.	HITS/AID should explain the present situation to the MAF. HITS/AID should meet with the MAF/ARA to help review their aims and identify activities that will help them reach their goals without AID/HITS involvement.

PLANT PROTECTION

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
The Inspection and Quarantine Department (I&Q) had official rules and regulations for a short time. It works in all agricultural areas. There is still bacterial canker in Yemen (since 1981). Nurseries are still selling plants infected with disease and pests.	From past I&Q activities, little information has been collected on its positive effect on ratios of tree survival and fruit production and in the provision of fruit trees free from disease and pests. The services of I&Q need to be improved.	The MAF should keep records of the activities of I&Q in fruit production so its effects can be determined. Additional training for I&Q staff is needed.
The Plant Protection Department has recently become a Directorate. IPM is being started. Fewer toxic pesticides are used by the MAF. Pesticides and fungicides are often not available.	Some insects and diseases in horticulture are being controlled better. Recommendations are not effective without pesticides/fungicides to apply. Improvement in plant protection services are being made.	HITS/PPD should continue to identify priority problems that can be solved quickly. AID should try to find a solution to shortage of pesticides and fungicides.
Many plant protection staff do not have English capabilities so they have not had training opportunities. There are plant protection training opportunities in Egypt and Morocco in Arabic.	Short training courses should be developed to match staff needs and be given in Arabic in or out of Yemen.	HITS should meet with the PPD to determine staff training needs at at the MAF Sana'a and in provinces.
The rules and regulations of I&Q service have recently been ratified by YARG. Physical facilities are lacking. The PPD is understaffed. There are several entities in MAF/YARG involved in plant protection.	Plant protection (entomology, nematology, virology and plant pathology) and I&Q will need support in their development activities over a long period to reach their goals.	A meeting should be sponsored by HITS/AID with all YARG entities in plant protection and I&Q activities, and with all donors that support these activities, to agree on methods to reach YARG's TFYP goals and to identify resources.

PLANT PROTECTION
(Continued)

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
Many insects and diseases were identified before 1981; additional ones have been identified since 1984. No complete survey of insects and diseases has been conducted in Yemen.	To develop a sound plan of action, information on all insects and diseases now in Yemen affecting agriculture--including beneficial insects for the IPM program--is necessary to make future plans.	HITS/MAF should make a survey of Yemen on all insects and diseases now present in agriculture. All printed information on insects and diseases should be reviewed and updated on completion of survey.
There are many diseases and insects that are causing, or could cause, serious economic effects on production.	Priorities need to be set on the many problems to be solved.	HITS should sponsor a meeting with ARA and the MAF to set priorities for solutions to plant protection problems.
ARA has been given the responsibility by YARG to do research in plant protection.	ARA will manage plant protection research in the future. The MAF can improve services to farmers on the control of harmful insects and diseases.	HITS should help ARA in research as needed and concentrate on develop-useful information/practices to enable the MAF to provide better plant protection services.

EXTENSION

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
The National Extension Service of the MAF is largely ineffective. Although NES produced and displayed TV tapes, they are too general in content to be helpful to farmers. Nor has the MAF produced packages of horticulture information for distribution to farmers.	Although HITS can be criticized for not doing more to strengthen the NES (see below), the fact is that the basis for yield improvement through the MAF extension service, as envisioned in the project paper, did not exist.	Continue to offer training to the MAF personnel. Establish a formal counterpart relationship with the NES (see below).
A number of regional DA's, most of them foreign funded, have their own extension training and activities, including demonstration plots and training and visitation systems.	Extension activities of the DA's are far more effective than those of the NES, but they are by nature regional in coverage. Furthermore, being geographically remote from HITS, they are not directly subject to HITS' influence.	Offer assistance to the DA's on their demonstration plots and training, as appropriate.
HITS' extension activities have been largely the work of one individual, encompassing production and display of TV tapes; establishment of demonstration plots and "lead farmer" programs; training courses at Al Irra and Al Jarouba; and visits to individual farmers.	The TV tapes are relevant and are believed to be effective, but are inadequate relative to the need. The same can be said of the demonstration plots, lead farmer program, and farm visits. The effectiveness of the training programs is limited by the capacities of the trainees, who often lack motivation. The HITS Extension Specialist is overextended relative to the need for extension services.	Work with ARA on the production of TV tapes and other media materials. Hire a Yemeni agriculturist to assist and improve the work of the HITS Extension Specialist.

EXTENSION
(Continued)

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
HITS does not keep records on farmers' receiving extension advice or trees distributed at HITS stations, and thus has no systems of followup for assessing the impact of extension advice. The MAF may keep at least partial records of tree distribution, but has apparently not undertaken followup surveys.	Given the absence of an information system, it is not possible to assess accurately the effectiveness of HITS' extension activities.	Establish a management information system along the lines discussed in Section 8--Information for Project Management.
HITS does not have a formal counterpart relationship with the NES. Relationships with the DA's and ARA are on an informal basis, often the result of requests for assistance.	The need for a better working relationship with the MAF exists in the extension area, as well as the other areas cited in this report. Relationships with the DA's also could and should be closer.	Establish a formal counterpart relationship with the NES. Offer training and assistance with demonstration plots to the DA's.

INSTITUTIONAL TRAINING

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
Long-term training in the U.S. is costly. Training in English capabilities of 500 TOEFL takes more than 1 year and costs $19,000 a year. Short courses can be given in Arabic-speaking countries quickly and are not as expensive as U.S. courses. Short courses can also be given in Yemen in Arabic. Most MAF staff have low English capabilities. No HITS U.S.-trained MAF staff has completed a degree.	Short-term training in Arabic, in and out of Yemen, will help implement and institutionalize more of the project by December 1989.	Future training should be short-term in Arabic for staff in Sana'a and provinces in or out of Yemen. Give management training inputs in all short courses that match the organizational level of participants.
The MAF has difficulty in finding counterparts to work on American projects. Most counterparts do not have adequate training or experience. HITS staff have not been able to adequately transfer their skills and knowledge needed to Yemeni. There are language problems with HITS and MAF staff.	A uniform system of donor payment to counterparts will allow American projects to get their proportionate share. Some HITS staff need better interpersonal skills, knowledge, and experience in adult education for effective work in developing countries.	A meeting among donors should be sponsored by AID to develop a uniform payment system for counterparts. CID and CP/P should develop adequate interpersonal skills in project staff before they arrive in Yemen.

INSTITUTIONAL TRAINING
(Continued)

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
Important problems related to the MAF providing adequate service in fruit production are still unresolved.	The MAF needs to further develop and institutionalize services that support fruit production activities of farmers. This includes appropriate varieties for different areas, improved cultural practices, and availability of fertilizers and plant protection products.	HITS/AID should sponsor coordination meetings as needed among entities involved. More discussions should be held at the MAF/YARG senior levels on improvements needed and the institutionalization processes involved.
Technical skills are important, but management skills such as planning, organizing, implementing, delegating, coordinating, and aiming are needed and have been requested.	Management skills will help the MAF staff get jobs in technical areas done better and faster working through other people in and out of the MAF.	Make a review of the Agricultural Management Development Project in the Ministries of Agriculture in Egypt, Nepal, and Bangladesh to see if the same type of training would be useful in the MAF.
MAF so far has depended on the MAF and local DA extension services to motivate average farmers. Large farmers are motivated primarily by profit. Lack of fertilizers and insecticides limits production/profits.	Average farmers will be motivated by new usable information on fruit production wherever the source, assurance of profit, and availability of necessary inputs. Large farmers are able to seek out needed information.	HITS should continue to package usable information developed so it is easily disseminated by MAF and local DA extension services and also via TV and radio. HITS should enlarge its extension service.
Several organizations/institutions/ authorities in the YARG as well as donors support fruit production. There is little communication and coordination among them.	With better communication and coordination, these entities can more effectively support fruit production in the future.	HITS/AID should sponsor meetings to help develop links among these YARG and donor organizations to be chaired by the MAF. NIPA could help organize these and act as facilitator.

INSTITUTIONAL TRAINING
(Continued)

FINDINGS	CONCLUSIONS	RECOMMENDATIONS
There is still not clarity among AID, the MAF, HITS, and ADSP on roles and responsibilities of each for institutionalization in the MAF generally and the HITS project specifically.	There have been limited accomplishments in implementation and institutionalization as roles and responsibilities are not clear among the major entities involved.	AID/HITS should sponsor a meeting as soon as possible with these four entities to set aims and end products, clarify roles and responsibilities, and develop a schedule of activities for more effective institutionalization.
YARG and AID rules and regulations on participant training are not being followed.	The systems, procedures, roles, and responsibilities of the various entities involved in participant training are not clear or are deliberately not being followed.	Universities/projects do not discuss or attempt to modify original training arrangements made with participants. Any such activity goes to YARG/AID for a joint decision.

ACRONYMS

AAD	Agricultural Affairs Directorate
ADO	Agriculture Development Officer
ADSP	Agriculture Development Support Program
AID	Agency for International Development
ARA	Agriculture Research Authority
CHRDP	Central Highlands Research and Development Project
CID	Consortium for International Development
CORE	Central ADSP Project
CPO	Central Planning Organization
CP/P	California State Polytechnic University, Pomona
DA's	Development Authorities
FAO	Food and Agriculture Organization
FFYP	First Five-Year Plan
FOA	Faculty of Agriculture
GDP	Gross Domestic Product
GTZ	German Technical Cooperation
HITS	Horticulture Improvement and Training Subproject
IRR	International rate of return
IPM	Integrated Pest Management
MAF	Ministry of Agriculture and Fisheries
ME	Ministry of Education
MI	Ministry of Irrigation
NIPA	National Institute of Public Administration
NES	National Extension Service
PACD	Project authorization completion date
PPD	Plant Protection Directorate
SFYP	Second Five-Year Plan
SURDP	Southern Uplands Rural Development Project
TDA	Tihama Development Authority
TDY	Temporary Duty
TFYP	Third Five-Year Plan
T&V	Training and Visitation
YAR	Yemen Arab Republic
YARG	Yemen Arab Republic Government
YALI	Yemen American Language Institute
YPPC	Yemen Plant Protection Center
YR	Yemen Rial

1. BACKGROUND

1.1 HISTORY AND CURRENT STATUS

The Horticulture Improvement and Training Subproject (HITS) is a component of the Agricultural Development Support Program (ADSP). USAID/Sana'a has contracted with the Consortium for International Development (CID), via a collaborative agreement, for services to design and implement ADSP and its subprojects. The California State Polytechnic University at Pomona (CP/P) is implementing HITS. HITS was authorized in February 1983 for $14,385,000 with a project authorization completion date (PACD) set for December 1989. Approximately $8 million have been spent as of February 1987. No additional funding or extension of the PACD is planned by the mission, nor is any recommended by this evaluation.

The original objective of HITS was to institutionalize within the Ministry of Agriculture and Fisheries (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. The intended beneficiaries of HITS are all farmers of Yemen, but especially medium and small farmers. To achieve project objectives, HITS has supported:

- The construction of two horticulture stations for varietal improvement testing, development of disease-free budwood and rootstock, demonstration programs, and extension training.
- Training the MAF fruit culture technicians and specialists in basic fruit culture skills and extension techniques.
- Expansion and improvement of the MAF's plant protection program.
- Expansion of the production and dissemination of horticultural information throughout Yemen via radio, television, newspapers, pamphlets/leaflets, and demonstrations.

In 1981, CID assumed management responsibility of staff from a preceding horticulture project implemented by Tuskegee Institute. Preimplementation activities began in 1982. Construction of the horticultural station at Al Jarouba (for tropical fruit trees), initiated by the preceding project, was continued through ADSP during the interim period while HITS was being designed. CP/P's direct involvement began in 1982 with the fielding of a long-term advisor, followed by a number of short-term (TDY) personnel. Work on Al Irra (the deciduous horticulture station) started in 1983. In early 1984--approximately 1 year after project authorization--additional long-term advisors were fielded for the project. Staff positions continued to be filled during 1984 and 1985, but it was not until February 1986 that HITS was fully staffed (the number of advisory positions had also been reduced because of budget cutbacks).

The project has had a troubled history. CP/P had considerable difficulty in recruiting individuals with the necessary skills and development experience, which slowed HITS implementation. Staffing problems arose between CP/P-HITS

and the MAF very early in the project. The MAF's refusal to accept CP/P's proposed candidates (who the MAF considered unqualified), early terminatio of HITS staff, and inadequate project leadership further interfered with implementation. (Section Three--Project Management--discusses this in mor detail.) Major setbacks occurred from citrus canker infection at Al Jarouba, resulting in the destruction of all citrus trees in the station, and from the project's introduction of crown gall disease at Al Irra.

As of February 1987--4 years after project authorization--the stations at A Jarouba and Al Irra are nearing completion. During this period they have been used for both research and production purposes as HITS' priorities ha shifted. Technical assistance has been provided to the Plant Protection Directorate (PPD) of the MAF, in-country and participant training has been conducted (including one horticulturalist currently in a Ph.D. program), ar a promising horticulture extension program at the farm level has been initiated. However, project outputs lag significantly behind original planning targets. Given the costs and time involved with the project's results to date, HITS' performance can only be viewed as very unsatisfactor Technical and managerial errors by CP/P, USAID/Sana'a, and the MAF have produced major setbacks for the project. Little significant progress has been made toward developing the MAF's capacity to adequately manage Al Irra and Al Jarouba after HITS is completed. It is very unlikely that this will be accomplished by the December 1989 PACD.

Approximately 34 months remain for HITS to achieve its objectives. The major purpose of this evaluation is to provide guidance for redirecting the project to concentrate on areas that are important and show promise and to develop a strategy to sustain the HITS stations for an orderly termination of the project in December 1989.

1.2 THE ECONOMIC ENVIRONMENT

The start of the HITS project in 1983 corresponded closely in time with the end of an economic boom and the beginning of hard times for Yemen, the clos of which is not yet at hand.

The boom period began with the upsurge in oil prices in 1974, which led in turn to soaring remittances from the roughly 25 percent of the Yemeni labor force who found work in Saudi Arabia. From 1975-82, real Gross Domestic Product (GDP) rose by 7 percent per annum, government spending on development and social services soared, and consumer tastes were permanently transformed by a flood of imported consumer goods. Since 1983, in belated response to the oil price collapse in 1981, government spending and imports have been reduced drastically; the Yemen Rial, which had been pegged at YR4.56 to the US$1.00 since 1971, has declined to 11.86; GDP per capita has marginally declined; and price inflation has risen sharply.

The boom period witnessed a mass exodus of farm laborers to the higher-paying jobs in Saudi Arabia, leading to the abandonment of marginally cultivated areas and to the stagnation of traditional foodgrain crops. On the other hand, irrigated production of fruits and vegetables increased, benefiting from generally higher incomes and the newly acquired tastes of returning workers.

The current economic downturn is expected to continue until at least 1988, when the country will begin to ship its first oil from the ongoing Hunt Oil Company development. Initial annual revenues are estimated at $400 million to $450 million, depending on world oil prices. While revenues of this magnitude will permit some upturn in imports and government spending, there will not be a return to the free-spending days of 1975-82.

Throughout the recent period of difficulty, Yemenis have been able to rely to a great extent on the very large "unofficial" economy, reflected in widespread smuggling across the porous border with Saudi Arabia. Although the unofficial economy has suffered along with the government from the downturn in oil prices (both have relied heavily on remittance income), there unquestionably remains a considerable store of wealth throughout the country not reflected in the official data. The existence of this wealth has been reflected in vigorous private-sector activity, even during the country's recent difficulties.

Following, in brief, are some of the implications of the economic downturn for project activities:

- Reduced government funding for virtually all areas of activity, including HITS.
- Lowered government morale, reflecting the fact that government salaries have remained virtually unchanged in the face of rapid and rising inflation.
- Shortages of imported agricultural imports, especially fertilizers and insecticides.
- A relatively greater role for the private sector as the leading force for economic growth.

2. ECONOMIC ANALYSIS

2.1 FRUIT INDUSTRY STRUCTURE AND GROWTH, 1982-86

The Agriculture Sector Census of 1978-82 showed 26,612 hectares, or 3.4 percent of all cultivated land, under fruit production. The total hectarage is roughly consistent with the agreed Central Planning Organization (CPO)-MAF data for those years, but there remains broad disagreement regarding the distribution of acreage by crop, and yields per hectare appear to be widely understated. Total fruit growing area is said to have increased by 1,400 hectares and production by 20,000 tons, or 4.2 percent per annum, during 1982-85. The implied increase in yield per hectare is from 5.43 tons in 1982 to 5.85 tons in 1985. These data are not entirely credible.

2.1.1 FINDINGS

Based upon the available data covering domestic nursery production and imports of trees (see below and Annex B), and allowing 400 trees per hectare, the fruit-growing area must have expanded by 5,500 hectares during

1982-86; but yields are more likely to have declined than increased. The salient points with regard to yields are these:

- Of the additional hectares added during 1982-86, only the proportions accounted for by grapes planted early in the period and bananas could have produced fruit by 1986, and a substantial proportion of the large-scale banana plantings are known to have failed (see Annex B).

- The National Extension Service (NES) has remained almost totally ineffective.

- Imports of fertilizers and insecticides were virtually cut off after 1982.

- According to the Fruit Growers' Survey, growers report continuing problems with inadequate irrigation and credit availability.

- On the positive side, the production of videotapes by HITS may have had a significantly favorable impact on farmer practices. The same is true, to a lesser extent, of the farm demonstration and model farmer programs conducted by HITS, and the various extension programs being conducted under the aegis of area-specific integrated rural development programs (see Section 6--Extension).

Based on these considerations, we estimate that average fruit yield per hectare declined at a rate of 3.2 percent per annum during 1982-86. Because of the increase in hectarage, however, fruit output increased an estimated 1.6 percent per annum to about 227,000 tons. (See Annex B for calculations and methodology.)

To be sure, the poor yield performance has been mainly a matter of additional plantings not yet bearing fruit; the payoff from these additional plantings should be seen starting in 1987. Accordingly, the government's Third Five-Year Plan (TFYP) projections, calling for a 7-percent annual increase in the output of most fruits during 1986-91, is within the bounds of reason. A strong cautionary note needs to be sounded, however. Increases in area under fruit will not alone do the job. If the constraints of inadequate extension, agricultural inputs, irrigation, and credit are not addressed, crop failures and generally declining yields can more than offset the gains expected from increased plantings. In fact, the potential exists for an output decline of significant proportions.

2.1.1.1 Changes in Farm Structure

The Agriculture Sector Census did not disaggregate the data to size of farm-holding by subsector. The project paper noted that fruit producers comprised two basic groups: subsistence growers with a small number of backyard trees, usually bearing low-quality fruit; and commercial growers cultivating less than 4 hectares, usually in a mixed-cropping pattern (fruit and other crops). HITS was to have collected data that would clarify the picture, as well as provide the basis within the MAF for the production of improved and up-to-date farm budget surveys. None of this has in fact been done.

If the picture with regard to farm holdings has not been clarified, a significant new trend has at least become apparent since the ban on importation of fruit in late 1983, namely the emergence of large-scale growers cultivating from 20 to several hundred hectares. HITS personnel have been able to identify projects totaling 1,009 hectares as having already started operations, with another 761 hectares in the planning stage However, this does not include one very large planned project at Al Jawf, involving some 6,000 hectares, of which an unknown portion would be in fruit. In a study by International Advisory Company Limited (IAC) in 1985,[1] large-scale new projects were projected to reach 3,300 hectares by 1990. It is not known whether this estimate included the Al Jawf project, but, if so, it would be reasonably consistent with the HITS estimates. Based on the ambitious plans of the large growers and the far less ambitious plans of the medium- and small-scale growers, the former are likely to account for 10 percent of all fruit-growing hectarage by 1990.

2.1.1.2 Nursery Production and Distribution

The number of government nurseries involved in fruit production has expanded from 10 at the start of the project to 24 at present. Government nursery production amounted to 3.5 million trees during 1982-86. There are no private-sector nurseries as such. Some large growers maintain nursery operations, including at least one involved in tissue culture, but only as a source of tree stock for their own use.

In addition to its nursery activities, the YARG imports trees in large numbers. The MAF data show some 365,000 trees imported during 1982-86, with another 156,000 planned for 1987. Imported trees are sold at approximately CIF value; nursery trees are sold for less than imported trees without regard to costs of nursery operations. The MAF officials conceded to us that the MAF nurseries operate at a loss, but we were unable to obtain the data needed to quantify the extent of loss.

Warren Enger[2] found that the MAF sales have never exceeded 60 percent of production in any one year, the remainder being distributed free of charge and used mainly for cover rather than organized orchard activity. The MAF tree distribution, which includes trees produced at the HITS stations, is made following public announcements, on a first-come-first-served basis. The MAF has information on distribution by lot size, but it is not in an organized form, and we were discouraged from attempting to sort through it. The average sale is said to be in lots of 15 to 25 trees. Some 20 to 25 percent of sales are seedlings; the remainder, budded trees. The survival rate of trees is said to be 75 percent and improving.

2.1.2 CONCLUSIONS

Official data appear to understate hectarage and yield by a wide margin. At the same time, they have overstated increase in yield and production during 1982-86. The TFYP production targets are achievable, but only if existing production constraints are addressed.

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[1] IAC, Fruit and Vegetable Marketing Study in the YAR, 1985.

[2] Warren Enger, Fruit Horticulture Sub-Sector Assessment--Yemen Arab Republic, RONCO Consulting Corp., August 1986.

The Central ADSP Project (CORE) agricultural economist advising HITS has not developed a capacity for data studies and analysis within the MAF, as contemplated in the project paper. However, given the paucity of resources available for this purpose within the MAF, it was unrealistic to expect that this could have been done.

There is under way a strong trend toward concentration of production among large farmers. The trend is facilitated by relatively easy access by the large farmers to foreign technical assistance and agricultural inputs.

The MAF's present emphasis is on nursery production and tree distribution, as opposed to extension and the removal of constraints to increased production from existing trees.

Private-sector entry into nursery production is discouraged, if not precluded, by the existing policy of subsidizing tree sales.

Tree distribution is fair in the sense that all farmers have an equal chance to obtain trees.

2.1.3 RECOMMENDATIONS

Further efforts should be made to improve the quality of agricultural data. The present CORE-funded effort to develop a nationwide statistical survey of agriculture is a step in the right direction.

The trend toward concentration of production among large-scale farmers will continue, regardless of AID's position on the matter. However, present HITS assistance to large farmers should be terminated. USAID can best aid the smaller farmer through an integrated approach that addresses existing constraints in the areas of extension, agricultural inputs, water, and credit.

Private-sector entry into nursery production should be encouraged. See Section 2.4 for further discussion of this subject.

2.2 ECONOMIC IMPACT OF THE PROJECT

In projecting the impact of HITS on fruit production in Yemen, the project paper made the assumption that the impact would come entirely through its influence on yield per hectare. It was assumed that yields could be increased from the 6.4 percent per annum growth rate for grapes and 2.6 percent per annum growth rate for other fruits implied in the Second Five-Year Plan (SFYP) to 9.0 percent for grapes and 9.3 percent for other fruits.[3] The projected increase in production under the "With HITS," as

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[3] The analysis appears to have ignored the fact that the SFYP projections must have involved increases in hectarage, as well as yield per hectare, but the oversight can be ignored for these purposes. The matter can be considered on the basis of area in production in 1981.

opposed to "Without HITS," model was 160,900 tons.[4]

2.2.1 FINDINGS

The redirection of the project, away from research and training activities toward tree production, in the first year of operation ended any chance of reaching these ambitious goals. Given the ineffectiveness of the YARG extension system (which the project was expected to impact), and the lack of agricultural inputs owing to import reductions after 1982, it is doubtful that the project could have attained its goals even had it hewed to its original course. With all due allowances, however, the economic impact of the project has been disappointing. Training of extension personnel, which was expected to have a major impact, has in fact had virtually no impact (see Section 6--Extension). A partial exception might be the few sessions devoted to training of nursery personnel. The areas in which HITS' activities to date have had, or will yet have, an impact may be summarized as follows:

- o The production of four videotapes by the HITS Extension Agent, all of which have appeared periodically on television since 1984. According to the project paper, the MAF was to have developed staff and facilities to produce agricultural television tapes and radio scripts with assistance from the CORE Information Technology Specialist. A number of these tapes were indeed produced and have appeared on the air. However, their content is by all accounts too general to be of practical benefit. Accordingly, the overall impact of the television effort has been less than planned.

- o The demonstration farms, farm field days, and work with pilot farmers, all carried out by the Extension Specialist.

- o Sales of some 50,000 trees from the Al Irra and Al Jarouba stations, the impact of which will not begin to occur before 1989.

- o Some impact from varietal testing at the two stations. According to the Project Manager, the importation of 50,000 to 100,000 high-quality orange trees from California was the direct result of HITS' varietal testing.

- o The assistance to large farmers who have benefited from the feasibility analyses provided by the HITS Extension Specialist/Citrus individual.

Except for the technical advice provided large farmers, virtually all of HITS' activities aimed at improving farm yields have been directed at producers of deciduous fruits and tropical fruits other than bananas. In

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[4] The project paper also put a dollar value on the expected impact of the project but made serious computational and other errors in doing so. Accordingly, comparisons of expected with intended results will be discussed in terms of yields per hectare. The problem of dollar valuation is covered in Annex B.

other words, grape and banana producers generally have not shared in the benefits provided through the television tapes and demonstration plots. Against the favorable influences listed above must be debited any degree of damage to Yemen soils (a point of controversy among the horticultural experts) arising from the distribution of trees infected with crown gall, as well as the general loss of project credibility arising from the crown gall and citrus canker episodes.

2.2.2 CONCLUSIONS

HITS' activities through FY87 are estimated to have increased the yields of fruit growers--other than those producing grapes and bananas--by 15 percent more than the yield increases that would have occurred in the absence of the project. Considering that virtually no yield increases were effected for producers of grapes and bananas, the increase in yields in all fruit crops, attributable to the project, is 5.9 percent, or 1.15 percent per annum. The yield increase for all fruits as projected in the project paper for the first 5 years of the project was 24.1 percent, or 4.4 percent per annum (using the separate project paper projections for grapes and "other fruits," but our data on respective shares of the overall cultivated area).

2.2.3 RECOMMENDATIONS

Discontinue tree production and return HITS to its original focus on applied research.

Phase out U.S. operations at Al Jarouba preparatory to turning the management and research agenda of the station to the Agricultural Research Authority (ARA).

Hire additional Arabic-speaking personnel to assist in and extend the work being done by the Extension Agent.

2.3 PROJECT SUSTAINABILITY

2.3.1 FINDINGS

According to the project paper, the MAF was to fund $4 million of the total $18 million of project costs. The dollar value of actual MAF support for the period 1983-87 is estimated at $1,711,000.

Based on project paper planning data and expenditure data supplied by HITS, the actual MAF expenditures were 79 percent of the amount budgeted for it in the first year of the project, a better ratio by far than the U.S. side was able to achieve. The MAF expenditures in that year included construction of a house at Al Irra, land clearing, and road construction. From Year 2 however, YARG expenditures have averaged only 52 percent of budget (in base year prices), about all of it spent on salaries of support personnel and wages paid to project laborers. If account is taken of the fact that increases in salaries and wages have lagged far beyond other costs while the Yemen Rial-to-U.S. dollar rate has risen sharply, the dollar equivalent value of the MAF support has fallen far more than these figures suggest. Estimated dollar value of the MAF support has fallen steadily from $1,267,000 in FY83 to $151,400 in FY84 to a projected $72,500 in FY87.

Until FY87, the unmet share of the MAF obligations was paid from unexpended local currency HITS funds. In FY87, for the first time, HITS budgeted for the U.S. dollar account the portion of MAF obligations that, on the record, the MAF was not expected to meet. Parenthetically, HITS' ability to pick up unmet MAF obligations constitutes one measure of the extent to which the project has been overfunded.

2.3.2 CONCLUSIONS

There is nothing on the record, or in the near-term fiscal outlook for the YARG, to suggest that the MAF will meet its agreed share of project funding between now and 1989. The MAF's obvious disenchantment with HITS to date tends to strengthen this conclusion. By 1989, the YARG's budget situation will have improved with the initial receipt of oil revenues. However, there will be many pent-up claims on available resources for years thereafter. The MAF would not be likely to continue funding a HITS project after the scheduled termination date in 1989 without a drastic revision of project goals and purposes that would meet perceived needs.

2.3.3 RECOMMENDATIONS

Proceed with a redesign of HITS, as described in this report, which minimizes the need for expensive foreign expertise and pursues agreed lines of endeavor.

2.4 PRIVATE-SECTOR ACTIVITY

2.4.1 FINDINGS

Investment in fruit production by private growers is proceeding at a rapid pace, especially when considering the constraints facing small- and medium-size growers. As shown in the Fruit Growers' Survey, most growers would like to expand their fruit operations but are constrained from doing so right away by lack of credit, water, and available land, in that order of importance. Credit is available, for the most part, only to the larger growers who can provide collateral. Even then, the best reported terms, 50 percent funding with 5 years grace period, are not attractive to growers of crops with 5 years or more gestation periods. Lack of fertilizer was not mentioned as an important constraint in the survey, but this appears to reflect a general unfamiliarity with the product. Whatever the constraints, total area under fruit production expanded by some 5,500 hectares, or 21 percent, during 1982-86. Large-scale farmers, just coming onto the scene following the import ban in 1983, accounted for about 1,000 hectares, or 18 percent of the expansion. The large farmers, operating from 20 to several hundred hectares, usually in mixed-cropping patterns, are far less constrained by lack of technical know-how and inputs than small farmers and accordingly will account for a rapidly increasing share of output as well as area in the forseeable future.

In his 1986 report on the fruit sector, Warren Enger expanded upon the cost of production work done by Asmon and reproduced in the project paper. His studies tend to confirm the finding regarding the high degree of profitability of fruit production. Among the important crops, the most profitable--with international rate of returns (IRR's)--were found to be oranges (217 percent), bananas (217 percent) and mangoes (189 percent). A weighted

average of all crops except grapes (weighted by value of crop marketed in 1986) showed an average IRR of 185 percent. The IRR for grapes was estimated at 39 percent, but the potential for yield improvement in grapes is said to be very great. The only unprofitable crop of importance was found to be dates. Continued profitability will, of course, depend on prices, but Enger does not forsee a leveling off in prices sufficient to bring about a halt to production increases before 2005.

As noted in Section 2.1 above, private-sector entry into nursery production is discouraged by the MAF policy of subsidizing nursery sales. This is unfortunate, as the fruit sector would benefit greatly from private-sector participation. The MAF's overriding emphasis on production is not an efficient way to meet demand; witness the large number of unsold trees every year even as buyers scramble madly for inadequate supplies of desired trees at nursery sales. Growers' profit margins are clearly sufficient to support the required higher tree prices, and private investors would like to enter the business. However, MAF personnel, including those in the higher ranks, appear to oppose their entry, citing the need for high-quality trees or for adequate supplies that, they appear to feel, only the government can ensure. Although the tree subsidization policy undoubtedly constitutes the main obstacle to private-sector entry, the prevailing official attitude is probably a factor in the failure of private operators to exploit such "niche" opportunities as may exist.

2.4.2 CONCLUSIONS

Private growers in general are doing well, but many of the smaller operators need assistance in the areas of water and credit. Additional fertilizers and pesticides would also help, but mere availability will not do in the absence of effective extension and distribution systems.

The MAF will not agree to conversion of government nurseries to private ownership, nor at this time to private-sector participation.

2.4.3 RECOMMENDATIONS

Proceed with an integrated agriculture program designed to remove constraints in the areas of water, credit, extension, and input distribution.

Do not press for conversion of the MAF nurseries to private ownership. Rather, USAID should initiate a policy dialogue aimed at eventual private-sector participation in nursery development, with elimination of subsidized tree sales as a necessary first step. The assurance of high-quality trees can be provided through a MAF regulatory body, if and when this is needed.

3. PROJECT MANAGEMENT

Virtually all development projects are affected to some extent by management problems of various sorts. Unfortunately, HITS has suffered more than its fair share from all sides--CP/P, CID, USAID/Sana'a, and the MAF. This evaluation provides an opportunity to come to grips with these problems, set aside the old ones, work to resolve existing problems, and get on with the important task of improving horticulture in Yemen.

3.1 CONTRACTOR PERFORMANCE: MANAGEMENT AND TECHNICAL ASSISTANCE FROM CP/P

3.1.1 FINDINGS

Useful technical assistance has been provided through HITS in important areas such as plant protection, horticultural extension activities, and in-country training. Current and past HITS advisors have contributed to these accomplishments. Efforts have also been made to improve the management of HITS. On CP/P's side, an important turning point was the assignment of the current team leader, a CP/P faculty member with administrative experience, in March 1985. As a consequence, improvements have been made in more effective direction of project staff and resources, procurement, communication between the field and CP/P, and a better working relationship between HITS and the mission. An important accomplishment has been the establishment of annual workplans; FY87 was the first year in which a workplan was signed jointly by HITS, the MAF, and the mission.

However, these improvements have come late to the project and considerably more remains to be done to resolve continuing management problems. For example, though the FY87 workplan constitutes an important step toward agreement on project activities, discussions with the MAF officials indicated a lack of consensus on basic project objectives--for example, the use of the stations for applied research versus increased production of trees. In short, greater progress has been made in improving project management between the mission and the contractor than in establishing a sound working relationship with the MAF.

A major factor accounting for the poor performance of HITS has been the inability of CP/P to recruit and field technical and managerial staff with the necessary skills and development experience. An underlying premise of the collaborative agreement mode of contracting with Title XII institutions (land-grant universities) is that the contractor (that is, the university implementing the project) has special expertise in a substantive area germane to the project's objectives. In the case of HITS, this assumes that CP/P was selected because of its special expertise in horticulture and its ability to provide adequate technical support services.

However, the staffing requirements for HITS have clearly exceeded CP/P's limited number of horticulture faculty and its administrative capabilities. Fielding well-qualified U.S. staff with development experience for projects in Yemen is no mean feat in itself. In recent years, Yemen has simply not been perceived by many as an attractive location for long-term assignments, if for no other than security reasons. Only a contractor with considerable experience could have easily fielded a high-caliber team.

This was certainly not the case for CP/P. Lack of prior experience in Yemen and in the Middle East region, combined with a poor understanding of working conditions in Yemen only exacerbated the problem. For example, of the 13 long-term advisors fielded thus far over the course of HITS, CP/P has provided only one person from its faculty who will return to CP/P when his assignment is completed. In the first 34 months of the project, HITS had three different team leaders (not counting acting team leaders during interim periods). CP/P worked on the design of HITS in 1982 and was well aware of the project's staffing requirements. It was not until February 1986--three years after project authorization--that the project was fully staffed, but this was after budget cutbacks forced a reduction in the number of HITS advisory positions that CP/P would have to fill.

In addition to CP/P's inability to field staff on a timely basis, the performance of several project advisors has been very unsatisfactory. The troubled history of the project and the major setbacks HITS has suffered resulted from serious technical and managerial errors made by project staff. Particularly in regard to station development and management, the applied research program, and team leadership, CP/P has provided individuals whose training, experience, and/or interpersonal skills were poorly matched to the requirements of HITS' and the MAF's need for technical assistance.

CID, which has overall responsibility for the ADSP (HITS is a subproject of this program) has provided little assistance to CP/P to identify and recruit staff from its consortium of universities. ADSP subprojects were also to have received technical and administrative assistance from a central support project--CORE. Here, too, HITS and CP/P have not received the amount or types of assistance originally planned.

The seriousness of this situation should not be underestimated. Even with staff changes over the past 2 years, the current HITS team is handicapped by problems created between the project and the MAF by preceding advisors. In particular, considerable dissatisfaction within the MAF has resulted from HITS staffing problems. Even though MAF officials still express high regard for U.S. technology, they do not view CP/P and HITS as credible sources of effective assistance. Even at the most senior levels in the MAF, officials candidly expressed their loss of confidence in HITS to provide sound horticultural advice. This negative view overshadows the positive contributions of the project. In short, staffing problems and the consequent technical and managerial errors have seriously damaged the credibility of CP/P and HITS in Yemen. MAF officials directly associate HITS and AID, jeopardizing the mission's credibility as well.

Administrative support from CP/P to the project also continues to be a problem despite the current team leader's concerted efforts to improve the situation. Responses by CP/P to important project activities have been entirely too slow in certain cases. For example, 3 months after the team leader requested short-term training for Yemeni staff, CP/P has yet to take necessary action. Financial accounting and reporting to the mission and the project by CID is deficient. Accounting for local currency billing and expenditures has been confusing throughout the course of the project. Expenditures reported by CID have at times differed significantly from project records, and reporting of total expenditures--U.S. and in-country combined--continues to be delayed.

3.1.2 CONCLUSIONS

Actions need to be taken to improve contractor performance and project management, especially in regard to future staffing, and to begin to reverse the serious loss of credibility of HITS. CP/P's overall performance to date as a contractor has been sufficiently unacceptable to warrant considering alternative sources of technical assistance for the remainder of HITS.

3.1.3 RECOMMENDATIONS

Review current HITS staffing in light of the proposed redirection of the project described in this evaluation. Place considerably more emphasis on organizational and institutional skills and on practical experience in developing countries than on highly sophisticated research skills in

recruiting future staff. The ability to speak Arabic should have high priority.

Review the costs and benefits (for example, time and money lost versus credibility gained from a more effective contractor) involved with replacing CP/P as the implementing institution for HITS. On the basis of this review, the mission should decide whether or not to replace CP/P.

The MAF and the mission should jointly exert considerably more control over the recruitment and hiring of project staff. A direct contract with CP/P (or another contractor) should be established to ensure this control.

The project should be audited both in the United States and in Yemen.

3.2 AID'S PERFORMANCE IN HITS MANAGEMENT

3.2.1 FINDINGS

In the course of re-establishing a development program in Yemen during the 1970's, agriculture was an obvious area for expanding the mission's portfolio because of the importance and potential for growth in the sector. Expanding the program, however, was not a simple matter. The mission had only two agricultural officers at that time. As noted in the preceding section, recruiting well-qualified U.S. personnel to work in Yemen is not an easy task; this problem applies to AID as well as to contractors. Compounding the mission's own limitations was the MAF's very limited capabilities for program and project development and management.

Nonetheless, the decision had been made to expand the program; however, there was no increase in staffing commensurate with the increase in the mission's budget. Instead, the mission was strongly encouraged by AID/Washington to enter into a collaborative assistance arrangement with Title XII institutions. Through this contractual mode, the design, implementation, and evaluation of agricultural projects would largely be the responsibility of the contractor--that is, the participating universities. Thus, the management requirements for the subprojects as well as the overall ADSP would be transferred to the selected universities. Accordingly, the mission contracted for services from CID and its member universities to establish ADSP and its subprojects. At the time, this arrangement was viewed in AID/Washington as the Agency's "Great Experiment" with collaborative assistance.

The serious problems that HITS has encountered require a fundamental questioning of the effectiveness of the collaborative assistance mode of contracting. At least in the case of HITS, the mission's reliance on CID and CP/P proved unfounded. As described in Section 3.1, the most basic requirements for project implementation--that is, providing qualified staff on a timely basis, sound financial accounting, and effective management--were not met. There is no evidence that the mission and AID/Washington had made a thorough assessment of the capabilities of each contracting university on a case-by-case basis. According to mission staff, the contractual arrangements of ADSP actually became an impediment to exerting necessary control and influence over project management and implementation. The mission's input had to be channeled through CID's chief of party to the team leader of the the subproject. Moreover, the administrative and

technical support system the central ADSP project (CORE) was to provide to other subprojects did not work as intended (at least in the case of HITS). This too was beyond the control of mission management. In effect, the mission abrogated its management responsibilities to the implementing institutions. Furthermore, in light of AID/Washington's advocacy and support for the collaborative assistance arrangement, the ANE Bureau, and particularly its senior managers, share equally with the mission the responsibility for such serious mismanagement.

By mid-1984, the mission began pushing CP/P to improve its staffing efforts to expedite project implementation. In September 1984, HITS' staffing was not complete and implementation had fallen behind schedule, some activities by as much as a year. The mission communicated its concern to CP/P. The situation deteriorated further in the following months--a disruptive TDY by CP/P staff, the MAF rejection of proposed advisors, a rebuttal from CP/P concerning the staffing issue, and a disharmonious Joint Annual Review in Washington, followed by a letter from a California congressman inquiring about HITS and expressing the high importance this gentleman placed on the project's success. In December 1984, the current team leader made the first of two TDY's to Yemen preceding official MAF approval of his assignment in March 1985. The mission decided to wait and see how the new team leader would perform. However, staffing problems continued into 1986 with the early termination of two individuals by the MAF. In short, the mission's efforts to resolve the staffing issue were only partially successful.

Beginning in 1984, major tree production targets were established for the two HITS stations. Though this constituted a major change in project objectives, no amendment to the project paper was made. The mission simply complied with the MAF's demands for increased tree production. The MAF's legitimate needs could have been accommodated by HITS stations providing budwood to MAF nurseries and by having advisors provide assistance and training to MAF nursery staff to increase tree production. However, a letter to the project file states that the mission's position was that significantly expanded production and HITS' original objective of applied research could be carried out simultaneously. In fact, costs increased substantially, and project funds and staff time were diverted to meet MAF production targets. Thus, production increases were imposed at the expense of applied research, the effects of which are still evident in the MAF's continuing lack of information to guide its production and importation decisions (the present HITS horticulturalist has recently tried to assist the MAF in this regard).

In 1985, the mission began to take action to change the contractual arrangement with CP/P for HITS. Direct contracting was proposed as a means of correcting project management problems. The process got as far as CP/P submitting a proposal to the mission in July 1985, but then the mission reversed itself. It was decided that its own staffing weaknesses precluded moving to a direct contract with CP/P and that an alternative would be to strengthen the annual workplan process as a mechanism for controlling project implementation. As the FY87 workplan indicates, this course was taken. The internal organization of ADSP was also changed--CORE was reduced in status to a subproject with the assumption that the mission's Agriculture Development Officer would play a more direct role in program and project management. As of February 1987, the changes made to ADSP are unclear to project staff and the MAF, and the mission has only recently begun taking a more active role in overall program management.

3.2.2 CONCLUSIONS

The expediency offered by the collaborative assistance arrangement with CID imposed a substantial cost on the performance of HITS. Why poor management occurred and was even accepted by the mission is hard to establish. Political pressure brought to bear on the mission and the Agency and CP/P's defensive stance regarding its staffing problems were probably contributing factors, but ultimate responsibility rests with the mission and the ANE Bureau for these events.

The decision not to move to direct contracting was probably justified at the time (mid-1985). Though the mission has strengthened its role in project management via the annual workplans, much of this progress reflects cooperation between the AID project officer and the HITS team leader. In other words, the improvements that have resulted largely depend upon the individuals involved. Because the contract for HITS has not been changed (that is, it is still with CID rather than directly with CP/P), the situation could quickly degenerate with staff turnover. The earlier reasons for not contracting directly with CP/P are no longer valid. The mission's staffing and the capabilities of the Agriculture Office have improved significantly since then.

3.2.3 RECOMMENDATIONS

Change the contracting mode for HITS to a direct contract with CP/P or another contractor.

The mission should take a more direct and active role in the monitoring of ADSP and subproject management. Clarify the management system for ADSP to subproject staff and the MAF.

The mission should work more closely with the MAF in deciding how to use contractor services and project resources over the remaining period for HITS.

Clarify the mission's position about the objectives of HITS with the MAF, in particular how the proposed changes in the management of the stations and ARA's role in this will accommodate the need for applied horticultural research and information and the MAF's interest in increased tree production.

3.3 MAF'S MANAGEMENT PERFORMANCE IN HITS

3.3.1 FINDINGS

The MAF's management capabilities are very limited, as is its operating budget. The MAF staff are spread thin given the number of development projects they participate in and must monitor. Consequently, the MAF is unable to provide consistent management support for projects, and, in the case of HITS, lacks technical understanding of key horticultural issues. Decisions based on inadequate information or misunderstanding of technical matters have had unanticipated negative effects on HITS and have impeded the MAF's larger development objectives.

In the case of HITS, the MAF's demand for substantial increases in tree production at the stations was a major management decision that had a significant negative impact on the project. The MAF believes it needs more

fruit trees; current domestic production falls short of existing demand. The MAF has accordingly resorted to importing fruit trees, which has been expensive and has been frequently surrounded by serious problems such as delivery of diseased trees, purchases of trees unsuitable for conditions in Yemen, and so forth. Problems with importation continue--approximately 20 percent of a recent tender for 126,000 trees included varieties which would never produce fruit in Yemen. To the MAF, therefore, the HITS stations represented a source of trees to meet their needs. The MAF's need for increased tree production is quite real and requests for assistance from HITS to meet this need are legitimate. However, imposing substantial production demands on the stations ultimately conflicted with project objectives.

Some limited production of trees at the stations was well within the capability of HITS without jeopardizing its original objectives. However, the level of production demanded by the MAF and accepted by USAID/Sana'a went well beyond this point. In the case of Al Jarouba, for example, production goals in excess of 100,000 citrus trees per year led to a concentration, rather than the planned diversification, of project resources. This later resulted in disaster. Because Al Jarouba was stocked principally with citrus trees highly susceptible to canker, when the disease reached the station and the trees were destroyed, the station was left virtually barren. Had the station contained a variety of tropical fruit trees, the loss of citrus would have been serious, but not devastating. The MAF's management decision in this case was a significant contributing factor.

MAF staffing for HITS has been and continues to be a problem for the project. As noted above, the MAF's management resources are very limited. The problem is exacerbated by the issue of salary supplements and differences in per diem rates between HITS advisors and their Yemeni counterparts. Quite understandably, the MAF views AID's refusal to provide salary supplements or incentives as unwarranted and the cause for assigning less qualified counterparts to the project, high staff turnover, and poor job performance. Given that other donors supplement salaries, the MAF staff are more eager to work with them rather than with AID projects. On the other hand, the Grant Agreement bars the mission from supplementing salaries. In short, HITS is stuck between a rock and a hard place.

The MAF's decision-making process has also been a problem for HITS. At times, it has been difficult to determine precisely what the MAF's position is on a specific issue. Information and opinions within the MAF on project matters often conflict. A case in point is station management. At times it is unclear whether the operation of Al Irra is under the control of the MAF or the Sana'a Regional Agriculture Office. The role of project staff for station management also varies--on one occasion they will be criticized by the MAF for inaction; on other occasions they are directed not to take action without prior approval from the MAF. The situation is further complicated by project advisors who do not understand how the MAF operates and are unable to work effectively within the existing system.

3.3.2 CONCLUSIONS

With CP/P, HITS, and USAID/Sana'a, the MAF has contributed to the poor management decisions that have interfered with project performance. Though the MAF's overall dissatisfaction with HITS is well-justified, scapegoating and distorted accusations among HITS, USAID, and MAF staff have become

counterproductive to accomplishing important project objectives. Communication, understanding, and cooperation are poor.

3.3.3 RECOMMENDATIONS

More frequent meetings and discussions about project implementation are needed. The mission and the MAF need to make a more concerted effort to establish better channels of communication, consistent with the more active role the mission needs to take in ADSP management.

The USAID project officer should begin holding regular monthly project meetings among the four or five key project managers--one or two MAF Directorate chiefs (for example, Plant Protection or Agricultural Affairs), the HITS team leader, and the USAID project officer. These meetings should be held outside of the usual workplace to prevent interruptions.

The mission and the MAF should explore possible alternative approaches to the issue of salary supplements, perhaps long-term secondment of staff as interns in training.

4. APPLIED HORTICULTURAL RESEARCH

4.1 STATION HISTORY

In 1977, USAID founded a horticulture improvement project with the MAF; it was implemented by Tuskegee Institute. The development of a tropical-subtropical station at Al Jarouba in the Tihama was started, as well as a deciduous station at Sana'a. The MAF, however, expressed dissatisfaction with the project because of slow progress in station development, a heavy orientation toward research, and low production of budded trees or high-producing cuttings/seedlings for distribution by the MAF. Then, in 1981, the deciduous tree plantings at the Sana'a station were mostly destroyed by government construction. (See Annex C for varieties planted at the Al Jarouba station.) The project was terminated in 1981.

In September 1981, under the CID/YARG/AID contract, CP/P officially assumed responsibility for the implementation of station construction begun by Tuskegee. CP/P was also responsible for designing the follow-on project--HITS. The HITS project was approved in December 1982, with final authorization in February 1983. Work continued toward the completion of the Al Jarouba station and development of a new deciduous station on land acquired by the MAF at Al Irra near Sana'a. The remaining portion of the Tuskegee deciduous station at Sana'a was not included in the HITS project.

In 1981, bacterial canker was identified in the Tihama. In late 1983, the YARG banned all importation of fruit. In early 1984, a yearly production goal (100,000) for budded citrus trees was assigned to Al Jarouba and agreed to by USAID Yemen. With limited resources, this forced the station to focus on production at the expense of varietal testing. In late 1984, the MAF again expressed dissatisfaction with the project because of the low number of budded trees and high-producing cuttings/seedlings available for distribution by the MAF.

Bacterial canker was discovered at Al Jarouba in October 1985. In early January 1986, the MAF agreed to destroy all citrus at the location. In March 1986, approximately 180,000 citrus seedlings budded or ready for budding and 400 mother budwood trees (all the citrus at Al Jarouba) were destroyed. (However, bacterial canker has not been eliminated in other citrus plantings in the Tihama.) After the removal of all citrus, the station's fields were leveled, a low-volume irrigation system was designed, and a planting plan was established. As of February 1987, the station is 90 percent complete.

Plantings of deciduous varieties at Al Irra were started in 1983. In the same year, trees arriving for varietal testing from the United States infested the plantings at the station with crown gall disease. (Crown gall had been introduced to Yemen three times previously on trees imported by others as well.) Additional disease-free land that had been under negotiation was then added to the station. However, as with Al Jarouba, the MAF has been dissatisfied with the volume of trees and cuttings resulting from Al Irra's activities. Al Irra is also 90 percent complete.

Several factors (other than government construction and crown gall disease) have also contributed to the slow progress at both stations. Important inputs for quality fruit production such as fertilizers, fungicides, and insecticides have been unobtainable. While precise data are not available, imports of these are known to have been virtually terminated after 1982. Also, data have not been properly recorded. For accurate data to be obtained from trials on cultural practices, trees should have been planted in randomized replicated plots. As HITS was not able to plant the trees in this method, data should have been obtained through the use of a statistical design. Finally, CP/P's inability to provide long-term technical experts with the appropriate horticulture expertise for the project delayed startup and maintaining the focus on project goals.

As of February 1987, the MAF and HITS have not yet developed a management system that allows the two stations to work effectively toward project objectives. Ineffective station management (influenced by the MAF) has resulted in the following:

- No irrigation at Al Irra from October 1985 to February 1986.
- No permission given to remove trees that have proven unsuitable for Yemen.
- No station staff on duty, especially during Ramadan.
- No labor available, but activities expected to be completed by a certain date.
- No decision on planting additional apple-cloning materials for several months.

4.2 ARA'S FUTURE ROLE IN SUSTAINING THE HITS STATIONS AND CONTINUING APPLIED HORTICULTURAL RESEARCH

4.2.1 FINDINGS

Staffing is a problem. Only a few MAF counterparts have received on-the-job training for the management of the stations. Some of these counterparts then receive additional training outside of Yemen. With this extra training, these individuals become overqualified for the station management job and thus tend to accept better positions elsewhere. Also, there is only a limited number of MAF-Sana'a staff with research education, skills, and experience capable of conducting trials on varieties and cultural practices. These staff are already in key management positions with no available replacements. More importantly, the MAF's limited budget questions its ability to fund adequately station operations (including staffing costs). Given the MAF's lack of adequate staff and budget, it is very unlikely the stations will be properly maintained and managed by the MAF after HITS ends.

The evaluation reviewed possible options for involving YARG agricultural development organizations in the Al Irra and Al Jarouba programs. The ARA was found to be the most suitable. Following are the findings with respect to ARA:

- The ARA was established by law in 1983 as a part of the MAF and is considered the sole coordinating body for agricultural research performed in Yemen.

- There has been significant growth of this organization since it was established. There are currently over 10 Yemeni possessing doctoral degrees, 22 with master's degrees, and many with bachelor's degrees engaged in various phases of research.

- The organization has a fruit and vegetable research expert and a chief technical advisor serving as counselors.

- The ARA fruit expert has worked in close collaboration with the HITS stations' employees. He is quite knowledgable of the day-to-day activities and the different resources at the stations.

- The ARA is developing central and regional quarters throughout Yemen to control all agricultural research activities.

- As part of the ARA's plans, all agricultural research activities in the YARG, regardless of their nature, will fall within the scope and jurisdiction of the ARA in the immediate future.

- The ARA has several experiment stations conducting research on different crops including fruit trees.

- The ARA needs additional research facilities but lacks the funding for construction.

- During the course of the evaluation, discussions have been held with the MAF Deputy Minister and the Director of ARA concerning their cooperation in operating the stations at Al Irra and Al Jarouba. Both expressed interest and support for ARA assuming the management of the facilities that support research activities.

4.2.2 CONCLUSIONS

The ARA is the appropriate YARG Organization for carrying out necessary applied horticultural research in Yemen and for overseeing the management of station activities in support of the HITS program. Production should be the sole responsibility of the MAF.

4.2.3 RECOMMENDATIONS

Complete all remaining construction as specified in the FY87 workplans for Al Jarouba (irrigation system and planting of additional varieties) and Al Irra.

The MAF and the ARA should establish an agreement that ARA will assume responsibility for research activities at Al Irra and Al Jarouba. The MAF will retain legal ownership of station facilities while the ARA will manage the research program.

The use of the stations could include both production and research. The MAF must be responsible for providing the necessary funding and staffing required to meet its own production goals. ARA must not be expected to perform the actual work involved with MAF's production. ARA needs to provide guidance, information, and some limited amount of budwood and rootstock to assist the MAF in improving its operations.

ARA needs to have complete control over establishing its research agenda and for providing information and guidance to the MAF about suitable varieties for production at MAF nurseries or for importation.

If properly managed, the ARA should be able to produce enough fruit and trees (during training) on its own to cover the operating expenses of its research activities. Tree production beyond this minimum level and the associated costs are the responsibility of the MAF. A revolving fund should be established from proceeds of sales sufficient to cover the continued research operating expenses of the stations. In the interim period, until the stations are able to produce trees and fruit to cover research operating expenses, HITS should cover the material operating expenses of the two stations for the ARA--fuel, equipment, and supplies. HITS should not pay the MAF for personnel-related expenses for large-scale production.

The use of the stations for research activities should be available to other institutions or organizations--for example, the Faculty of Agriculture (FOA) and the Central Highlands Research and Development Project (CHRDP) at Al Irra, and the FOA and the Tihama Development Authority (TDA) at Al Jarouba. ARA should be responsible for coordinating these activities.

HITS needs to provide technical assistance to ARA in support of ARA's research agenda in horticulture. This will require a research horticulturist. HITS should have no other horticulture research agenda.

The Director of ARA and the Deputy Minister of the MAF need to meet as soon as possible to establish a clear agreement in writing concerning the responsibilities of both organizations in the use and operation of the stations.

4.3 VARIETIES INTRODUCED, TESTED, PROVEN, DISTRIBUTED, AND ADAPTED

4.3.1 FINDINGS

4.3.1.1 General

It normally takes 6 to 10 years after planting a 1-year-old budded tree or seedling to obtain adequate data to determine if a variety is suitable for or adaptable to a particular environment or location. A major objective of HITS was to support such applied research. This information, in turn, was to have assisted the MAF in meeting its tree production and supply objectives.

The MAF has distributed--either from imports or its own production--more than 3 million fruit trees since 1982, of which HITS stations have accounted for some 50,000. During the next 5 years, the MAF would like to make available to farmers a total of 7 million trees. A list of individual varieties for 1987 (including volume) is found in Annex C.

4.3.1.2 Tropical and Subtropical Varieties

Until November 1986, the only varieties other than citrus at Al Jarouba were planted under the first (Tuskegee) project. Plant introduction and research focused on citrus from 1982 through 1986. Varieties planted in November 1986 and those to be planted in the near future are listed in Annex C.

Though all citrus budwood and rootstock mother trees imported by the two projects (Tuskegee and HITS) were destroyed, the same varieties are available at the ARA research station at Taiz and at some government nurseries. The MAF and individual farmers continue to import budded citrus trees. Government nurseries continue to grow and sell budded citrus trees. Horticulture training other than citrus has been limited to budding and nursery practices.

The Al Jarouba station is 4 years behind schedule in plantings for varietal testing. On varieties planted in 1986-87, information on their suitability for the Al Jarouba area will not be available until after December 1989 (6 to 9 years from planting). Information on papaya, passion fruit, banana, and mango trees planted in the 1970's will be available before December 1989. Limited data have been collected from the few mature mango trees and banana plants.

Certain tropical varieties planted at Al Jarouba would be more productive in specific microclimate areas of Yemen. For example, lychee requires a cool and dry climate period before flowering, macadamia are best adapted to medium elevations, and loquat trees are sensitive to high summer temperatures.

No trials have been conducted to identify cultural practices in irrigation, fertilizing, and pruning that are specific to Yemen conditions. It will be 4 to 6 years before most varieties are mature enough for these trials to begin.

4.3.1.3 Deciduous Varieties

The HITS Al Irra station, elevation of 2,230 meters, is suitable for varieties having a chill unit requirement of 450 or less as measured by U.S. standards. The varieties of trees planted are listed in Annex C. From data collected, the varieties that appear to be suitable (at this time in the Sana'a Basin and in areas of higher chilling requirements such as Dhamar) are:

- Peaches--Florida Red, Florida Beauty, Florida Prince, Florida Sun, Florida Gold, Florida King, Florida Belle, Desert Gold, Early Grand, and Four Star Daily News.
- Nectarines--Sunred.
- Plums--Red Plum NBR 3-4 and Yellow Plum NBR 8-1.
- Apples--Dorset Golden, Anna, and Ein Shemer.

A problem that has interfered with the varietal testing of the station is that fruit has been picked and eaten before yields can be recorded to ensure accurate varietal testing. Although high-chill varieties have better quality fruit than the low-chill varieties, most are not adaptable to the Sana'a Basin. However, some low-chill varieties on trial at Al Irra appear unsuitable to the Sana'a Basin conditions.

There are approximately 7,500 budded trees that can be distributed this year (1987). Some are infected with crown gall. There are also 10,000 EMLA 106 apple rootstock plantings to be increased primarily by cloning. These can be increased to 25,000 to 30,000 by layering--not cutting--if adequate labor is supplied by the MAF. No more than 30,000 plantings of these rootstocks can be grown at Al Irra. Supplies of proven productive rootstock for varieties other than apple are not yet available for production in Yemen.

There are productive local apricot and almond trees in Yemen. Imported olive and loquat trees are grown at the Ibb government nursery. The MAF has requested that HITS not work with grapes. There are deciduous varieties yet to be identified outside of Yemen for testing.

The chill unit requirement figures used for selection of varieties to be tested are based on the present American/European method of calculation. These methods have not been compatible to conditions in the Sana'a Basin.

Tests have been started on how to delay flowering, break dormancy, foster horizontal limb training, and conduct pruning. Fertilizer trials have not been conducted to date and cannot be started until correct types and amounts of fertilizer are available. HITS has not conducted irrigation or pruning trials to date; trees at the station were pruned for the first time in 1986. All variety trials by HITS have been limited to the Sana'a Basin (Al Irra station and five HITS extension plots). Great Britain started deciduous fruit trials in Dhamar and the Southern Uplands Rural Development Project (SURDP) has 140 deciduous demonstration plots throughout its area of involvement.

The MAF has imported several thousand budded deciduous trees over the last 3 years. It wants to supply 970,000 deciduous trees to the farmers in 1987. For the individual varieties and expected number of trees to be distributed by the MAF, see Annex C.

4.3.2 CONCLUSIONS

4.3.2.1 General

Little assistance has been given to the MAF by HITS in developing a system for production and distribution of varieties of trees adaptable to the Al Irra and Al Jarouba areas, let alone other areas in Yemen that are capable of producing fruit. Cultural practices recommended to farmers in Yemen are general and have been developed outside of Yemen. As of February 1987, no Yemen-specific practices have been identified from trials conducted at the HITS stations. Also, production and quality of fruit will remain low if fertilizers and insecticides are not available. In addition, many general as well as microclimate areas are yet to be tested so that fruit varieties appropriate to the area can be planted. Commercial private nurseries have not developed, for reasons discussed in Section 2--Economic Analysis. There are additional varieties of fruit trees outside of Yemen suitable for testing. Also, individual fruit trees in Yemen--such as mango, apricot, and almond--that produce high-yielding quality fruit, useful for budwood and as sources of rootstock, need to be tested. Rootstock sources that can be grown in Yemen are needed for all fruit trees other than apples. Essentially more could be accomplished in reaching project goals if a MAF-HITS coordinated management system were instituted at the stations. Specifically, this would improve decisions concerning production and importation.

Because of the time it takes for fruit trees to come into production, few additional recommendations on varieties adapted and proven to the Al Irra and Al Jarouba areas can be given before 1989.

4.3.2.2 Tropical and Subtropical Varieties

Most citrus plantings in areas conducive to bacterial canker growth are in danger of infection as long as bacterial canker is present in Yemen. However, it appears from the tests currently being conducted by HITS that there are a few varieties that show resistance to bacterial canker.

The Al Jarouba station should be involved only in varietal testing activities, trials or cultural practices, and training of extension service personnel and farmers under the ARA. Tree production should be solely the responsibility of the MAF. Some varieties on trial may not be productive with their present genetic composition but are useful for breeding work in the future.

Microclimatic areas that are more suitable for varieties such as lychee, macadamia, and loquat need to be identified.

4.3.2.3 Deciduous Varieties

Crown gall needs to be kept under control if not eliminated at Al Irra. Also, some nonadaptable varieties are taking up valuable space at the station.

Because of the recent plantings (Al Jarouba, 1986 and 1987; Al Irra, 1985), limited data have been collected on these varieties to date. Adequate data cannot be collected on varietal adaptation trees if fruit is eaten before recordings of yield are made. More information is needed on chill unit requirements for all geographical/microclimate areas in Yemen. Use of chemicals could enable the growing of fruit trees with a higher chill requirement, thereby producing better quality fruit in the Sana'a Basin. However, use of chemicals by other than large growers is very unlikely.

The MAF will have to continue to import deciduous trees for several years to satisfy farmer requests.

4.3.3 RECOMMENDATIONS

4.3.3.1 General

A system of future varietal testing at Al Jarouba and Al Irra (as well as at other locations throughout Yemen) needs to be developed and implemented in the immediate future by the ARA. HITS should assist and support the ARA in carrying out this work. Extension demonstration plots, as well as records of individual plantings maintained by the MAF (if any), should be used to obtain information for initial screenings. Applied research at the stations should include testing alternative cultural practices. HITS needs to focus on developing practices suitable for resources available to farmers of 1 to 4 hectares throughout Yemen. Seed gardens also need to be established so that genetic purity is maintained for varieties reproduced by seed, such as papaya and guava.

All areas outside of Yemen having varieties suitable for trial in Yemen should be reviewed so that arrangements can be made for the suitable varieties to be delivered before 1989. Grapes, olives, and dates should be included in the variety search.

HITS needs to establish a system between the MAF and the ARA to identify any individual trees during the local mature fruit seasons that are high producers of quality fruit or that are suitable for rootstock.

In coordination with the MAF and the ARA, HITS needs to identify and establish outside worldwide links with appropriate sources, such as germ plasm banks, universities, government departments, and seed and plant companies, who can continue to work with the ARA and the MAF after 1989.

HITS needs to help the MAF develop a system whereby YARG research stations and nurseries can produce a supply of budwood and rootstock, and thereby budded trees. The system should also include genetically productive cuttings and seedlings from parent stock for the normal yearly needs of farmers. Consequently, HITS should assist the ARA in identifying those varieties from which MAF can produce the amounts needed. HITS should supply the MAF and the ARA with a list of reputable nurseries in the United States to use until all fruit tree requirements are grown in Yemen. HITS also needs to help the MAF develop a program aimed at protecting the citrus industry from bacterial canker.

4.3.3.2 Tropical and Subtropical Varieties

To separate production activities controlled by the MAF from research activities managed by the ARA on land it now owns, the MAF needs to start an adjoining government nursery at Al Jarouba.

A special effort should be made with the ARA to develop a system to identify microclimatic areas for varieties not suitable to the climate at Al Jarouba. All tropical and subtropical introductions at Al Jarouba should be maintained for possible long-term breeding programs even if not presently adaptable to Al Jarouba conditions.

4.3.3.3 Deciduous Varieties

A system needs to be developed with the MAF Plant Protection Directorate, the ARA, and HITS on the management of crown gall at Al Irra so that budwood and rootstock can continue to be produced and harvested without contamination and new varieties placed under trial. All trees on trial that do not prove to be adaptable to Sana'a conditions should be removed. However, one of each variety should be retained to be used in future cross-breeding experiments.

Discussions should be held with the ARA on how to obtain more information on determining chill unit requirements in the various areas of Yemen. (The University of Michigan is now working on a system that is universally adaptable.)

While not immediately practical for use by Yemeni farmers, trials in delaying flowering, breaking dormancy, and pruning practices need to be continued. This work might lead to techniques that eventually can be used to increase fruit production throughout Yemen.

4.4 NEW TREE PLANTINGS AND FUTURE AVAILABILITY OF WATER

4.4.1 FINDINGS

Yemen contains approximately 20 million hectares of which 1 million hectares are normally cultivated. In this cultivated land, 229,000 hectares are under irrigation--springs provide water to 17,700 hectares, pumps provide water to 118,900 hectares, and spate water supplies 85,900 hectares. The Enger report shows that in some areas of Yemen there is already an overdraft of the water-bearing aquifer because of the number of wells. In other areas, the continued drilling of wells will soon produce an overdraft. Available water is being used inefficiently by farmers. A year-round source of irrigation water is the most important input of fruit production. Orchards are a large and long-term investment.

4.4.2 CONCLUSIONS

In some areas of Yemen, costs of water for irrigation may become prohibitive before the orchards now being planted have completed their normal economic life.

4.4.3 RECOMMENDATIONS

New tree plantings should not be recommended for areas with a present or a possible future overdraft of the underground water supply. Irrigation trials for horticulture need to be started immediately, focusing on the most efficient uses of water that are adaptable to farmers of 1 to 4 hectares throughout Yemen.

4.5 MARIB NURSERY

4.5.1 FINDINGS

The Marib area (190 kilometers east of Sana'a) has been identified as a suitable location for citrus production. However, citrus viruses Xyloporosis and Exocort were discovered there in 1983 and citrus canker has been found 40 to 50 miles from the nursery site and in the nearby nurseries at Negran and Jezan. Nonetheless, ARA wants to develop a research station in the Jawb-Marib area. Farmers are developing citrus orchards in the area and the MAF has facilities for citrus tree production there as well. The establishment of a third station would impose additional staffing requirements and costs on the MAF and HITS near the end of the HITS project.

ADSP and HITS have funded construction of the Al Irra and Al Jarouba stations for 5 years and they are only now nearing completion. Public Law 480 funds have not been available for the past 3 years from the YARC for horticultural activities, and it is unlikely this situation will change soon. The HITS project is to be completed in December 1989.

4.5.2 CONCLUSIONS

There is not enough time for HITS to complete the station before 1989 judging from past experience. The Public Law 480 funds may not be available for several years and there may not be enough dollars committed to cover all station costs.

4.5.3 RECOMMENDATIONS

HITS should terminate planning work for the establishment of a citrus nursery in the Marib area. All work done to date should be reviewed by the ARA and the MAF to help them with future activities on a citrus research station. Also, HITS needs to assist the MAF and the ARA in developing citrus production that is economically viable, given the insects and diseases now present in Yemen.

5. PLANT PROTECTION

5.1 PLANT PROTECTION RESEARCH ACTIVITIES

5.1.1 FINDINGS

Plant protection is composed of the disciplines of entomology, plant pathology, nematology, virology, and weed and rodent control. Efforts to

strengthen the Plant Protection Directorate have been under way since 1974 through the German Technical Cooperation (GTZ). GTZ helped draft the rules and regulations needed for a stronger inspection and quarantine system. Over time, the importance of plant protection and inspection and quarantine has increased, leading to the establishment of the Plant Protection Directorate within the MAF.

In 1983, the ARA was given the responsibility by the YARG to conduct research in plant protection and to develop useful information for distribution through the media and through the extension services of the MAF and the local DA's. HITS provided an entomologist and lab technician in late 1984 and a plant pathologist in late 1985. The lab technician assignment ended in 1986.

It is the responsibility of the Plant Protection Directorate to maintain accurate data regarding diseases and insects and to establish specific control measures to deal with them. Over the years, the plant protection effort in Yemen has been developing its information base. A report on insects and diseases in Yemen was published prior to HITS' involvement. The report identified 40 diseases and insects of citrus and 20 diseases and insects of the cucurbit family. Since 1984, HITS has identified 30 additional insects and diseases. The project has also published more than 30 pamphlets, conducted several surveys of citrus canker in the Tihama and prepared reports on the disease, and visited farms to identify disease and insect problems and recommend control measures.

Control of beneficial and harmful insects as well as diseases are interrelated: the control of insects or disease on one crop can affect the control of insects and diseases on other crops or other insects and diseases on the same crop. A complete survey has not been made of the harmful and beneficial insects or diseases of agricultural crops in Yemen; nor have tests been made of procedures for diagnosis, eradication, and/or control of all plant pathogens and anthropod pests identified to date.

HITS has assisted the Plant Protection Directorate of the MAF in initiating an integrated pest management (IPM) program. Field research on IPM and training programs on California and Florida red scales have been conducted jointly by HITS, the ARA, and the Yemen Plant Protection Center (YPPC).

Work in plant pathology by HITS includes grapes, bananas, papayas, guava, and such vegetables as watermelons and tomatoes. Rugose mosaic on watermelons, banana spot on bananas, green lime virus on papaya, and fruit scab on guava have been identified as threats to successful crop production in some areas. The pomegranate fruit borer, an insect creating serious problems in Sadah province, has been investigated and recommendations for its control have been given to the Plant Protection Directorate. The Mediterranean fruit fly, a pest of citrus and deciduous fruit, and the coffee fruit fly are being investigated to identify areas now infected and to establish possible control measures for either eradication or limiting their spread.

It has been found that shot hole and powdery mildew are the only problems identified so far on fruit trees; both can be controlled with the proper application of a fungicide. The Anna apple is found to be the most susceptible to two-spotted spider mites, wooly apple aphid, and powdery mildew among apples now in Yemen. Thrips on bananas have been studied and a

pesticide management control program has been developed. The serious black spot disease of bananas has been under observation; a control program will soon be introduced. HITS is also supporting trials in greenhouse and laboratory facilities to identify varieties and strains of citrus immune to bacterial canker. A new entomology laboratory at YPPC has been established by HITS' staff and counterparts.

As a result of these activities, new extension information has been produced and disseminated. This information is also available to the ARA and the local Development Authorities (DA's) and to the MAF Plant Protection Directorate representatives in most of the 11 provincial agricultural offices.

Transfer of plant protection technology to the MAF is progressing, but many of the counterparts working in plant protection do not have the required training or experience to take advantage of the technical expertise of HITS advisors. On the other hand, the MAF and the Plant Protection Directorate are very interested and supportive of these efforts. For example, the MAF has issued long-term travel permits for the first time, allowing more flexibility for surveys and field trips.

5.1.2 CONCLUSIONS

HITS' plant protection activities have contributed to fruit tree survival and improved fruit production through the identification of diseases and insects and recommendations for their proper control. An IPM program is being introduced which should benefit the farmers through reduced costs and less indiscriminate use of pesticides.

Identification of harmful insects and diseases and development of control measures are more pertinent if there are pesticides and fungicides available. Appropriate insect and disease control practices that are adaptable to conditions throughout Yemen are as important in improving fruit production as the major cultural practices of planting high-yielding quality varieties, having adequate irrigation and fertilizer, and conducting correct pruning.

Because of too few inadequately trained staff in the Plant Protection Directorate, a delicate balance between research and applied control practices (for example, inspection-quarantine) is needed to meet immediate and future requirements to strengthen plant protection in Yemen. Also, the MAF staff for both plant protection and inspection and quarantine needs to be enlarged.

In the future, HITS should support strengthening the MAF's services delivery and the ARA's research activities. More coordination among various ongoing plant protection activities in Yemen is needed. More information is necessary to support and coordinate these activities. A complete field survey of insects and diseases of agricultural crops in Yemen is needed.

5.1.3 RECOMMENDATIONS

HITS/AID should sponsor a workshop involving the MAF and ARA plant protection directors, MAF agricultural offices, the MAF Extension Directorate, representatives of TDA, SURDP, and CHTRP, and donors supporting plant protection activities to develop a coordinated plan of action.

HITS should identify with the Plant Protection Directorate the types and amounts of short-term training required by plant protection technical staff. The training should be conducted in Arabic, in or out of Yemen.

Short-term specialists should be used to work on specific tasks. One of these should be a comprehensive insect and disease survey.

As information on practices for specific geographic locations is developed, it should be packaged for illiterate farmers. Copies should be provided to local DA's and extension services of the ARA and the MAF.

The IPM program should be reviewed in light of MAF staff skills, information available on beneficial and harmful insects in Yemen, and availability of control products used in IPM.

HITS and the Plant Protection Directorate should review and evaluate all previous publications and update them when the Yemen insect disease survey has been completed. HITS and the Plant Protection Directorate should review constraints such as language, counterparts with limited knowledge and skills, limited information dissemination by the extension service, lack of pesticides and fungicides, and counterpart turnover rate to identify ways to improve the effectiveness of HITS' technical assistance.

HITS should complete the relocation of its facilities and resources dealing with plant protection to the YPPC and integrate HITS' activities with YPPC programs.

HITS should discuss with the MAF the establishment of sections within the YPPC that deal with entomology, plant pathology, weed control, and rodent control.

HITS should add to its staff one Yemeni counterpart and two technicians that have adequate education and experience in both entomology and plant pathology.

The physical facilities of the YPPC should be improved. This can be accomplished by:

- o Building two small greenhouses at YPPC.
- o Building an insect rearing facility at YPPC.
- o Updating the laboratory facilities and improving equipment.
- o Increasing the supply of electricity.

The YPPC and ARA libraries should be supplied with books and key periodicals on plant pathology, entomology, and weed control to furnish research workers with up-to-date research information in plant protection.

Activities should be organized and coordinated in the plant protection field through the development of a Yemeni Plant Protection Professional Society.

5.2 INSPECTION AND QUARANTINE ACTIVITIES

5.2.1 FINDINGS

The establishment of an effective inspection and quarantine system is essential for the development of the horticulture subsector in Yemen.

However, the lack of data prevents assessing the impact of HITS' assistance for inspection and quarantine on fruit tree survival and fruit production.

Though progress has been made toward strengthening the MAF's inspection and quarantine program, much remains to be done. Despite quarterly inspections at MAF nurseries, trees sold by the nurseries continue to be infected with insects and disease. Farmers also sell trees locally that are infected, and trees are imported to Yemen which escape proper inspection and quarantine.

HITS provides further evidence of the importance of making improvements in this area. The introduction of bacterial canker in the Tihama in 1981 from citrus trees from India ultimately led to the destruction of 180,000 citrus trees and 400 mother trees at Al Jarouba. HITS' own introduction of crown gall disease at Al Irra further illustrates the necessity of better inspection and quarantine of imported trees. As of February 1987, no solution to these problems has been found. Elimination of the diseases is very unlikely; the alternative appears to be to develop inspection and quarantine systems that minimize the spread and adverse effects of the disease.

HITS has supported efforts to strengthen inspection and quarantine. A pamphlet on proper procedures has been distributed and a list of quarantine pests has been prepared for use by inspection and quarantine staff. HITS' technical assistance facilitated a conference leading to the banning of importation and use of chlorinated hydrocarbon compounds and toxic phosphorous compounds--provided that inspection and quarantine staff have also received short-term and on-the-job training, but planned long-term training is years behind schedule. HITS has also proposed additional training for inspection and quarantine staff and for a joint training program involving HITS, the Food and Agriculture Organization (FAO), the ARA, and the Yemen-German Plant Protection Project.

Five individuals were to have been trained as agricultural inspectors. This training was to have included horticultural skills; identification of disease and pests on tropical, subtropical, and deciduous fruit (both nursery stock and mature trees); the hazards of pesticide use; and specific use of fungicides, insecticides, herbicides, and nematocides and the effects of these chemicals on beneficial insects and mites. Only two have been trained. Five MAF staff were to have been sent to the United States for training in agricultural inspection; only two have been trained. Five MAF staff were to have been selected for university-level training in agricultural inspection--three at a B.A. level and one each at the M.S. and Ph.D. level in entomology or plant nematology; none have been trained. No training has been provided to plant protection extension specialists.

The MAF has reported that a course on quarantine is available in Morocco in Arabic. The Egyptian International Centre for Agriculture in Dhoki, Egypt, can arrange special courses such as plant protection and extension in Arabic. Also, special courses in Arabic can be conducted in Yemen for groups.

5.2.2 CONCLUSIONS

Decisions are needed concerning how to deal with the crown gall disease at Al Irra, and more broadly, what the best strategy is concerning citrus canker and crown gall throughout the country. An important element in this

will be the strengthening of the MAF's inspection and quarantine system. Short-term training conducted in Arabic will be most effective in accomplishing this. Better coordination among on-going plant protection activities will contribute to this by bringing together the different types of expertise in plant protection. Better physical facilities will also improve the inspection and quarantine system.

5.2.3 RECOMMENDATIONS

HITS should assist the MAF and the ARA in developing a strategy for dealing with citrus canker and crown gall disease. Particular attention should be given to reaching a satisfactory solution to the crown gall problem at Al Irra as soon as possible. HITS' resources should be directed toward providing short-term training and limited technical assistance in the practical aspects of operating an effective quarantine and inspection system. Equally important, the YARG should give higher priority to following sound inspection and quarantine practices in its importation and distribution of trees, that is, follow the directions given by the Plant Protection Directorate.

Finally, HITS should facilitate coordination of MAF and donor activities in plant protection through meetings and dissemination of information pertinent to inspection and quarantine. This should include determining what physical facilities and equipment are needed to strenghen inspection and quarantine.

6. EXTENSION

6.1 AGRICULTURAL EXTENSION IN YEMEN--GENERAL

Apart from the activities of HITS itself, there are basically two sources of agricultural extension activity in Yemen:

- The National Extension Service of the MAF. NES agents are recruited from among students failing to advance beyond primary school (9th grade) level. They are given an 11-month training course, of which horticulture comprises a minor part. As of February 1987, the NES had graduated 537 students, of whom 251 were still active (see Annex D). As suggested by the high rate of turnover, these agents are poorly motivated, owing to low pay and little chance of advancement (being, by definition, already out of the academic mainstream). As discussed in the Agriculture Sector Survey of December 1985, they are unable to cope with the more sophisticated agricultural techniques and cannot help farmers with the economics of major investments in tractors, wells, pumps, or tree plantations.

- o Extension activities appurtenant to the various regional DA's, usually supported by foreign funding and employing foreign technicians. The DA's train their own personnel and employ a variety of extension techniques, including Training and Visitation (T&V) and demonstration plots. The most notable of these organizations are:

  -- The Tihama Development Authority, funded by the World Bank, the FAO, and the Netherlands.

  -- The CHRDP, covering Dhamar Governorate and part of Sana'a Province, with British direction and U.K. and World Bank funding.

  -- The Southern Uplands Rural Development Project covering Taiz and Ibb provinces.

Another source of extension agents is the Ibb Agricultural Secondary Institute, an ADSP subproject. The ARA provides extension advice and has considerable potential in the area (see below), but is without outreach capability at this time. Finally, the Faculty of Agriculture at the University of Sana'a may be mentioned as a possible source of future training in extension.

6.1.1 FINDINGS

The NES is almost wholly ineffective. During field visits, only one NES agent was located, and only one farmer reported he had been visited by an NES agent. A large grower volunteered the thought that while he had never been visited by an NES agent, based on the Service's reputation, he would not be interested in their advice if he were visited. These impressions correspond with the findings of Warren Enger's Fruit Growers' Survey, to the effect that more than 70 percent of the farmers surveyed had never been visited by an extension agent, a finding that Enger found remarkable considering that the farmers selected for the survey were chosen on their presumed willingness to cooperate.[5] With the assistance of the CORE Information Technology Specialist, the MAF/NES has produced and displays television tapes on the subject of fruit growing. However, these tapes are not keyed to the production calendar and are too general in nature to be of practical benefit. The NES coordinates in a loose fashion with the extension activities of the DA's. Graduates of DA courses at Ibb and the Surdud Agricultural Secondary Institute take the basic 11-month NES course.

For the record (addressing specific scope of work questions), the MAF has developed no packages of information suitable for farmers in different agricultural zones (HITS development of such packages is discussed below), there has been no discernible improvement in the skills of YARG extension staff, and the MAF has not made discernible progress in motivating farmers to adopt new practices.

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[5] Warren Enger, Fruit Horticulture Sub-Sector Assessment--Yemen Arab Republic, August 1986.

Visits were made to the TDA, the SURPD, the CHRDP, and the Surdud and I schools. Under the direction of a British Extension Specialist, CHRDP trainees live on the station for 3 months where they undergo fruit-spec extension training. Surdud and Ibb provide 3 years of secondary school (equivalent to high school) agricultural training. The field activitie these organizations are described by Enger[6] and will not be detailed here. Suffice it to say, that while these organizations are far more effective than the NES, they are semi-regional in nature; and being geographically removed from the HITS area, they are not subject to dire project influence. Such relationships with HITS that do exist are disc in Section 6.3.

6.1.2 CONCLUSIONS

Agricultural extension in Yemen is in a very rudimentary state, the por subject to immediate HITS influence (the NES) being almost nonexistent. Although HITS can be criticized for not doing more to strengthen NES capability (see Section 6.3), the fact is that the basis for yield improvements through the MAF extension service, as envisioned in the pr paper, simply does not exist. Improvements in fruit yields have occurr but these have come through the direct activities of HITS (Sections 2.2 6.2) and, to a lesser extent, through the DA's on a regional basis.

6.1.3 RECOMMENDATIONS

Continue to offer training to the MAF personnel (see Section 6.2). Establish a formal counterpart relationship with the MAF extension (see Section 6.3).

Offer assistance to DA's with their demonstration plots (see Section 6.3

Work with the ARA in the production of video materials and instructional brochures (see Section 6.3).

6.2 HITS EXTENSION

HITS' extension activities, for the most part, have been the work of third-country national who fills the position of Extension Specialist Since joining the project in 1984, this individual has undertaken the following activities:

- Produced four television tapes, which play regularly on national television.
- Produced eight videocasettes and monitors made for smaller audiences, and numerous brochures and leaflets describing proper horticultural techniques.
- Established 10 demonstration plots, requiring a corresponding number of "lead farmers" in the plot areas.

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[6] Enger, ibid., pp. 173-177.

- o Instructed a course for 318 citrus farmers in the Marib area during December through January 1986-87.
- o Visited individual farmers, estimated at 200 per year.
- o Conducted training courses at the Al Irra and Al Jarouba stations.

The HITS Extension Specialist also is a member of the MAF Tree Distribution Committee, along with the Director of the Sana'a Agricultural Directorate and other MAF personnel.

6.2.1 FINDINGS

The cultural practices demonstrated in the television tapes and in other instructional materials have not been developed in Yemen, but they have a practical orientation and are relevant to conditions in Yemen. They are timed to correspond with the phases of the cropping cycle (planting, tree care, and harvest). Their coverage is at present limited to deciduous fruits and tropical fruits other than bananas (that is, omitting grapes and bananas, which account for 57 percent of fruit production nationwide). From the recognition accorded the HITS extension agent on farm visits, it is apparent that the tapes do have an audience, and if instructions are followed, the tapes should have a positive effect on yields.

The situation with regard to the production and display of television materials represents a reversal of the situation as forseen in the project paper. The project paper had called for the strengthening of the MAF capability in this area, followed by the MAF production and display of tapes. As noted in Section 2--Economic Analysis, CORE has provided media assistance to the MAF, but the resulting television output has been disappointing; the direct HITS effort, not contemplated in the project paper, has been relatively effective.

HITS staff estimated that the average farm demonstration plot influences 20 to 25 hectares, and this estimate was incorporated into the economic analysis appearing in Section 2.2 and Annex B. However, based on our observations of four of the plots, the actual area of influence may be a good deal less, at least at this time. Some of the plots are in a very early stage of development.

Before the arrival of the Extension Specialist in 1984, training courses at Al Irra and Al Jarouba were conducted entirely in English and were generally ineffective. Courses are now taught mainly in Arabic (though not entirely, since the entire HITS team participates), which represents a distinct improvement. However, the effectiveness of the programs is limited by the capacities and interests of the attendees. The MAF personnel attending the sessions are from the Horticulture Department, rather than the Extension Directorate. According to one HITS staffer, they do not ask questions, and there is real concern as to the amount of information being absorbed.

The Extension Specialist is present at tree distributions in the Sana'a area, and thus is involved in a considerably wider area of tree distribution than that of the HITS stations alone (see Annex B for data on tree distribution). Farmers receiving trees are provided instructional material prepared by HITS. HITS does not maintain records of farmers receiving

trees, thus there are no followup studies to monitor farmers' progress. One MAF official claimed that such records are kept, but turned aside a request that we be allowed to see them. The same official asserted that the purpose of the recordkeeping was to enable followup activities with individual farmers, but it appears doubtful that any such followup has been conducted.

In addition to the activities of the Extension Specialist, the Extension Specialist/Citrus undertakes feasibility studies for large farmers. Both technical and financial aspects are covered.

6.2.2 CONCLUSIONS

The HITS television tapes are believed to have had a positive--perhaps strongly positive--impact on farmer practices. They have filled a part of the void created by the ineffectiveness of the MAF effort in this area but are nevertheless insufficient relative to the need. The need is for wider coverage (that is, moving beyond the present emphasis on deciduous fruits), more depth, and the beginning of a Yemen-specific content to the material.

The demonstration plot and lead farmer programs show good promise. However, HITS' work in this area is far behind that of some of the DA's. The TDA, for example, has some 140 demonstration plots in Taiz Province alone.

The training courses have improved in content; the main requirement is for more receptive audiences.

HITS, if not the MAF, has developed packages of information suitable for farmers, but the information is limited mainly to those fruits grown in the Sana'a area. Given the absence of any followup system (see Section 8--Information for Project Management), no judgment can be made as to whether the advice has been put into practice. Yemen's farmers do appear receptive to advice and appear to have especially good rapport with the HITS Extension Specialist. Factors hindering the adoption of recommended technology include the influence of traditional practices and the lack of agricultural inputs, notably fertilizers, pesticides, and water.

The work being done by the Extension Specialist/Citrus is undoubtedly useful, but the benefits accrue entirely to large farmers who can afford to pay for the services being rendered.

The Extension Specialist has a substantial workload at present and could not expand his activities without additional support and staffing.

6.2.3 RECOMMENDATIONS

HITS should work with the ARA, which is developing a strong research capability (see Section 4--Applied Horticultural Research) for the production of television tapes and instructional materials.

HITS should assist DA's, as appropriate, with their demonstration plots. The course of instruction provided citrus growers in Marib by the Extension Specialist points the way in this regard.

HITS should continue to offer training to the MAF personnel, including NES agents who have thus far not participated, and should endeavor to involve more DA and ARA personnel.

Although the project paper specified that project beneficiaries would be "all fruit growers," rather than a subsection of fruit growers, the project paper was written before the emergence of the large farmers operating 20 to several hundred hectares of land (see Section 2.1). It is doubtful that designers of the project would have approved this group as one of the principal beneficiaries, and therefore termination of the present activities of the Extension Specialist/Citrus is recommended.

The present MAF counterpart should have another MAF extensionist to work with.

6.3 HITS' RELATIONS WITH OTHER AGENCIES

6.3.1 FINDINGS

Although formal counterpart relationships exist between HITS and the MAF Directorates of Agricultural Affairs, Plant Protection, and Statistics ar Planning, there is no formal relationship with the Extension Directorate. Furthermore, the MAF has submitted to HITS a written request for assistance with its extension service, but the request has not been answered as of February 1987.

HITS' relationships with the DA's have been mainly a matter of responses to requests for assistance or collaboration from the institutions themselves, for example, training provided TDA personnel at Al Jarouba. On the other hand, officials at Surdud stated that they had no contact with ADSP, HITS, or the school.

HITS has established a working relationship with the ARA, mainly through contacts at the Al Jarouba station and at Taiz concerning plant protection activities.

6.3.2 CONCLUSIONS

A better relationship between HITS and NES is needed.

HITS could be more enterprising in its relationships with the DA's and the ARA, to the benefit of extension in general.

6.3.3 RECOMMENDATIONS

Establish a formal counterpart relationship with the MAF/NES.

Pursue opportunities for closer collaboration with the DA's in training, demonstration plots, and exchanges of information.

Increase contacts with the ARA at all levels, pursuant to recommendations made in this and other sections of this report.

7. TRAINING AND INSTITUTION BUILDING

7.1 DEFINITION OF INSTITUTIONAL DEVELOPMENT

Institutional development in this evaluation refers to efforts to improve the performance of the MAF and to increase its capacity to carry out specific horticulture development activities. In recent years, the World Bank, CTZ, and Great Britain have supported the institutional development of the MAF through their agriculture projects. Since 1979, USAID has provided assistance to strengthen the MAF through ADSP. Specifically, HITS provides technical assistance in horticulture to the Agricultural Affairs and the Plant Protection Directorates.

7.2 TRAINING FOR MAF STAFF IN SANA'A

7.2.1 FINDINGS

Projections of personnel requirements by both World Bank and USAID reports indicate that the MAF needs a larger staff with improved skills and experience to provide agricultural services adequately. The MAF's salaries are low and fringe benefits are limited. Individuals who obtain training through the MAF soon obtain better jobs elsewhere. Maintaining an adequate number of qualified staff in the MAF has been and will continue to be a problem because of high turnover.

In response to these critical needs, HITS provides several types of training: U.S. training conducted in English (B.S., M.S., Ph.D., and short courses); third-country training conducted in Arabic (B.S., M.S., Ph.D., and short courses); in-country short courses and field days for farmers and extension agents, agricultural technicians, nurserymen, and horticulture specialists; and on-the-job training for MAF counterparts to HITS advisors. Information on HITS training conducted in and out of Yemen to date is found in Annex E.

HITS' training program has been primarily conducted in the United States with short-term courses mostly in Yemen. In 1986, a long-term participant was started in Egypt. To support and strengthen ARA's research and management operations at Al Jarouba and Al Irra, HITS training would also be of benefit to ARA's staff working at the stations.

The majority of MAF staff have not been able to participate in HITS' university-level training because of English language requirements. The normal time for the MAF staff to learn English to a TOEFL level of 500 is 1-1/2 years at a present cost of US$19,000-plus per year. Some participants have required more than 2 years. Moreover, it is much less expensive to provide training in an Arabic-speaking country than in the United States. In short, HITS' long-term training program has been largely ineffective and expensive.

It is difficult for the MAF to maintain its present level of performance because many of its staff are currently in long-term training provided through projects other than HITS. Even on their return, the assignment system reduces potential gains because of training. Individuals who have completed technical training are often assigned to management positions

despite the fact that they have received little, if any, management training during their studies abroad. In other words, their new positions within the MAF may constitute a career advancement; however, at the same time it lessens their direct involvement in technical matters (for which they were trained), yet demands management skills they have not acquired.

7.2.2 CONCLUSIONS

A critical component of institutional development is having an adequate number of staff with sound technical and managerial skills. In this regard, long-term U.S. training conducted in English has not met the MAF's training needs in numbers trained or skills learned. Increased short-term training in Arabic of the MAF non-English-speaking staff will develop needed skills in a large number of staff of the directorates in Sana'a and province levels in a short time.

7.2.3 RECOMMENDATIONS

Concentrate on short-term horticultural training in Arabic for the remainder of the project to raise the skill level of MAF staff. Include some management training in short- and long-term courses.

7.3 ON-THE-JOB TRAINING FOR HITS COUNTERPARTS

7.3.1 FINDINGS

An important aspect of HITS' institutional development efforts was to have the MAF staff who are working as counterparts to technical advisors receive on-the-job training. This has not occurred to the extent envisioned largely because of the difficulties encountered with assignment of counterparts. The MAF has difficulty assigning counterparts to the HITS project because other donors supplement counterpart salaries and furnish more fringe benefits than USAID projects. An added constraint is the small number of persons qualified to be counterparts, a situation that will continue for the foreseeable future. Furthermore, many HITS staff have had limited experience in the transfer of skills and knowledge to people in a developing country. At present, only two members of the HITS staff are fluent in Arabic.

7.3.2 CONCLUSIONS

Attracting an adequate number of counterparts will continue to be a serious problem for HITS staff because of USAID's policy on salaries and fringe benefits. However, discussions among donors to uniformly eliminate salary supplements might reverse this situation.

To transfer skills and knowledge adequately to counterparts, experts need skills and experience applicable to conditions in developing countries as well as those used in adult learning for use in on-the-job training.

7.3.3 RECOMMENDATIONS

Given USAID's policy of minimal fringe benefits and no salary supplements to counterparts, AID should work with CPO to implement a uniform donor policy concerning assignment of counterparts.

HITS' future staffing should emphasize skills and experience required for developing institutional capabilities to sustain project activities.

AID should provide training to new technical advisors to develop their interpersonal skills and understanding of the host countries' culture. This would better prepare them for their assignments with the MAF staff in general and with counterparts specifically.

7.4 THE MAF'S ABILITY TO DELIVER SERVICES

7.4.1 FINDINGS

As stated in Section 6--Extension, the effectiveness to date of the MAF's extension service in disseminating useful horticulture information on new varieties, cultural practices, and plant protection to farmers via traditional and nontraditional extension activities has been very limited. However, HITS' extension activities have produced some positive results and appear to be a promising component of the project.

In regard to tree production, government nurseries have increased from 14 to 24, but production lags behind farmer demand for trees; and nursery production is not disease and insect free. Also, the MAF does not have a sufficient supply of budwood and rootstock for suitable varieties recommended by HITS from sources in Yemen. The lack of fertilizers and other chemical inputs further hampers the MAF's service delivery efforts.

As described above in regard to HITS' training efforts, the MAF staff responsible for project implementation activities are inadequately trained and too few in number to provide the expected services. The notable exception to this general situation is the Plant Protection Directorate. It is able to provide recommendations for controlling some of the insects and diseases now in Yemen and has a small quarantine and inspection system that recently started operations (see Section 5--Plant Protection). HITS has helped prepare informative pamphlets on plant protection for both farmers and extension agents. Also, an integrated pest-control program is being implemented.

7.4.2 CONCLUSIONS

The MAF lacks a realist strategy for meeting the demand for fruit trees through domestic production. This impedes its ability to improve an important service--tree production and distribution throughout Yemen.

HITS' extension activities have produced positive results by introducing new varieties and improving plant protection and cultural practices. However, these services are constrained by the limited capabilities of the NES and are therefore not disseminated effectively. Similarly, the Agricultural Affairs' Horticulture Department, the Plant Protection Directorate, and the ARA have also provided useful information to farmers; however, this information has reached only a limited number of farmers through the NES (see Section 6--Extension).

7.4.3 RECOMMENDATIONS

HITS and the MAF should review progress made to date on reaching project goals and identify the activities that are most important to accomplish in the next 34 months.

A specific plan of action should be identified by HITS and the MAF to ensure that useful information for improved fruit production reaches as many farmers as possible. HITS should help the MAF develop a long-range plan to produce all fruit trees in Yemen that are requested by farmers.

7.5 ROLES AND RESPONSIBILITIES OF SOME YARG AGENCIES IN HORTICULTURE DEVELOPMENT

7.5.1 FINDINGS

The four important MAF Directorates in improved fruit production are Agricultural Affairs, Plant Protection, Extension Service, and Planning and Statistics. There are also the Agricultural Research Authority and the three local DA's in Hodediah, Taiz, and Sana'a. Under the Ministry of Education are the FOA and the Ibb and Surdud Agricultural Secondary Institutes. Overall responsibility for agriculture development comes under the CPO. There are also several donors who support various horticulture improvement activities.

The HITS plant protection inputs have just been merged with those of GTZ at the YPPC. HITS has not developed working relations with the ARA in its new role as manager of all agricultural research in Yemen.

Individual donor and YARG representatives have stated that more coordination, cooperation, and sharing of information would increase the effectiveness of project resources.

7.5.2 CONCLUSIONS

Donors normally work independently. More coordination is needed among the YARG and donor organizations to effectively use the available resources in reaching YARG goals in fruit production.

7.5.3 RECOMMENDATIONS

HITS should continue to help the MAF and YARG clarify roles and responsibilities and develop useful relationships with organizations in YARG and with donors who are involved in fruit production.

7.6 MAF'S MOTIVATION OF PEOPLE TO ADOPT NEW VARIETIES AND IMPROVE HORTICULTURE PRACTICES

7.6.1 FINDINGS

The MAF tries to motivate people to plant new fruit varieties through their daily radio and limited television programs, the importation of various varieties of fruit trees, and banning imports of fresh fruit. However, motivation efforts are negated by limited supplies of fertilizers and

pesticides, and the inability of the MAF's extension service to deliver useful information to farmers. The MAF's decision to focus on production more than research--so Yemen-specific horticultural practices to support fruit production are now unavailable--has not been positive.

With no further imports of fresh fruit, prices have risen so that profits from fruit production are attractive. The MAF continues to import new varieties of fruit trees to meet farmers demand until these varieties can be produced in Yemen.

7.6.2 CONCLUSIONS

The MAF does not have a well-coordinated plan to motivate people to adopt new varieties and improve horticultural practices.

7.6.3 RECOMMENDATIONS

HITS should help the MAF develop additional strategies to motivate people to improve fruit production in Yemen and to work toward eliminating present constraints. Activities should include developing useful information regarding fruit production in specific geographic areas for dissemination through television and radio. Credit and fertilizers, fungicides, and pesticides need to be increased.

7.7 PROJECT TRENDS TOWARD INSTITUTIONALIZATION

7.7.1 FINDINGS

The percentage of MAF staff receiving training regarding increased fruit production in Yemen is small. In addition, the U.S. participant training program is behind schedule and there has been limited training in Arabic for the majority of staff with inadequate English. Plant protection and inspection and quarantine activities are helping PPD proceed toward its TFYP goals.

Lack of enough qualified counterparts has been identified as a major block to institutionalization. There is little mention of other institutionalization activities in the past workplans of HITS as well as little evidence of coordination between ADSP, HITS, and the MAF in this area.

7.7.2 CONCLUSIONS

Institutionalization has had low priority in the project because of the MAF's focus on production versus variety testing, training, and extension activities at stations. HITS and AID have not made any specific proposals to the MAF on how to improve the process, nor has the MAF made any suggestions to HITS or AID on improvements they feel are needed.

7.7.3 RECOMMENDATIONS

A strategy for improved institutionalization with specific scheduled goals should be developed by the MAF, AID, HITS, and ADSP and reviewed quarterly by these organizations.

7.8 FURTHER ASSISTANCE BY HITS TO MAF IN DEVELOPING INSTITUTIONAL CAPACITY IN THE HORTICULTURE SECTOR

7.8.1 FINDINGS

There are more varieties in the world suitable for trial in Yemen; however, the MAF does not have a plan for testing possible suitable varieties in the future. A few recommendations have been made on new varieties adaptable to the Sana'a and Al Jarouba geographic-climatic areas of Yemen; a few more recommendations can be made before 1989 once data are available on those varieties planted before 1987.

While the quarantine and inspection system has been started, it is understaffed and is less effective than desirable. Quarantine and inspection facilities at key border entries and posts are nonexistent. Bacterial canker has not been eradicated in Yemen, and government nurseries' stock is not disease or insect free.

Adequate plant protection services are a major component that is needed to improve quality and quantity of fruit production; however, the Plant Protection Directorate is also understaffed and is short on basic information regarding insects and diseases (see Section 5--Plant Protection).

MAF staff with limited English have had few opportunities in training.

The MAF is evolving into a service organization, since research has been transferred to the ARA.

7.8.2 CONCLUSIONS

The MAF needs additional assistance in developing its service systems and procedures in the above activities. The quarantine and inspection service of PPD needs the same autonomy from the YARG as ARA. Any future HITS research activities in plant protection and horticulture need to be coordinated with the ARA.

7.8.3 RECOMMENDATIONS

HITS should meet with the MAF and the ARA to help clarify goals and activities as they relate to horticulture and plant protection. The meeting should review institutionalization areas that the MAF and the ARA think are most critical, identify where HITS can help most, and develop a coordinated strategy.

7.9 POLICY OR INSTITUTIONAL CHANGES THAT WILL SUPPORT HITS ADAPTIVE RESEARCH

7.9.1 FINDINGS

To increase the quality and quantity of fruit production in Yemen, there are additional critical resources needed along with new fruit varieties, correct cultural practices, and a qualified MAF staff. These are fertilizers, fungicides, and pesticides; water; and credit. Currently, fertilizers, pesticides, and fungicides are in short supply; and Enger's report indicates that there is a present overdraft in the water-bearing aquifer in the Sana'a

and Dhamar areas and in a belt along the Red Sea in the Tihama. Credit is difficult to obtain for farmers of 1 to 4 hectares.

7.9.2 CONCLUSIONS

Major inputs to develop high-producing fruit farms are either in short supply or their continued availability is unknown.

7.9.3 RECOMMENDATIONS

Information on how the above constraints affect future fruit production should be submitted to the MAF, CPO, and the Ministry of Irrigation (MI) by USAID and HITS (see Sections 4 and 5 for details).

7.10 MAF'S INCREASED ABILITY TO PLAN, ORGANIZE, AND IMPLEMENT

7.10.1 FINDINGS

The Plant Protection and Agricultural Affairs Directorates are understaffed and therefore cannot perform adequately their assigned services. Short daily work hours further aggravate this. However, based on joint MAF-HITS planning and implementation activities, there are some good management practices being implemented.

Participant training has been technical; little management training has been available to the MAF staff. Courses in administration and management are available to the MAF at the National Institute of Public Administration (NIPA).

7.10.2 CONCLUSIONS

HITS' technical inputs are not all that is needed. MAF staff need to improve their management skills. Only limited management training has been available to MAF staff.

7.10.3 RECOMMENDATIONS

Management opportunities available at NIPA should be explored for the MAF staff. The Management Development Program that was institutionalized in the Ministries of Agriculture of Egypt, Nepal, and Bangladesh should be examined to see if a similar program would be useful for the MAF. Appropriate management inputs should be given with all technical training.

8. INFORMATION FOR PROJECT MANAGEMENT

8.1 FINDINGS

HITS has not established an effective information system to track project outputs and estimate their short-term effect on beneficiaries. Even the simplest types of output data--such as records of how many trees have been distributed from the stations and a listing of farmers receiving trees and how many they received--are lacking. Implementation problems have been so

persistent and serious that progress toward HITS' objectives can be measured more by the number of "fires extinguished" than by empirically verifiable improvements in institutional performance or effects at the farm level. Staff time has simply been diverted from planned data collection activities by such problems. Furthermore, HITS has received no technical assistance from CORE for such work, as originally described in the project paper. The dearth of such data is clearly illustrated by the "heroic" efforts that had to be made by the evaluation economist to even roughly estimate project effects to date (see Section 2 and Annex B). In short, after 4 years of implementation, the project should have been able to generate better data than somebody's best guess at what probably/maybe has happened as a result of project activities.

The argument cannot be made that it is too soon to estimate effects of the project--for example, that it takes 4 or 5 years for trees to come into production, or that significant production increases cannot occur until that time. The HITS component that most directly reaches farmers is its extension activities. The information provided to farmers about improved management for mature trees (they do indeed exist) should have almost immediate effects on production. No one has taken the time and effort to follow up on this and other project activities in any systematic fashion to document such project effects; it has simply been assumed it will happen.

What HITS has maintained is a simple count of the number of training days provided through the project. The extension specialist is also keeping track of which farmers have participated in field days and other training activities.

8.2 CONCLUSIONS

The data on training and participant farmers should be continued as the extension component of HITS is expanded as recommended in Section 6--Extension. This list will serve as a basis for drawing a sample of farmers; interviews with these selected farmers could provide data needed to estimate the effects of horticultural training and information obtained through HITS. Data are also needed on the effects of the demonstration fields. A sample of farmers living near HITS demonstration plots should be interviewed concerning how they have changed their fruit tree cultivation practices as a result of the information made available to them. These data collection activities need not be too complicated or expensive. A relatively small sample of farmers (for example, 30 to 40 farmers from the training lists and a comparable number living near demonstration plots) using a very focused and short questionnaire would be sufficient for project evaluation purposes.

At the very least, such data would allow an assessment of benefits currently assumed to result from such activities. Equally important, if HITS' extension activities are to be expanded, their effectiveness to date should be thoroughly monitored in the process. Short-term technical assistance for this work will be needed.

8.3 RECOMMENDATIONS

Monthly reports on horticulture, plant protection, and extension activities should be required by the USAID Project Manager from the HITS advisors as a basis for monitoring implementation progress.

The project should fund necessary short-term technical assistance to obtain data on the farm-level effects of HITS' extension activities.

The ARA must begin keeping station records on its applied research activities and on the provision of budwood and rootstock to MAF nurseries.

9. LOGICAL FRAMEWORK

Based on the recommended changes to HITS, a number of adjustments to the logical framework of the project are needed (see Annex F). In general, the evaluation re-focuses HITS on its original objectives of applied research and institution building. Changes to the logical framework largely reflect current conditions in Yemen, such as the unavailability of fertilizers and other inputs, and experience to date with project implementation.

10. FUTURE ASSISTANCE

Horticulture will be an increasingly significant element in Yemen's agricultural sector for the foreseeable future. AID should continue to assist Yemen in developing this important area of its economy. However, AID and the YARG should consider additional or alternative strategies to the technical assistance approach represented by HITS, in particular the possibility of developing projects that are more directly linked to fruit production. This might include expanding horticultural extension or emphasizing improved farm management practices. Moreover, if AID's overall agricultural program addressed major constraints in the sector, such as water, credit, and inputs, fruit production would be favorably affected. Horticultural activities might also be incorporated as a component within other projects. For example, horticulture activities could be included in future projects concerning on-farm water management.

11. LESSONS LEARNED

11.1 PROJECT DESIGN

Unrealistic assumptions of host-country capabilities result in training programs and technical assistance poorly attuned to the skill level and training needs of host-country personnel.

Projects that require a long-term effort to achieve their objectives, such as institution-building projects, should also include activities that will produce results in the interim period.

Information systems to track project performance and provide a basis to follow up on the short-term or intermediate effects of project activities should be incorporated into the design as a project component.

Institution-building projects should facilitate coordination among the project's primary client institution and other organizations (including other donor projects) dealing with similar or related development activities.

11.2 ECONOMIC ANALYSIS

Modification of project objectives should take into consideration the economic effects of these changes, particularly in regard to project benefits and sustainability.

11.3 PROJECT MANAGEMENT

A common understanding of major project objectives at the outset among AID, the host country, and the contractor is essential to project success.

As legitimate host-country needs arise, accommodation of project activities to meet these needs should be done in ways that do not undermine project objectives.

Use of a collaborative agreement mode of contracting should be based on a thorough assessment of the administrative and technical capabilities of the implementing institution.

Joint ventures between Title XII institutions and private consulting firms should be encouraged by AID.

Concerning collaborative agreements, project evaluation should be conducted by individuals with no direct or current association with the implementing institution or the larger consortium to which the institution belongs, nor to any other Title XII institution.

Concerning collaborative agreements, direct contracting with the implementing institution should be the preferred mode for obtaining services.

Concerning collaborative agreements, AID and the host country should work closely on the selection and fielding of staff by implementing institutions.

AID must retain control over basic design, implementation, and evaluation functions to ensure that it can meet its management responsibilities.

11.4 TECHNICAL ISSUES

Applied horticultural research programs that generate information useful for production and importation decisions, and for improved cultural practices by farmers, can have significant long-term benefits.

The long-term benefits of applied research can be minimized by over-emphasizing the short-term gains of production increases.

Academic research standards are not necessarily appropriate for meeting the immediate needs, particularly information requirements of host-country institutions.

Sophisticated technical assistance quickly exceeds the capability of host-country staff to absorb and use it.

The linkage between applied research and extension activities--in particular, packaging information in forms that can be understood and used by small farmers--is critical for generating economic benefits.

11.5 TRAINING AND INSTITUTION BUILDING

Development of local training institutions is needed to offset the high rate of staff turnover in the host-country government.

Because overtraining contributes to high staff turnover, institution-building projects should provide on-the-job training in small increments to develop the skills of host-country staff.

In addition to developing or strengthening technical capabilities, institution-building projects should include management training.

Institution-building efforts are most effective when inputs are made in small incremental steps over a prolonged period of time.

To be effective, technical advisors in institution-building projects obviously need sound technical skills, but they also need development project training or experience, adequate interpersonal skills, and a basic understanding of and appreciation for the local culture and society.

ANNEX A
STATEMENT OF WORK

WORK STATEMENT

I. Activity to be Evaluated:

The Horticulture Improvement and Training Subproject (HITS), 279-0052, one of five subprojects of the Agriculture Development Support Program (ADSP), was authorized December 17, 1982 for five years with funding of $14,385,000. Extension of the PACD to December 31,1989, was subsequently authorized, and the HITS Subproject was added to the ADSP by Grant Agreement Amendment No. 15. (The HITS Grant Agreement was signed on February 14, 1983 establishing a PACD of December 31, 1989.) All activities of this subproject will be evaluated under the terms of this Scope of Work.

II. Purpose:

This external evaluation is scheduled in the current ANE Bureau Evaluation Plan and in the Evaluation Plan of the Project Paper.

This external evaluation is an important segment of a comprehensive USAID/Yemen undertaking which will produce a coherent horticultural project with defined outputs which are built by discrete activities, and supported by inputs. The first step of this plan has been completed, a Horticulture Assessment. This provides an in-depth view of the fruit tree sector in Yemen. The second step is the external evaluation which will respond to ten main questions listed in the Statement of Work. It will provide recommendations to mission management, the Contractor, and the MAF on ways the HITS can be more effective in addressing the Yemeni horticultural needs. It will be a team building process that will foster cooperation among all parties involved in the fruit tree sector. In addition, the recommendations will provide the groundwork for the next and final step. This step is to utilize the recommendations of the evaluation in developing a formal operational plan for the life of the project. If the evaluation indicates a project paper amendment is necessary, it would be done in conjunction with the operational plan. A facilitator will be contracted to insure evaluation recommendations are negotiated and adopted by the MAF and contractor. The operational plan will describe the project's outputs, list supporting activities that will produce those outputs and budget money, training and human resources for each activity. The final step is to link the operational plan to a specific scope of work for the university contractor who is currently implementing the HITS.

III. Background:

In the summer of 1977, the Ministry of Agriculture and Fisheries (MAF), USAID/Yemen and Tuskegee Institute embarked on the first horticulture project which introduced varieties of fruit trees in Yemen for applied research. This project ended in September of 1981. The MAF was dissatisfied with the project because (1) of the slow progress of developing horticulture stations, (2) project activities were research oriented and (3) production of seedlings and grafted trees for sale and distribution to farmers were unavailable.

The MAF and USAID decided to continue fruit tree activities, station development and tree production under the Agriculture Development Support Program (ADSP). The Consortium for International Development (CID), the contractor for the ADSP, selected California State Polytechnic University, Pomona (Cal Poly) in 1981 as the lead university for the follow-on horticulture project. The Horticulture Improvement and Training Subproject (HITS) was designed in May and authorized in December of 1982. Cal Poly has been responsible for project design and implementation since 1981.

Since HITS was designed the climate for the horticultural sector has drastically changed. The YARG banned the importation of fresh fruit in early 1984. The MAF added activities outside those of the original project paper. As a result the project is underbudgeted if it is to accomplish all the on-going and proposed activities. The budget reductions called for by the Gramm-Rudman-Hollings Bill, has reduced the planned additional funds for HITS to zero.

Below is a brief summary of the project paper's goal, purpose, and outputs:

The Goal:
To increase rural incomes in the YAR through agriculture development.

The Subgoal:
To increase the quantity, quality, and diversity of fruits produced in Yemen.

The 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.

The Outputs As Of April, 1986:

1. Establishment of 2 horticulture training and improvement stations.
   Status: The infrastructure of each is 90% completed, but MAF financial support and the continuity of trained capable Yemeni management are lacking.

2. Expanded plant protection department trained in plant protection methods.
   Status: By August of 1986 approximately 5 PY (person/years) of technical assistance will have been contributed to the Plant Protection Directorate. It is difficult to quantify the impact of technical assistance provided under HITS because the Federal Republic of Germany has had an on-going project with the Directorate since 1974.

3. Short-term and Long-term training completed.
   Status:
   a. The target of 12 participants at the college level, B.S., M.S., and Ph.D., was established, but to date only one Yemeni is undergoing U.S. M.S. degree training.

   b. Short-term, U.S. training per the project paper was 36 PM; status 8 PM completed. In-country training target was 175 PM; status about 120 PM of training conducted.

4. Expanded horticulture information production and distribution.
   Status: A total of five pamphlets produced.

5. Developed improved fruit varieties in insect/disease-free conditions.
   Status: Approximately 22 varieties of citrus and 54 deciduous varieties with various rootstocks have been introduced through the project. Varietal screening began in earnest in December of 1985.

6. Farmer demonstration program and workshops.
   Status: Five deciduous fruit demonstration plots have been established in different regions of Yemen.

In addition to the original outputs, HITS has added activities through the Annual Work Plan process and other agreements.

- By April of 1984, one year after Amendment No. 15 to the project agreement was signed, the MAF assigned seedling production goals to the two horticulture stations. The annual budget increased dramatically to cover extra material, construction, labor, time of advisors, and nursery operations. By October of 1984, the MAF recorded its dissatisfaction with the project because the MAF's production goals were unattained by the project. This same criticism was recorded in 1981 with the Tuskegee project.

- Citrus Canker, the same disease that threatens the orange groves of Florida, was discovered in Yemen in 1981. By January of 1985, AID, Cal Poly, and the MAF had prepared for a phase-out of citrus production at Al Jarouba, a project nursery. By March 1986 the nursery had cut and burned all citrus trees at Al Jarouba. HITS is providing advice to the YARG in citrus eradication and PL 480 funds are programmed to provide a partial support to the YARG to compensate growers.

- Al Jarouba has now shifted to non-citrus tropical and sub-tropical fruit trees varieties for varietal evaluation. This will undoubtedly double project costs and time to establish new trees and screen them for adaptability in Yemen.

- The HITS plant protection activity became operational with the arrival of an entomologist in September of 1984 and a plant pathologist in November of 1984. Project activities have concentrated on insect and disease identification at the expense of developing regulations and a training program for quarantine and inspection prodedures. Now HITS is embarking on a state-of-art biological control of citrus scale insects and the construction of a laboratory facility with PL 480 funds and additional person years of technical assistance from the HITS.

- With the advent of citrus canker, it was realized that an isolated region of Yemen must be found to begin a canker-free citrus industry. The Marib area was chosen by the MAF. AID has committed PL 480 funds for nursery infrastructure and HITS will provide 3 PY of technical assistance.

In conclusion, all the activities in this section are valid and reflect the needs and desires of the MAF and AID. Unfortunately, the funds available and the time frame for their successful accomplishment (PACD, 31 Dec 89) necessitate a collaborative evaluation to prioritize HITS activities with the needs of the horticulture sector.

IV. Scope of of Work

The contractor shall prepare a statement of actual versus intended on project accomplishments. They should update and complete the information in the preceeding section.

The following questions are the body of the evaluation. The contractor must respond to each of the questions in their final report by presenting their findings (i.e., evidence), their conclusions (i.e., their interpretation of the evidence), and their recommendations based on their best judgement. Eacn section in the final evaluation report should respond to the sub-headings from A-K. The evaluators are requested to distinguish clearly between findings, conclusions, and recommendations. The questions are listed in order of priority with the first being highest.

A. Improved Fruit Varieties: Introduction, Adoption, Production:

To what extent has progress been made in providing improved fruit varieties to Yemeni farmers that are free from disease and pests?

1. What varieties have been introduced, tested, proven, distributed and adopted?

2. What percentage of target farmers have adopted improved varieities? How many farmers have received improved varieties?

3. How many extension visits have been made to those farmers who received improved varietes?

4. Do the beneficiaries of the trees receive sound horticultural advice in establishing their orchards?

5. To what extent have inspection, quarantine, and plant protection activities assisted the beneficiaries and made a difference with respect to survival rates of trees and fruit production? Can tne impact of tnese activities be quantified?

6. Using the village as the level of analysis, has the supply of fruit trees and fruit tree production increased in rural areas? To what extent?

7. To what extent nas tne establishment of orchards and nurseries increased? What are the survival rates?

8. To what extent is the project contributing to increased quantity, quality, and diversity of fruit trees in Yemen?

B. Development of Horticultural Practices and Extension

If HITS effectiveness depends on traditional and non-traditional extension activities, to what extent is the traditional service delivering appropriate, relevant, and timely information and practices to farmers?

1. To what extent has research been completed on varieties suitable for Yemeni farmers in different agricultural zones?

2. What specific horticultural practices have been developed by HITS that will increase fruit production, promote better tree health and survival, and be suitable for the Yemeni farmer in various zones?

3. To what extent have these practices been put into packages of information suitable for farmers in different agricultural zones?

4. To what extent have the practices been adopted by the farmer?

5. What factors facilitate and/or hinder adoption of these practices?

6. To what extent have the numbers and skills of the YARG extension staff increased with regard to appropriate horticulture and plant protection practices?

7. How effective are the training courses for extension personnel?

C. Institutional Development of the Ministry of Agriculture

To what extent does the MAF have an increased capacity to assist Yemeni farmers improve the quality and quantity of fruit production? To what extent has the MAF increased its capacity in extension, plant protection and delivery of disease-free planting stock?

1. Has the MAF provided the counterparts necessary, and made personnel available for training, for satisfactory implementation of this project?

2. To what extent has the MAF motivated villages, individual farmers, and commercial producers to

adopt new varieties and improved horticultural practices?

3. As a result of HITS, to what extent has the MAF increased its capacity to plan, organize, and implement actions which will improve the quality and quantity of fruit?

4. What have been project trends with respect to institution building and the delivery of services? Is MAF staff adequately trained to improve performance in the horticulture sector? Is there a manpower and staffing plan? Is it adhered to? If staffing and training show deficiency, what should be done?

5. How can HITS assist Yemen in developing its fruit sector?

6. How can HITS further assist the MAF in developing institutional capacity in the horticulture sector?

7. Have the long and short-term training targets been met? If not, why not? What should be done?

D. Investment of HITS and YARG Resources

Where in the horticultural sector should AID and YARG resources be invested to improve fruit production in Yemen? From the point of view of the MAF, the contractor, and the project beneficiaries?

1. What policy or institutional changes might be needed to maximize the adaptive research generated by HITS?

2. What is the profitability of parastatal nurseries and orchards compared with the private sector? Is there a role for AID policy dialogue with regard to privatization of parastatal nurseries?

E. Donor Collaboration

To what extent have HITS, USAID/Yemen, the MAF and other donors collaborated and cooperated to promote increased fruit production in Yemen?

F. Beneficiaries

Who is actually benefitting from this project? Describe the types of farmers and approximate income level. How have they benefited? Is there any evidence to show that beneficiary income has increased?

G. Project Sustainability

Is it likely that the project can or will be sustained after U.S. assistance is withdrawn? Is there adequate YARG financial and counterpart support for the project? Can recurrent costs be covered by the YARG after AID assistance terminates?

H. Lessons Learned

What lessons have been learned about the design and implementation of this project? If the evaluation team were to design this project over again, what would they do differently? How can these lessons be applied during the remaining years of the project? What are the major decisions which need to be made to improve project effectiveness?

I. Logical Framework

Is the logical framework of the HITS paper consistent with the activities of HITS and does it reflect the realities of the horticulture sector?

1. Is the vertical logic of the project sound?

2. Are the input, output, purpose and goal plausible?

3. Do the assumptions provide a functional statement of the critical conditions which are required to achieve the goal?

4. What is the impact and confidence level of the assumptions at all levels?

5. To what extent have the inputs been provided and the outputs been achieved as planned?

6. To what degree are the inputs and outputs contributing to achievement of the purpose.

J. Information Gathering for Project Management

1. To what extent does the project have a useful and timely information system which provides regular information to managers on outputs, purposes, and goal achievements? Do managers use this information for project decision making? If not, what should be done?

2. As specified in the HITS Project Paper on Page 62, has each long-term technical expert and his counterpart developed appropriate data collection strategy, whereby key program indicators are monitored. If not, what not? What should be done?

K. Contractor Performance

To what extent has the contractor (Cal/Poly-Pomana) been successful in accomplishing the stated outputs of the project as well as the additional project activities that were listed in the background section of this statement of work?

V Composition of Evaluation Team

Title/Function	Organization	L.O.E.
Evaluation Specialist/Team Leader 1/	AID/PPC/CDIE	45 P/D
Agriculture Economist	L.A.I.	27 P/D
Institutional Development Specialist	L.A.I.	27 P/D
Extension Outreach Specialist	L.A.I.	27 P/D
Plant Protection Specialist	L.A.I.	27 P/D
Horticulture Specialist	L.A.I.	27 P/D
Project Manager Home Office	L.A.I.	10 P/D
Horticulture Agent	MAF	1 P/M
Rep from Planning Directorate	MAF	1 P/M
Plant Protection Agent	MAF	1 P/M

1/The Team Leader/Evaluation Specialist is not funded under this contract.

To clarify the roles of the positions of Team Leader/Evaluation Specialist and the Institutional Development Specialist the following is noted.

The Team Leader/Evaluation Specialist will have the following duties and responsibilities:

Leads the TPM in the U.S. and is the counterpart to the facilitator for the TPM. If there will be a TPM in Yemen, he will present it

Designs and plans the overall evaluation strategy in coordination with his team

Assigns tasks, reviews progress of individual team members on a regular basis

Reviews and edits the preliminary and final reports for substance, accuracy, and conformance with ANE evaluation guidelines

Works closely with the L.A.I.'s Evaluation Project Manager and Institutional Development Specialist to ensure a quality end product

Mediates in cases of disagreement

Coordinates meetings and works closely with the USAID Project Officer.

The Institutional Development Specialist will have the following duties in addition to those found on page 1-3 of the original proposal:

Write the preliminary report based on the individual reports of the other team members

Incorporate into the final draft report USAID's, MAF's, and Cal Poly's comments on the prelinimary report and substance of team members' field debriefing

Prepare the final draft report according to established ANE/DP/E guidelines at his residence and present it to C. Hermann, the Team Leader, AID/PPC/CDIE by March 6, 1987

Serve as the laison to the Project Manager, Felipe Tajeda on contract issues, contract compliance, and home office coordination.

Evaluation Project Manager's role is accepted as presented in the second technical proposal with the following clarification with regard to the submission of the final report. The Institutional Development Specialist will write the final draft report which will be edited for substance and accuracy by the Team Leader. The latter will submit it to Tajeda by March 12 who will be responsible for the final production, conformance to ANE guidelines, and delivery via DHL courrier to USAID/Yemen by March 20, 1987.

VI. Reporting Requirements:

1. Format of the Report: The contractor shall prepare a written report containing the following sections:

Basic Project Identification Data Sheet (see attachment to this section)

Executive Summary and Abstract. (This will adhere to the guidance in ANE Bureau Evaluation Summary)

Body of the Report. The report is to include a description of the country context in which the

project was developed and carried out, and provide the information (evidence and analysis) on which the conclusions and recommendations are based. The body of the report will be no less than 30, and no more than 40 pages. The evaluator may include details in appendices.

The report should end with a full statement of findings, conclusions and recommendations and presented in a matrix format. Conclusions should be short and succinct, with the topic identified by a short sub-heading related to the questions posed in the Statement of Work. Recommendations should correspond to the conclusions; whenever possible, the recommendations should specify who, or what agency, should take the recommended actions;

Apendices. These are to include at a minimum the following:

(a) The Evaluation Scope of Work;

(b) The pertinent Logical Framework(s), together with a brief summary of the current status/attainment of original or modified inputs and outputs (if these are not already indicated in the body of the report);

(c) A description of the methodology used in the evaluation (e.g., the research approach or design, the types of indicators used to measure change of the direction/trend of impacts, how external factors were treated in the analysis). The contractor may offer methodological recommendations for future evaluations;

(d) A bibliography of documents consulted.

Other appendices may include more details on special topics, and a list of agencies consulted.

2. Submission of Report: The preliminary drafts will be presented to USAID/Yemen upon completion of the field portion of the evaluation. Twenty copies of the final report will be submitted to USAID/Yemen by March 20, 1987. The contractor will be reponsible for seeing the report through to a timely, professional completion.

BASIC PROJECT IDENTIFICATION DATA

(Outline)

1. Country:

2. Project Title:

3. Project Number: (Grant and/or Loan?)

4. Project Dates:

   a. First Project Agreement:
   b. Final Obligation: FY-- (Planned/Actual?)
   c. Project Assistance Completion Date (PACD):

5. Project Funding:

   a. A.I.D. Bilateral Funding (Grant and/or Loan):
   b. Other Major Donors:
   c. Host Country Counterpart Funds:

   TOTAL:

6. Mode of Implementation: (Host Country or A.I.D. direct Contract? Include name of contractor.)

7. Project Design: (Organizational names of those involved in the design of the project, i.e., the Government of Sri Lanka, USAID/Colombo, and the International Science and Technology Institute (ISTI)

8. Responsible Mission Officials: (For the full life of the project.)

   a. Mission Director(s):

   b. Project Officer(s):

9. Previous Evaluation(s):

10. Cost of Present Evaluation:

	Person Days	Dollar Costs
a. Direct Hire:		
(1) AID/W TDY:		
(2) USAID staff:		
b. Contract:		
c. Other:		

ANNEX B
ECONOMIC ANALYSIS

I. THE ECONOMIC ENVIRONMENT

The period during which the HITS project has been operational has been marked by a dramatic deterioration in the economic environment. Adverse economic conditions, the extent of which could probably not be foreseen at the time of project design, have impacted on the agriculture sector, and directly and indirectly on the project itself.

A. The Boom Years, 1974-83

Prior to the start of the oil price boom in 1974, Yemen was a basically subsistence economy, heavily dependent on agriculture, with limited development in terms of social and economic institutions. The country had, and still has, virtually no commodity export trade. From the mid-1970's through 1982, the economy advanced rapidly on the strength of rising remittances from Yemeni workers in Saudi Arabia and generous Saudi grant aid. The rapidly rising purchasing power created by the remittance flow was translated into equally rapid increases in imports and, through import taxes, to government revenues. Government expenditures accordingly surged, at a rate of some 10 percent per annum. With the help of generous assistance from other doners, the YARG undertook an ambitious and largely successful First Five Year Plan (1976-81), followed by an equally ambitious, and ultimately unsuccessful, Second Five Year Plan (1981-86). Education, health and other services were greatly expanded, rising from 11 percent of GDP in 1973/74 to 26 percent of GDP in 1983. Construction boomed and manufacturing, expanding from a very low base, rose from 5 to 8 percent of GDP. GDP itself expanded at an annual rate of 7 percent during 1973-82.

The agriculture sector as a whole did not share in the general prosperity of the boom years. In the face of the higher returns to be gained from employment in Saudi Arabia, a growing manpower shortage led to abandonment of marginal cultivated areas, and production of traditional foodgrain crops stagnated. On the other hand, irrigated production of fruit and vegetables increased, benefiting from generally higher incomes and the newly acquired tastes of returning workers.

B. Retrenchment, 1983-87

Although the end of the oil boom is generally dated from the oil price collapse in 1981, remittances from Yemen workers merely leveled off at about $1.2 billion and did not turn downward until 1984. Saudi grant aid declined steadily from $462 million in 1982 to $103 million in 1985, but despite a reduced level of overall external availabilities and declining exchange reserves, retrenchment did not set in until 1983. In that year, government investment expenditures were cut by 36 percent, import licensing was tightened, and the YARG abandoned the fixed exhange rate which had been pegged at YR 4.56: $US 1.00 since 1971. By 1984, the Second Five Year Plan had become virtually a dead letter with expenditures confined almost entirely to foreign-funded projects. Of immediate interest to the Project, from the standpoint of purchasing power, YARG support, and availability and cost of imported agricultural imports, are the following indicators for the period, 1982-86:

	1982	1986 (est.)	% Change
GDP PER CAPITA (1982 dollars and exchange rate)	409	402	-1.7
GOVT. EXPENDITURES (Millions of 1982 Rials)[a]	7,089	4,633	-34.6
IMPORTS Millons of dollars)	1,926	715[b]	- 62.9
NET FOREIGN ASSETS OF THE CENTRAL BANK ($ Millions, year-end)	550	348[c]	-36.7
YR: DOLLAR RATE (year-end)	4.56	11.86	160.1

Notes: (a) Not including "unclassified" and "various" expenditures, which comprise mainly military spending and service on internal debt.
(b) Estimate based on 9 months data.
(c) September 30, 1986.

Sources: CPO, Yemen Central Bank

C. Prospects, 1987-90

Retrenchment has brought about a rough equilibrium in the balance of payments, albeit at a greatly reduced level of imports, and the YARG budget deficit showed a marked reduction in the first three quarters of 1986 (from 40 percent of expenditures during 1985 to 21 percent of expenditures during Jan.-Sept. 1986). The situation, however, is far from satisfactory. The import and expenditure reductions have reduced GDP growth to zero, or slightly less, on a per capita basis, and unemployment exacerbated by returning workers from abroad has become a problem.

Monetary pressure, fed by deficit spending and devaluation have combined to produce rapidly rising price inflation. The Sana'a retail price index rose by 27 percent in 1985 and an estimated 36 percent in 1986.

In this situation, all eyes are turned toward the oil development under way under the direction of Hunt Oil Co. The YARG professes to see initial exports of petroleum at a rate of 130,000-135,000 barrels per day by the end of 1987, but most observers familiar with the situation feel that late 1988 is more like it. Under the agreed production-sharing arrangements, Yemen will initially receive about 50 percent of the proceeds of exported oil, rising to about 60 percent within a few years' time. Actual revenues to Yemen will then depend on the world price of oil. Initial annual revenues of $450 million, consistent with a per barrel price of $18.50, would seem a reasonable estimate.

The addition of $450 million in oil revenues would certainly ease Yemen's situation, but it would not enable a return to the free-spending days of 1975-82. The country will be able to afford some increases in imports and development spending, but it will have to husband its resources carefully. And, of course, there can be little relief from existing constraints within the time frame of a project scheduled for termination in 1989.

Fortunately for Yemen, there exists a very considerable "underground," or parallel (since there is nothing very underground about it) economy functioning outside of the official system. The parallel economy, reflected in widespread smuggling across the porous border with Saudi Arabia, has unquestionably suffered along with the government from the downturn in oil prices (after all, both economies have relied heavily on remittance income). Yet, there unquestionably remains a considerable store of wealth throughout the country not reflected in the official data. There is more than a little truth in the addage that "The Government is poor, but the people are wealthy." The existence of this wealth has been reflected in vigorous private sector activity, even during the country's recent difficulties, and as will be discussed below, is an important source of present and potential growth in the fruit industry.

II. FRUIT INDUSTRY STRUCTURE AND GROWTH, 1982-86

A. Data Problems

Discrepancies in the basic data with regard to fruit production in Yemen are every bit as great as with agricultural production in general. Warren Enger attempted to shed some light on the problem,[1] but he was unable to resolve--indeed, who could?--the wide disagreements among data sources regarding area and yield per hectare, and his own work contains inconsistencies in these areas. His most important contribution was his Fruit Growers' Survey, covering 118 medium-size fruit growers, selected to ensure complete coverage by crop and region.

Enger's work contained a thorough discussion of the data problems by principal crop. His material will not be rehashed here, other than to note the striking disagreement among data sources in two areas: the distribution of area by crop, and the estimates of yield per hectare.

(1) Distribution by crop: The Agricultural Census of 1978-82 shows 26,612 hectares, or 3.4 percent of the total cultivated area, in fruit. Of the total area 28.5 percent was accounted for by grapes. This ratio is reasonably consistent with the findings of the Six Province Survey (accounting for about 80 percent of all fruit production) done in 1985. On the other hand, the agreed CPO-MAF data, published annually, have shown a far higher proportion in grapes: 47.5 percent in 1985, the last year for which CPO-MAF data are available. The Project Paper appears to have accepted the CPO-MAF data for purposes of its calculations of Project benefits. We are basing our estimates, for bananas as well as grapes, on the Agricultural Census extended to 1986 on the basis of (apparent) subsequent developments.

[1]Warren J. Enger, RONCO Consulting Corp., Fruit Horticulture Sub-Sector Assessment--Yemen Arab Republic, Aug. 1986

(2) Yield per hectare: Following are the findings with respect to yields per hectare, according to the various data sources:

ESTIMATES OF YIELD PER HECTARE (TONS)

	6 Province Survey (1985)	Fruit Growers' Survey (1986)	CPO-MAF (1985)
Grapes	10.3	14.4	5.75
Other fruits	6.1	9.9[a]	5.95
(Bananas)	(8.1)	(17.5)	(b)
(Other)	(5.7)	(8.1)[a]	(b)
All fruits	7.2	11.9[a]	5.86

Notes: (a) Author's calculations based on Enger's data for production (Table III-2) and yield data for individual crops (Fruit Growers' Survey).
(b) Not separately estimated.

Given his own findings showing generally higher yields for all crops other than those shown in the official data, it is hard to understand Enger's reference to an all-fruit yield level of 7 tons per hectare in his Executive Summary (p. 10; Enger's reference, same page, to a planning base of 25,000 hectares under fruit production is equally hard to understand; see below). He makes an especially good case for a banana yield close to his own findings of 17.5 tons/ha., and otherwise strongly suggests that the official data understate fruit yields.

Obviously, the true situation is not known, and any set of estimates is bound to be off the mark. For purpose of this analysis, we will rely mainly on the 6 Province Survey, tempered by Enger's findings. Following are the yield estimates assumed for 1985:

	TONS PER HECTARE
Grapes	10.3
Other fruits	7.45
(Bananas)	15.0
(Other)	5.7
All fruits	8.26

B. Production Trends, 1982-86

According to CPO-MAF data for 1982-85 (data for 1986 not yet available), the total fruit growing area expanded by 1,400 hectares (5.0 percent); average fruit yields increased by 7.7 percent; and production rose by 20,000 tons, or 4.2 percent p.a. These data are not credible.

Based on the number of trees distributed by MAF (see section D and Table 4), the fruit-growing area must have expanded by 5,500 hectares during 1982-86 (Enger's estimate was 6,000 hectares during 1981-86), and yields are more likely to have declined than increased. The salient points with regard to yield are these:

(a) Of the additional hectares added during 1982-86, only the proportions accounted for by grapes planted early in the period and bananas could have produced fruit by 1986; and a substantial proportion of the large-scale banana plantings are known to have failed;

(b) The National Extension Service has remained almost totally ineffective;

(c) Imports of fertilizers and insecticides were virtually cut off after 1982. To be sure, farmers were using little fertilizer before the cut off, but the change from some use to no use is bound to have had an adverse impact.

(d) According to the Fruit Growers' Survey, growers report continuing problems with inadequate irrigation and credit availability.

(e) On the positive side, the production of videotapes by HITS may have had a significantly favorable impact on farmer practices. The same is true, to a lesser extent, of the farm demonstration and model farmer programs conducted by HITS, and the various extension programs being conducted under the aegis of area-specific rural development programs (see Section 6--Extension--of the main report).

Based on these considerations, we estimate that average fruit yield per hectare declined at a rate of 3.2 percent p.a. during 1982-86. Because of the increase in hectarage, however, fruit output increased an estimated 1.6 percent p.a. to about 227,000 tons.

Table 1 summarizes the factors regarding fruit yields, as far as concerns mature trees (those bearing fruit in 1982). All crops have been adversely affected by the virtual cutoff in imports of fertilizer and insecticides after 1982. Crops other than grapes and bananas, benefiting from the extension activities of HITS and others, are believed to have overcome this effect and experienced some degree of net yield increase. Banana yields probably benefited enough from the extension activities of the Tihama Development Authority to offset the adverse effect of reduced input availability. Yields for all crops combined are believed to have increased by about 0.5 percent p.a. during 1982-86.

Of the 5,500 hectares added to the fruit-growing area during this period, only a portion of the grapes and bananas are bearing fruit as yet. Some 500 hectares have been planted to bananas, but while bananas take only a year to bear fruit, at least 200 hectares of new plantings are known to have failed in their first year.[2] Putting together the situation with regard to

mature crops and the existence of 5,500 new hectares bearing little fruit as yet, overall yield is estimated to have declined by 3.2 percent p.a. during 1982-86. Overall production is estimated to have risen by 1.6 percent per annum to about 227,000 tons (see Table 2 for a summary estimate of yield and production).

To be sure, the poor yield performance has been mainly a matter of additional plantings not yet bearing fruit; the payoff from these additional plantings should be seen starting in 1987. Accordingly, the government's Third Five Year Plan projections, calling for a 7 percent annual increase in the output of most fruits during 1986-91, is within the bounds of reason. A strong cautionary note needs to be sounded, however. Increases in area under fruit will not alone do the job. If the constraints of inadequate extension, agricultural inputs, irrigation and credit are not addressed, crop failures and generally declining yields can more than offset the gains expected from increased plantings. In fact, the potential exists for an output decline of significant proportions.

C. Changes in Farm Structure

The Agriculture Census did not disaggregate the data to size of farm holding by subsector. The Project Paper noted that fruit producers comprised two basic groups: subsistance growers with a small number of backyard trees, usually bearing low quality fruit; and commercial growers cultivating less than four hectares, usually in a mixed cropping pattern (fruit and other crops). HITS was to have collected data that would clarify the picture, as well as provide the basis within the MAF for the production of improved and up-to-date farm budget surveys. None of this has in fact been done.

If the picture with regard to farm holdings has not been clarified, a significant new trend has at least become apparent since the ban on importation of fruit in late 1983; namely, the emergence of large-scale growers cultivating from 20 to several hundred hectares. HITS personnel have been able to identify projects totaling 1,009 hectares as having already started operations, with another 761 hectares in the planning stage. Nor does this include one very large planned project at Al Jawf, involving some 6,000 hectares, of which an unknown portion would be in fruit. In a study by International Advisory Co. Ltd. in 1985[3] large-scale new projects were projected to reach 3,300 hectares by 1990. It is not known whether this estimate included the Al Jawf project, but if so, it would be reasonably consistent with the HITS estimates. Based on the ambitious plans of the large growers and the far less ambitious plans of the medium and small-scale growers, the former are likely to account for 10 percent of all fruit growing hectarage by 1990.

[2]One large grower told us that he had suffered a total loss on 80 hectares of bananas planted in 1984, owing to thrip infection, and said he know of other large Tihama growers who had suffered wipe-outs owing to Thrip and/or salinity.

[3]International Advisory Co. Ltd., Fruit and Vegetable Marketing Study in the YAR, 1985.

D. Nursery Production and Distribution

The number of government nurseries involved in fruit production has expanded from 10 at the start of the project to 24 at present. Government nursery production amounted to 3.5 million trees during 1982-86. There are no private-sector nurseries as such. Some large growers maintain nursery operations, including at least one involved in tissue culture, but only as a source of tree stock for their own use.

In addition to its nursery activities, the YARG imports trees in large numbers. MAF data show some 365,000 trees imported during 1982-86, with another 156,000 planned for 1987. Imported trees are sold at approximately CIF value; nursery trees are sold for less than imported trees without regard to costs of nursery operations. MAF officials conceded to us that MAF nurseries operate at a loss, but we were unable to obtain the data needed to quantify the extent of loss.

Warren Enger found that MAF sales have never exceeded 60 percent of production in any one year, the remainder being distributed free of charge and used mainly for cover rather than organized orchard activity. Table 3 summarizes MAF nursery production and imports, and Table 4 tree distibution and our estimate of the increase in planted area, during 1982-87.

MAF tree distribution, which includes trees produced at the HITS stations, is made following public announcements, on a first-come-first-served basis. The MAF has information on distribution by lot size, but it is not in an organized form, and we were discouraged from attempting to sort through it. The average sale is said to be in lots of 15 to 25 trees. Some 20-25 percent of sales are seedlings, the remainder budded trees. The survival rate of trees is said to be 75 percent and improving.

E. Marketing

Based on the findings of Enger's Fruit Growers' Survey, 79 percent of all fruit production is marketed, the highest shares being accounted for by grapes (95 percent), bananas (95 percent), dates (90 percent) and papaya (80 percent). The marketing structure is an array of informal arrangements, with most farmers relying on wholesalers, but some using commission agents as intermediaries. Farmers may transport their crops to wholesalers at market locations, or the wholesaler (or commission agent) may come to the farms. Enger cited farmers margins (farmgate price as percent of retail price) ranging from 35 to 60 percent; he used 50 percent as an average margin for analytical purposes. The IAC Study estimated average margins at from 35 to 45 percent.

The system appears to work reasonably well, though there is a need for a system of grading and packaging standards, as well as cold-storage facilities to extend the selling season for the more perishable crops. Something will have to be done in these areas before exports for crops other than grapes can become a reality.

Sporadic efforts by farmers to establish more formal marketing arrangements have foundered in the face of government competition, in particular the Military Economic and Commerical Organization (MECO), which ironically was established in 1983 as a joint private-public-sector operation.

Cooperatives have also been tried, but have mostly succumbed to management problems. Only about 1 percent of farmers are currently enrolled in cooperatives.

F. Fruit Prices

Table 5 shows retail fruit prices for 1983-86. Averages have been calculated, weighted according to tons marketed in 1986, as estimated by Warren Enger.

Except for grapes, which actually declined in price, retail fruit prices rose rapidly following the ban on fruit imports near the end of 1983. Prices of banana, the most important fruit crop after grapes, rose by 89 percent during 1983-85, before declining sharply in 1986. Average prices of fruit crops except grapes and bananas rose by 78 percent during 1983-86, somewhat less than the 96.5 percent increase in all retail prices, as measured by the Sana's Retail Price Index.

Since fruits are a domestically produced commodity (since late 1983), it is not surprising that fruit prices should lag the increase in a retail price index which reflects imported goods that have been impacted directly by devaluation. With the exception of grapes and dates, the profitability of fruit growing probably did not decline during this period. The decline in banana prices in 1986 most likely reflects large-scale plantings in 1984 and 1985.

III PRIVATE-SECTOR ACTIVITY

Investment in fruit production by private growers is proceeding at a rapid pace, especially when considering the constraints facing small and medium size growers. As shown in the Fruit Growers' Survey, most growers would like to expand their fruit operations, but are constrained from doing so right away by lack of credit, water, and available land, in that order of importance. Credit is available, for the most part, only to the larger growers who can provide collateral. Even then, the best reported terms, 50 percent funding with 5 years grace period, are not attractive to growers of crops with 5 years or more gestation periods. Lack of fertilizer was not mentioned as an important constraint in the survey, but this appears to reflect a general unfamiliarity with the product. Whatever the constraints, total area under fruit production expanded by some 5,500 hectares, or 21 percent, during 1982-86. Large-scale farmers, just coming onto the scene following the import ban in 1983, accounted for about 1,000 hectares, or 18 percent of the expansion. The large farmers, operating from 20 to several hundred hectares, usually in mixed cropping patterns, are far less constrained by lack of technical knowhow and inputs than small farmers, and accordingly will account for a rapidly increasing share of output as well as area in the foreseeable future.

In his 1986 report Enger expanded upon the cost of production work done by Asmon and reproduced in the Project Paper. His studies tend to confirm the finding regarding the high degree of profitability of fruit production. Among the important crops, the most profitable (with IRR's) were found to be oranges (217 percent), bananas (217 percent) and mangoes (189 percent). A weighted average of all crops except grapes (weighted by value of crop marketed in 1986) showed an average IRR of 185 percent.

The IRR for grapes was estimated at 39 percent, but the potential for yield improvement in grapes is said to be very great. The only unprofitable crop of importance was found to be dates. Continued profitability will, of course, depend on prices, but Enger does not foresee a leveling off in prices sufficient to bring about a halt to production increases before 2005.

The fruit sector would benefit from private-sector participation in nursery operations; the MAF's overriding emphasis on production is not an efficient way to meet demand, witness the large number of unsold trees every year, even as buyers scramble madly for inadequate supplies of desired trees at nursery sales. There is interest on the part of entrepreneurs, as evidenced by there feasibility studies (that we have heard of) done to date on tissue culture production. As noted above, the main obstacle to private-sector entry is the MAF's policy of subsidizing tree sales. It might be possible for private operators to compete, even in the face of the true subsidy policy, on the basis of more efficient operation, especially in tissue culture, or by filling "niches" in demand that the MAF does not fill. The fact that none have come forward suggests that something more than the tree subsidy policy is holding potential investors back. Most likely, the absence of a favorable policy climate or, indeed, any signal that private investors are wanted in this area.

On their part, MAF officials state (depending on whom you talk to) either (or both) that the private sector is welcome--the tree subsidy policy is purely to make sure the small farmers can afford trees--or that the present policy of discouraging private sector entry is only temporary. We have concluded that there is no chance the MAF could be pursuaded to transfer existing MAF nurseries to private ownership, but that eventual private-sector participation is a possibility.

IV. ECONOMIC IMPACT OF THE HITS PROJECT

A. Methodology

The methodology adopted for measurements of benefits accrued to date (FY 1983-86 and projected for FY 1987) is essentially that of the Project Paper, that is, an estimate of increases in yields per hectare arising from extension services including the transmission of information to farmers through the media (TV and printed materials). The PP estimated that the HITS would result in production increases 25 percent greater for grapes and 65 percent greater for other fruits than would have occurred in the absence of the Project. The implied increase for all fruits combined came to 42.6 percent, or 4.5 percent p.a. For the first five years of the project, corresponding to the actual project years 1983-87, grape yields were to increase 25.4 percent (4.6 percent p.a.) and yields of other fruits 23.6 percent (4.3 percent p.a.), more rapidly than under the "Without HITS" scenario

At this point, the PP analysis went completely haywire. In an effort to translate Project results into dollar terms, the author first calculated the implied increases in production, in terms of tons; then attempted to derive per ton retail values for grapes and fruits, respectively. Retail prices per kilo, in 1981, were converted into per ton terms, and divided by the then exchange rate of YR4.55: $US 1.00. Somewhere along the line a decimal point was skipped; grape prices came out as $396.60 per ton and other fruit prices as $241.75 per ton, when they should have come out as $3,956 per ton

and $2,417.50 per ton, respectively. The erroneous per ton figures, when applied to the tonnage increases to be effected by the Project, led to a finding that Project benefits would total $48 million. Other things being equal (which they were not; see Section B below), Project benefits should have been projected at $480 million, and the Project IRR, calculated as a modest 11.9 percent, should have been shown as 119 percent. In other words, though no one recognized the point at the time, AID was proposing one of the most profitable projects of all time.

In calculating benefits derived from the Project to date, we have followed the basic methodology of the PP up to the point of measuring yield increases. Tentative estimates of dollar impact are included, but are not to be taken too seriously, not only because of the PP fiasco discussed above, but because with both fruit prices and the YR:dollar exchange rate moving widely during the period under review, any measurement based on a per ton estimate has to be essentially arbitrary.

In addition to the basic methodology as followed by the PP, account has been taken of the basic redirection of the Project towards tree production; a tentative measurement has been made of the eventual benefits to be derived from tree sales to date. Included in this category are sales of budwood to MAF nurseries (which were contemplated in the PP).

B. Benefits to date

HITS has provided training to some 350 MAF personnel, many of them extension agents. However, considering the ineffectiveness of the Extension Service itself (see Section 6--Extension--of the main report), the HITS effort in this regard cannot logically be credited with any impact in terms of increased fruit yields. All of the HITS impact appears to have derived from the direct efforts of the HITS Extension Specialist in his production and display of TV tapes; his demonstration plots and model farmer programs; his direct work with citrus farmers in Marib; and his visits to some 200 farmers outside of the demonstration areas each year. The TV effort, which has resulted in four tapes displayed regularly since 1984, has been less effective than it might have been, since it has not been supported by a build up in MAF's own capability in this area, as assumed in the PP. In all areas, the Extension Specialist's efforts have been directed at growers of deciduous fruits and tropical fruits excluding bananas; that is, all fruits excluding grapes and bananas. Further, given the long gestation period of most fruits, his efforts are assumed to have impacted only on the 15,100 hectares of mature other-than-grape-and-banana trees estimated for 1982.

Assumptions:

(1) TV tapes: As with the rest of the rural population, 80 percent of fruit growers are assumed to have TV sets. The percentage of those watching the instructional tapes and following the instructions is assumed to have increased in a 5-10-15-20 progression, so that by 1987, 50 percent of all those with sets are assumed to have benefited positively from the tapes. Finally, it is assumed that the farmers benefiting have been able to increase their fruit yields by one-third (the yield increases could be greater were it not for the extreme shortage of agricultural inputs). The calculation of increase in yield on "other fruits" (that is, excluding grapes and bananas) from the TV effect is, therefore, as follows:
.8 x .55 x 1/3 = .133.

(2) Demonstration plots and model farmers: The HITS Extension Specialist has established 10 demonstration plots, each managed by a model farmer, to which neighboring farmers may come for informal instruction. Each plot and model farmer are estimated to influence about 25 hectares of fruit growing land. Because of the direct nature of the contact, the influence on yield is believed to be greater than that of TV, but owing to the shortage of ag inputs, less than the 65 percent contemplated in the PP. For these purposes, a 50 percent yield increase for affected formers is assumed. The calculation of yield increase from this effect is 0.8 percent, as follows: 10 x 25/15,100 x .5 = .008.

(3) Marib citrus growers: In December-January 1986-87, the Extension Specialist conducted instruction sessions for 318 citrus farmers in the Marib area. Assuming the farmers had an average one hectare of mature citrus trees, that half of them followed instructions, and that each farmer could thereby increase his yield by one-third, the impact on all other-than-grape-and-banana area would be 0.4 percent, as follows: 318/15,100 x 1/3 x .5 = .004.

(4) Additional farm visits: As with the citrus farmers, it is assumed that the farmers have on an average one hectare of land, and that the visits result in yield improvements of one-third. Assuming 500 visits from mid-1984 to mid-1987, the calculated improvements in "other" yield is 1.1 percent: 500/15,00 x 1/3 = .011.

(5) Summary of impact on yield: Summarizing to this point, the Extension Specialist's work is estimated to have resulted in a 15 percent increase in other-than-grape-and-banana yelds, as follows:

TV tapes	13.3%
Demonstration plots and model farmers	0.8%
Instruction to Marib citrus growers	0.4%
Farm Visits	1.1%
Subtotal	15.6%
Less allowance for duplication between TV and other effects	- 0.6%
Net Impact	15.0%

Production of all mature fruit trees other than grapes and bananas in 1982 is estimated at 83,654 tons. Other things remaining equal (which they weren't) production from HITS efforts would have increased 15 percent to 96,202 tons in 1987; and assuming no effect on grapes and bananas from HITS efforts, production of all fruits would have risen from 213,558 tons in 1982 to 226,106 tons in 1987, an increase of 5.9 percent, or 1.15 percent p.a. The PP had called for an increase from HITS efforts of 24.4 percent, or 4.5 percent p.a., during this period.

(6) Dollar value of yield increases

a. Project Paper revisited

As noted, the PP projected dollar benefits totaling $48 million in (1981 prices at the 1981 exchange rate) for the full seven-year Project period, but in the process miscalculated by a factor of ten. Other things being equal, the calculated benefits should have been shown as $480 million.

Apart from the miscalcultation, the PP based its calculations on a 1981 production base that seems to have been off the mark in terms of total area and the division of area between grapes and other crops; and used inaccurate fruit prices (since the PP used an arithmetic average of only a few fruits, not including some of the more important ones such as dates, papaya and mango). Based on our estimate of production in 1982, a weighted average of fruit prices for 1983 (the first full year of Project operation), and the average YR:dollar rate for that year (4.60), the amended PP projection of benefits would be $278 million for the full project period; $118 million for the 1983-87 portion (first five of the scheduled seven years).

If 1985 prices and the average 1985 exchange rate (7.11) are used, the revised PP projections are: $234 million for the full Project period; $93 million for 1983-87. The lower estimate based on 1985 prices reflects the fact that devaluation of the Rial has been more rapid than the increases in fruit prices. Table 6 provides a summary of the projected benefits, based on PP assumptions with respect to production increases, and revised to reflect 1985 prices and exchange rate.

b. Estimate of Project Benefits

The estimate of actual Project benefits to date, based on 1985 prices and exchange rate, and the estimated increase in yields effected by HITS, is $21.5 million, which compares with the amended PP estimate of $93 million. Annex Table 7 summarizes the finding.

C. Future Benefits from Tree and Budwood Sales

An estimated 50,100 trees will have been turned over to the MAF for distribution from Al Irra and Jarouba stations by the end of FY87, comprising varying quantities of mango, guava, papaya, sugar apple and citrus.[4] If the MAF follows its usual tendencies, only 60 percent of these trees will actually be sold to growers. Most of the budwood grown at Al Irra has been used to bud seedlings grown at the Station. Five thousand apple cuttings were released to the Dhamar MAF nursery in FY86 and another 30,000 are expected to be released to MAF nurseries in FY87. Assuming an average per tree yield of 14 kilos of fruit, an average price of $1.72 per kilo (1985 prices and exchange rate), an average producing life of ten years, and finally, that the effect of a budwood sale is to improve the eventual yield of a seedling by 80 percent, HITS sales of trees and budwood through FY87 will eventually--beginning in 1989--produce fruit with a retail value of $11.2 million.

Trees:	50,100 x .6 x 14 x 1.72 x 10 =	$ 7.2 million
Budwood:	35,000 x .6 x .8 x 14 x 1.72 =	4.0 million
TOTAL		$11.2 million

[4]HITS personnel have been able to provide only rounded estimates of past, let alone future, tree distribution. The 1987 estimate (13,000 trees) is complicated by the presence of diseases of varying severity in a portion of the present tree stock.

D. Other Factors

Other HITS activities that have had, or will have, an economic impact are varietal testing and the technical assistance provided large farmers by the Extension Specialist/Citrus. The former is said to have resulted specifically in the importation of 50,000-100,000 high-quality orange trees (presumably, of a higher quality than would otherwise have been imported). Doubtless there was a favorable impact here, but it cannot have been very significant, and available data do not permit a benefit: cost analysis.

Except for bananas, with a gestation period of only a year, the technical assistance to large farmers has not yet resulted in any payoff. In a sense, considering that the growers in question could, and undoubtedly would, have paid for this assistance if HITS were not supplying it gratis, there will be no net economic benefit. The only benefit will be to the large growers themselves. The Evaluation Team has recommended the termination of this activity.

TABLE 1

TRENDS IN YIELD PER HECTARE OF MATURE FRUIT CROPS, 1982-86
(Percent changes in yield per hectare)

	1983	1984-85 (per annum)	1986
A. Bananas:			
1. Lack of inputs	-1.0	-1.0	-1.0
2. Extension[1]	1.0	1.0	1.0
3. Net change p.a.	0	0	0
B. Grapes:			
1. Lack of inputs	-1.0	-1.0	-1.0
2. Extension[2]	0.5	0.5	0.5
3. Net Change p.a.	-0.5	-0.5	-0.5
C. Other Fruits:			
1. Lack of inputs	-1.0	-1.0	-1.0
2. Extension:			
a. HITS	0	2.2	3.2
b. Other	0.5	0.5	0.5
3. Net change p.a.	-0.5	1.7	2.7

[1]Primarily Tihama Development Authority

[2]Various local development authorities

TABLE 3

TREE PRODUCTION AND IMPORTS, 1982-87

	MAF Nursery Production	Imports		
		MAF	Private Sector	Total
1981-82	175,154	17,000		192,154
1982-83	452,189	10,100		402,289
1983-84	550,197	64,863	133,000	748,060
1984-85	1,419,396	190,000	20,500	1,629,896
1985-86	918,565	83,000	96,000	1,097,565
1986-87	1,342,000[1]	154,000[1]	100,000[2]	1,598,000

[1]MAF estimates

[2]Estimate made for the purpose of area projection, Table 4.

Sources: Enger, Fruit Horticulture Subsector Assessment
MAF

TABLE 4

TREE DISTRIBUTION AND PLANTED AREA, 1982-86

	Trees Available For Distribution (Table 3)	Trees Distributed[1]	Hectares Planted to Fruit[2]
1982	192,154	38,431	26,000
1983	462,289	184,915	26,500
1984	748,060	352,424	27,300
1985	1,629,896	982,038	29,800
1986	1,097,565	677,739	31,500
1987	1,598,000	978,800	32,200

[1]Based on Table 3 and assuming following percentages of available trees actually distributed:

	MAF	Private Sector
1982	20%	---
1983	40%	---
1984	40%	80%
1985	60%	80%
1986	60%	80%
1987	60%	80%

[2]Assumes an average of 400 trees per hectare. Findings from the Fruit Growers' Survey suggest the actual number of trees per hectare may be closer to 300. On the other hand, these projections do not take account of a tree mortality rate of around 25%. The two factors are assumed to be roughly offsetting.

Sources: Table 3 and Enger.

TABLE 5

FRUIT PRICES, 1983-86[1]

(RIALS PER KILO)

	Quantity Marketed in 1986 (000 tons)[2]	1983	1984	1985	1986 [3]
Grapes	(68.4)	24	21	23	15.15
Bananas	(54.1)	9	14	17	10.00
Papayas	(39.2)	7	12	8	17.30
Oranges	(12.5)	9	14	19	15.00
Dates	(10.8)	10	10	9	9.70
Apricots	(6.0)	18	21	24	21.85
Mangoes	(2.7)	19	23	23	27.41
Peaches	(.5)	14	14	20	20.24
Lemons	(.3)	17	19	28	8.42
Pomegranetes	(.1)	21	22	28	15.76
Figs	(.1)	--	19	24	19.22
Pears	(.1)	20	27	26	24.50
Weighted averages:					
All Fruits		14.38	16.20	17.32	14.23
All except grapes		9.16	13.59	14.24	13.73
All except grapes & bananas		9.29	13.29	12.18	16.52

Percent Increases:	1983-85	1985-86	1983-86
All fruits	20.4	-17.8	- 1.0
Grapes	- 4.2	-34.1	-20.9
Bananas	88.9	-41.2	11.1
All except grapes	55.5	- 3.6	49.9
All except grapes & bananas	31.1	35.6	77.8
Sana'a retail price index	43.4	37.0	96.5

[1]Averages of prices for 5 cities

[2]As estimated by Warren Enger, Fruit Horticulture Subsector Assessment--Yemen Arab Republic, August 1986, p. 148

[3]Prices are for first half of 1986, so are not strictly comparable with those for previous years.

Sources: Enger
MAF

TABLE 6

PROJECT PAPER PROJECTION OF BENEFITS, AS AMENDED[1]

A. Production (000 tons)

1. Without HITS

	Grapes	Other Fruit	Total
1982	77.4	136.2	213.6
1987	105.5	154.8	260.3
1989	119.5	163.0	282.5

2. With HITS

1982	77.4	136.2	213.6
1987	118.0	181.2	299.2
1989	141.2	241.0	382.2

B. Calculation of Benefits

	(1) Inc. in Prod. as Result of HITS		(2) Ave. Prices Per Ton, 1985 ($)		(3) Projected Benefit ($ Millions)		
	Grapes	Other	Grapes	Other[2]	Grapes	Other	Total
1982-87	12.5	26.4	3,235	2,004	40.4	52.9	93.3
1982-89	21.7	78.0	3,235	2,004	70.2	156.3	234.3

[1]Based on the production increases implied in Annex Table 24 of the PP, applied to revised estimates of production in 1982.

[2]Average of 11 fruits weighted by Rial values of fruit marketed in 1986 (as estimated by Warren Enger), converted to dollars at YR 7.11 = US 1.00).

Sources: MAF
Warren Enger, Fruit Horticulture Sub-Sector Assessment--Yemen Arab Republic, Aug, 1986

TABLE 7

ESTIMATED ACTUAL PROJECT BENFITS TO DATE

A. Production (Tons)

	1982[1]	% Inc. as Result of HITS, 1982-87	1987[2]
Grapes	77,404	-0-	77,404
Bananas	52,500	Negligible	52,500
Other Fruit	83,654	15.0	96,202
Total	213,558	5.9	226,106

B. Calculation of Benefit

	Inc. in tons Produced as a Result of HITS	Retail Value Per Ton ($ 1985)	Est. Benefit ($ Millions)
Grapes	-0-	--	-0-
Banana	-0-	--	-0-
Other Fruit	12,548	1,713 [3]	21.5
Total	12,548		21.5

[1]See Annex Table 2

[2]Assumes only increases in production effected by HITS

[3]12,180 Rials per ton (Table 5) converted at YR 7.11 = $US 1.00.

TABLE 2

FRUIT-GROWING AREA, YIELD, AND PRODUCTION, 1982-86

	HECTARES (000)				YIELD PER HECTARE (TONS)				PRODUCTION (000 TONS)			
	Grapes	Bananas	Other	Total	Grapes	Bananas	Other	Total	Grapes	Bananas	Other	Total
A. On Area in Production in 1982												
1982	7.4	3.5	15.1	26.0	10.46	15.0	5.54	8.21	77.4	52.5	83.7	213.6
1983	7.4	3.5	15.1	26.0	10.40	15.0	5.51	8.16	77.0	52.5	83.2	212.7
1984	7.4	3.5	15.1	26.0	10.35	15.0	5.60	8.22	76.6	52.5	84.6	213.7
1985	7.4	3.5	15.1	26.0	10.30	15.0	5.70	8.26	76.2	52.5	86.1	214.8
1986	7.4	3.5	15.1	26.0	10.25	15.0	5.85	8.33	75.9	52.5	88.3	216.7
B. On Area Planted, 1983-86												
1983-86	2.6	0.5	2.4	5.5	2.40	9.0	--	1.94	6.2	4.5	-0-	10.7
(Proportion bearing fruit in 1986)	(0.6)	(0.3)	(-0-)	(0.9)	(10.30)	(15.0)	(--)	(11.87)	(6.2)	(4.5)	(-0-)	(10.7)
C. Summary 1986	10.0	4.0	17.5	31.5	9.20	14.25	5.11	7.22	82.0	57.0	88.3	227.3
D. Percent Inc. p.a., 1982-86												
a. on old area	--	--	--	--	(0.5)	(-0-)	1.4	(0.5)	(0.5)	(-0-)	1.4	0.4
b. on total area	7.8	3.4	3.8	4.9	(5.9)	(1.3)	(2.0)	(3.2)	1.5	2.1	1.4	1.6

ANNEX C
HORTICULTURE

FRUIT VARIETIES FOR TRIAL AL JAROUBA

Fruit Trees Growing at Al Jarouba When Project Transferred to HITS in September 1981

Four hundred mother trees of different varieties of citrus (sweet orange, mandarin orange, grapefruit, lemon, lime and pummolo) budded on sour orange, rough lemon, Volkamariana, Carrizo citrange, Troyer citrange and Cleopatra mandarin rootstocks; approximately 30,000 citrus seedlings of different varieties at different stages of growth; 112 banana plants (dwarf Cavendish, Williams, Orinoco, rhino horn, and apple); 30 mango trees (Tommy Atkins, Tymore, Zibda, and Hindi), and an unknown number of papaya and soursop trees.

Fruit Varieties Planted in 1986 at Al Jarouba

Mango		**Sapote**	
Varieties	15	Varieties	2
Total Trees	118	Total Trees	20
Guava		**Tamarind**	
Varieties	5	Varieties	1
Total Trees	39	Total Trees	6
Avocado		**Bananas**	
Varieties	7	Variety Known	1
Total Trees	54	Variety Mixed	3
Subtotal	238	Subtotal	33
TOTAL TREES	271		

Trees to Be Planted at Al Jarouba Early 1987

Ananas comosus (pineapple)	5
4 Dole, 5 white sugarloaf,	4
5 Grandul	5
Annona muricata (soursop)	10
Annona reticulata (custard apple)	10
Arbutus unedo "Elfin King"	10
Asimina triloba	2
Averrhoa carambola	2
Euphoria longan "Kohala"	5
Subtotal	53

Litchi Chinensis

Sweet Cliff	5
Kwai Mi	5
Malpighia Glabra "Mancoa Sweet"	10
Brewster	10
Subtotal	30

Manilkara Zapota (sapota)

Chico sapote	10
Subtotal	10

Musa Sp. (banana)

Dwarf Cavendish	5
Enano Gigante	5
Ice Cream	5
Dwarf Jamaican Red	5
Lady Finger	5
Cuban Red	2
Grand Nain	5
Del Monte	3
Theobroma Cacao	3
Subtotal	38

Guava

Strawberry	25
Red seedling	25
Yellow seedling	25
Ice Cream bean seedling	25
Subtotal	100

Loquat

Advance	5
Big Jim	5
Benlehr	5
Golden Nugget	5
Champagne	5
Subtotal	25

Macadamia		
Beaumont		5
Cate		5
	Subtotal	10
Passion fruit		
Purple		10
Yellow		10
	Subtotal	20
Pitanga cherry		
Westree		5
Lolita		5
Vermillion		5
Lorver		5
	Subtotal	20
Tree tomato seedlings		10
	Subtotal	10
White sapote		
Suebelle		10
Sunrise		10
Vernon		10
Chestnut		10
Ortega		10
Gwin		10
Pike		10
Rainbow		10
McDill		10
Fisch		10
Reinecke		10
Commercial		10
Molibu		10
Vista		10
	Subtotal	140

Avocado		
Hass		5
Pinkerton		5
Gewenn		5
Whitsell		5
Bacon		5
Zutano		5
Reed		5
Fuerte		5
Susan		5
	Subtotal	45
Black sapote		
Seedlings		20
	Subtotal	20
Capulin cherry		
Huachi Grande		5
Werner		5
Harriet		5
Lomeli		5
	Subtotal	20
Carob		
Sante Fe		10
	Subtotal	10
Cherimoya		
White		5
Bays		5
Spain		5
Booth		5
Pierce		5
Chaffey		5
Thompson		5
Fino de Jete		5
Sabor		5
	Subtotal	45

Atemoya

African Pride	10
Gefner	10
Subtotal	20

Ferjoa (pineapple guava)

Edenvale Supreme	5
Edenvale Late	5
Edenvale Improved Coolidge	5
Nazemetz	5
Trask	5
Triumph	5
Mammoth	5
Pineapple Gem	5
Superba	5
Coolidge	5
Subtotal	50
TOTAL	666

TREES NOW PLANTED AT AL IRRA

There are a total of 1,508 trees at Al Irra. This includes all the bearing and nonbearing trees but does not include a few trees at the far end of the budwood block. In most cases there are only 3 or 4 trees in a row and no records are being kept on these trees at present.

These include:

Cherry
Pomegranate
Fig
Persimmon
Mulberry

The following list does not include rootstocks or nursery trees.

Apples

Dorsett Golden	95
Anna	211
Ein Shemer	16
Winter Banana	99
Rome	30
Golden Delicious	64
Granny Smith	31
Red Delicious	22
Spur Red Delicious	20
Idared	70
Jonathan	26
Gala	20
Tropical Beauty	9
Spartan	20
British Varieties	9
TOTAL	742

Pears

Florida Home	10
Hood	5
Le Conte	30
Orient Pear	15
20th Century	10
Fanstil	10
Keiffer	10
TOTAL	90

Peaches

Florida Red	32
Florida Beauty	56
Florida Prince	58
Florida Sun	40
Florida Gold	43
Florida King	43
Early Elberta	5
Red Wing	5
Autumn Gold	3
Desert Gold	17
Early Grand	10
Four Star Daily News	18
Florida Belle	16
TOTAL	346

Apricots

Maycot	32
Gold Kist	10
Nugget	4
Royal Rosa	3
Castle Brite	18
Kathy	10
Mesa #2	10
TOTAL	87

Nectarines

Sunred	38
Sunripe	10
TOTAL	48

Plums

Santa Rosa	73
Yellow Plus 3-4	27
Red Plum 8-1	47
British Varieties	3
TOTAL	150

Cherry		
Stella		7
Bing		4
	TOTAL	11
Prune		
Sugar Prune		7
TOTAL		7
Almond		
Price		6
Non Pareil		11
Karmel		10
	TOTAL	27
	GRAND TOTAL	1,556

MAF PLANNED TREE DISTRIBUTION IN 1987

Estimated Tree Requirements for Third Five-Year Plan

Tropical and Subtropical Trees

VARIETY	1987	1991
Citrus	85,000	220,000
Mango	50,000	120,000
Guava	75,000	120,000
Banana	40,000	60,000
Papaya	50,000	110,000
Anona	35,000	110,000
Dates	15,000	110,000
Olives	1,000	10,000
Pineapple	2,000	10,000
Tamarind	?	10,000
	5,000	25,000
TOTAL	358,000	905,000

Deciduous Trees

VARIETY	1987	1991
Kakiri	A Few	
Grapes	80,000	120,000
Peach	90,000	155,000
Apricot	55,000	55,000
Walnut	20,000	20,000
Almonds	30,000	65,000
Plums	30,000	50,000
Apples	50,000	60,000
Pears	20,000	25,000
Pistachio	10,000	25,000
Mulberry	10,000	10,000
Quince	25,000	30,000
Pomegranate	100,000	125,000
Figs	50,000	60,000
TOTAL	570,000	800,000
YEAR TOTAL	928,000	1,705,000

Total for all varieties for the 5-year period is 7,029,000.

Total estimated for next 5-year period is 7,029,000.

ANNEX D
EXTENSION

HITS TRAINING SCHEDULE

LOCATION	DATES	NUMBER OF OF STUDENTS	MAN-DAYS	TOPIC
Al Jarouba	11/5-11/21 '83	37	629	Tropical/Sub-Fruits
Al Irra	12/10-12/14 '83	20	100	Tree Distribution
Al Jarouba	7/24-7/25 '84	25	50	Nursery Management
Al Irra	7(month) '84	4	840	Internship
Al Irra	11/24-12/4 '84	17	204	Cultural Practices
Al Jarouba	12/8-12/24 '84	25	400	Cultural Practices
Al Irra	4/6-4/18 '85	16	192	Cultural Practices
Al Jarouba	4/27-5/9 '85	17	204	Cultural Practices
Al Irra	5/18-7/12 '85	12	552	Propagation
Al Irra	6/29-7/29 '85	29	696	Nursery Management
Al Jarouba	10/5-10/24 '85	22	396	Cultural Practices
Al Irra	11/16-12/5 '85	24	432	Cultural Practices
Al Jarouba(PP)	1/8/86 '86	28	28	Canker Eradication
Al Irra	3/22-4/3 '86	14	168	Nursery Management
Al Jarouba	4/19-5/1 '86	18	216	Orchard Planning
Al Irra	5/31-6/3 '86	9	36	Pistachio Budding
Al Irra(PP)	9/11 '86	22	22	Crown Gall
Al Jarouba	10/25-10/29 '86	11	55	Mango Grafting
Al Irra	Subtotal	167	2,242	
Al Jarouba	Subtotal	183	1,978	
Marib	Subtotal		318	
	TOTAL	669	4,618	

NUMBER OF GRADUATES FROM MAF/NES SCHOOL, SANA'A

	1974	14
	1975	47
	1976	64
	1977	51
	1978	47
	1979	46
	1980	24
	1981	48
	1982	50
	1983	49
	1984	37
	1985	40
	1986	40
TOTAL	537[1]	

The curriculum is comprehensive and is completely detailed in the report by Thomas B. Stevenson, Agricultural Extension Services in Yemen, 1982. The training is to prepare village and province extension agents.

[1] 253 remain in NES

ANNEX E
TRAINING

TRAINING IN YEMEN

COURSE DESCRIPTION	TOTAL EXPECTED TO BE TRAINED PER PROJECT PAPER	TOTAL TRAINED TO DATE
1-2 week course in basics of fruit production and plant protection.	200-250 extension agents.	139
Practical horticulture skills.	200 agr-technicians. 20-25 graduates of Ibb and Surdud.	207 31 from Ibb school.
Basic skills for effective nursery production and management.	10 nurserymen of government nurseries.	14
Demonstration/training classes in propagation, and pest identification and control at existing nurseries by trained extension agents.	Not stated.	3 training courses and farmers' meetings.
Farmers trained by trained extension agents, agricultural technicians and nurserymen and media.	Not stated.	About 500 farmers.
6-9 month internship at either of the improvement and training stations in fruit production, nursery management, and plant protection.	20 horticultural specialists (5 per year).	4

TRAINING OUTSIDE OF YEMEN

The project paper has stated the following people will be trained for HITS:

Degrees

Horticulture	5 B.S.; 1 M.S.; 1 Ph.D.
Plant Protection	3 B.S.; 1 M.S.; 1 Ph.D.

Short Courses

Horticulture	3 per 6 months each
Plant Protection	5 per 6 months each

The following training has been finished:

Those outside Yemen under university training:

Horticulture	1 Ph.D. OSU
Plant Protection	1 M.S. Cairo

Short Courses

Horticulture	1
Plant Protection	2

Those in YALI learning English for HITS

Horticulture	2 M.S.--ready to go (500 TOEFL)
Horticulture	4 B.S.--one 471 TOEFL at YALI, 2 years; one 463 TOEFL at YALI, 2 years; two just starting.

HITS LOGFRAME

AGRICULTURAL DEVELOPMENT SUPPORT PROGRAM (279-0052)
Horticulture Improvement and Training Subproject (HITS)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE 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 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 of extension agents. (5) Evaluation of extension information produced; review of records regarding 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.

HITS LOGFRAME
(Continued)

NARRATIVE SUMMARY	OBJECTIVELY VERIFICABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
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, and 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 a timely manner. (2) Improved varieties can be adoptable in the YAR. (3) Timely provision of construction/engineering services.
Inputs: USAID (1) Technical assistance (2) Participant training (3) Commodities (4) Construction building (5) Other costs	Level of Inputs: USAID $14 Million	Inputs: (1) USAID/YARG records (2) Drawdown on CID work-plan budgets	Inputs: (1) YARG identifies counterparts (2) Timely availability of funds/TDY support
YARG (6) Counterparts (7) Participants (8) Land for project sites (9) Construction (road) (10) Local labor	YARG $4 Million		

AGRICULTURAL DEVELOPMENT SUPPORT PROGRAM (279-0052)
Horticulture Improvement and Training Subproject (HITS)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE 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 exist-growers. (2) Increase in the planting of improved fruit tree varieties and use of improved cultural practices. (3) Increase in the provision and/or importation of suitable varieties of budwood and rootstock to MAF nurseries.	Goal: (1) Survey data from a) farmers participating in HITS training activities and b) farmers living near demonstration fields. (2) Review of MAF nursery records.	(1) YARG maintains appropriate fruit pricing policy. (2) Fruit production remains important economic activity in the YAR. (3) Farmers allocate more land to fruit production and have adequate water supply for new plantings. (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. (2) To strengthen the capacity of the ARA to conduct an applied horticultural research program to generate information on suitable varieties and cultural practices needed by the MAF and the private sector.	Purpose (End of Project Status): (1) Operational horticulture stations providing budwood and rootstock to MAF nurseries and an ongoing program of applied horticultural research conducted by ARA at both stations. (2) Functional MAF plant protection program monitoring importation of trees and MAF nursery production and coordinating with other organizations and projects involved with plant protection. (3) Expanded traditional and mass media horticulture extension activities. (4) Increased sales of nursery stock to farmers.	Purpose: (1) Review records of HITS stations and MAF nurseries, and ARA records of applied research activities. (2) Evaluation of Plant Protection Directorate activities. (3) Survey data from a) farmers participating in HITS training activities and b) farmers living near demonstration fields. (4) Review of extension information produced and disseminated.	Purpose: (1) YARG remains committed to increasing fruit production. (2) MAF and ARA are able to provide qualified staff already trained. (3) YARG develops commitment to enforcing plant protection regulations. (4) Information on suitable improved varieties and cultural practices attuned to the conditions of small and medium farmers becomes available in packages farmers can use and adopt.

RECOMMENDED LOGFRAME
(Continued)

NARRATIVE SUMMARY	OBJECTIVELY VERIFICABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Outputs: (1) Establishment of horticulture training and improvement station. (2) Expanded plant protection department trained in plant protection methods. (3) Training for MAF extension agents, plant protection staff, nurserymen, and farmers in improved horticultural practices. (4) Expanded horticulture information production and distribution program for farmers, nurserymen, and private horticulture input suppliers. (5) Information based on applied horticultural research concerning suitable varieties and improved cultural practices.	Magnitude of Outputs: (1) Two stations (2) One department (3) 350 extension agents 60 nurserymen 30 plant protection staff 1000 farmers (4) A set of 6 videotapes demonstrating proper horticultural practices and shown annually on television at the appropriate time of year. (5) Not limited. (6) Minimum of 25.	Outputs: (1) Station records. (2) Physical inspection. (3) Project records.	Outputs: (1) MAF and ARA staff are made available for training and farmers are interested in attending field days and other training. (2) Improved varieties can be adoptable in the YAR. (3) Timely provision of construction/engineering services.
Inputs: USAID (1) Technical assistance (2) Participant training (3) Commodities (4) Construction building (5) Other costs	Level of Inputs: USAID $14 Million	Inputs: (1) USAID/YARG records (2) Drawdown on CID work-plan budgets	Inputs: (1) YARG identifies counterparts (2) Timely availability of funds/TDY support
YARG (6) Counterparts (7) Participants (8) Land for project sites (9) Construction (road) (10) Local labor	YARG $4 Million		

ANNEX G
INDIVIDUALS INTERVIEWED

MAF

Moqbil Ali Moqbil	Deputy Minister, MAF
Husain Al Wajei	Extension Agent, MAF
Abdullah Ahmed Abdullah	Extension Agent, MAF
Muh'd Al Ala'wa	Counterpart, HITS Extension Specialist
Ahmed Muh'd Kamel	Agriculure Technician Extension
Zaid A Rahman	Head, Pest Management PPD
Abbas A Mugni	Plant Quarantine PPD
Ahmad Hassan	Chemical Supplies (GTZ), MAF
Moh'd Al Irriany	Director, National Extension Service
Jamil Ahmed*	Assistant, Horticulture, AAD, MAF
Moh'd Sharaf Al-Din*	General Co-Manager Title XII Program (ADSP nominee)
Moh'd Al Ghashm*	Director, Plant Protection Directorate, MAF
Ahmed Taleb*	Director, Agricultural Affairs Directorate, MAF
Abdul Hafiz Karhash*	MAF Assistant
Ali Al Ashmori	Deputy Assistant, MAF
Lutf Al Ansi*	Director of Planning and Statistics, MAF
Mohamed Al Haidiri	Department of Planning and Statistics, MAF
Abdul Malek Alhon	Department of Planning and Statistics, MAF
Yahay Shouga*	General Director, Agricultural Office Sana'a, and Head of Tree Distribution Committee
Mohamed Farah	Manager, Ibb Nursery
Mansour El Awdy	Manager, Warazan Nursery
Manafaque Saad	Extension Agent, Marib
A. Lt Sabrah	Economic Counterpart
Al Someiry	Surdud Farm Manager
Tallal Yemeni	General Director, Agricultural Office, Hodeidah
Salah M. Matter	Co-Manager of Al Jarouba farm
Ali Abdulmalik Alaki	General Director, Agricultural Office Dhamar
Salek Hamzah	Sana'a Agricultural Office, Extension
Abdulla Aboull Rahman	Head of Communications, Extension Directorate
Madam Hayad	Head of Training, Extension Directorate
Ali Masoud	German Plant Protection Project

*Interviewed more than one time.

USAID

John Rifenbark*	USAID Project Manager
Keith Morris*	British Fruit R&D Station, Dhamar
Tony Portman*	British Fruit R&D Station, Dhamar
Edward Hirabayashi*	USAID Special Assistant to Director
Michael Lukomski*	Acting Director, USAID
John Swanson*	Agriculture Development Officer, USAID
Ray Renfro	Agriculture Economist, USAID/Yemen
Mark Krasczkiewiaz	Regional Program Economist, USAID/Jordan

HITS

Robert Tullock*	Team Leader, HITS
Mayser Z. Al Abushi*	Extension Specialist, HITS
A.A. Cook*	Plant Pathologist, HITS
Ray Lockard*	Fruit Research, HITS
John Lindeman*	Manager, Al Irra, HITS
Robert Verloop*	Manager, Al Jarouba, HITS
Ahmad Askari*	Entomologist, HITS
Gary Baltzer*	Private Enterprise Specialist, HITS

CID/ADSP/FOA/Ibb

Royal Brooks	CID, Faculty of Agriculture
Darryl Kuhnle*	Information Transfer Specialist, CORE
Carlos Rosencrans	Farm Manager, Ibb/Ibb/CID
Amir Badiei*	Team Leader, CORE
Victor Amman	Agricultural Planning Advisor, ADSP, CORE

MINISTRY OF EDUCATION

Nasser Al Aulagi*	Dean, Faculty of Agriculture
Omar A.G. Ali Arifi	Teacher, Surdud Agricultural Secondary Institute
Moh'd Ismail Jama	Teacher, Surdud Agricultural Secondary Institute
Eng. Omar Abdul Jabar	Head, Surdud Agricultural Secondary Institute
Ali Kassam	Co-Manager, Ibb Agricultural Secondary Institute

*Interviewed more than one time.

LOCAL DEVELOPMENT AUTHORITIES

Abdul M. Al Haseim Kheiri	Director, Agriculture Department, Hodeidah FOA, TDA
Moh'd Chemli	Manager, Extension Training Project, FOA, TDA, Hodeidah
Ghazi N. Mohamed	Project Manager, SURDP, Taiz
Al Hussayneab	Tihama Development Farm
Sulaimen A. Awazi	Head, Livestock Section, TDA
Mohamed al Nuweira	Sana'a Agricultural Directorate, Statistical Chief CHRDP
Yousef El Mahia	Horticulturist, SURDP
Ahmed Mansour	Assistant Director, SURDP
Dr. Shahata	Plant Protection, TDA
Mr. A. Saif	Plant Protection, CHRDP
M.A. Nagi	Plant Protection, SURDP

AGRICULTURAL RESEARCH AUTHORITY

Abdul N. Ahmed	Director, ARA/TDA Station, Hodeidah
Abdul R. Sallam	Director General, ARA, Taiz
Abdulla Heioub	Communication Specialist, FOA/ARA, Taiz
Abdulrahman M. Bamatiaf	Research Specialist, Soils and Irrigation, ARA, Tihama
Abdul Elalin Sayed	ARA FAO Specialist
Ahmed Zubaidi	Plant Protection, ARA
Dr. Ismail Maharrem	Entomology, ARA
Mr. Abdullah Munslied	Pesticides, ARA
Dr. Ahmad Awad	Plant Pathology, ARA
Algheri A. Abdulhaq	ARA Farm, Surdud

YARG

Anwar Al Harazi	CPO Director General of Projects & Loans
Anam Ghaleb	Director General, NIPA
Mahmoud Shafei	Advisor to the CPO

*Interviewed more than one time.

OTHERS

Mike Allen	Transcentury, Sana'a
Karl Drobnic	Head, YALI English Training
Mark Liberman	Transcentury, Hodeidah
Saif Abdul	Mango Farmer outside of Taiz
No Name	Mixed Fruit Farm outside of Taiz
Faysal Sharif	Private Consultant
Eckardt Poellehn	Pesticide Expert, German Plant Protection Project
Muh'd Hamed Al Hamdani	Farmer near Sana'a
Abdullah Muh'd Al Yazidi	Farmer near Sana'a
Sadek Ahmed Wahlias	Farmer in Artel
Amin Kassem Sultan	Fruit Grower (also Advisor to the Central Bank)
Ali Hassan Saad	Farmer, Sana'a area
Dr. Hassan Abu Zaed	Team Leader, World Bank
Dr. Link	General Director of German Project
Ahmed Al Bushary	Farmer
Dr. George Stino	Head, Department of Horticulture, Cairo University, Cairo, Egypt
Moh. Desouki	Head, Egyptian International Centre for Agriculture, Dhoki, Egypt
Adly Akman Halim	Program Director, Egyptian International Centre for Agriculture, Dhoki, Egypt

*Interviewed more than one time.

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