

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



# END OF TOUR REPORT

PART II

## ACHIEVEMENTS AND FIELD MANAGEMENT

OF

### HORTICULTURE IMPROVEMENT AND TRAINING

### SUBPROJECT (HITS)

DURING MAY 1987-JULY 1989

BY

DR. AHMAD ASKARI, HITS TEAM LEADER

SANA'A  
YEMEN ARAB REPUBLIC

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**AGRICULTURAL DEVELOPMENT SUPPORT PROGRAM (ADSP)**

**CONSORTIUM FOR INTERNATIONAL DEVELOPMENT (CID)  
CONTRACT NO. AID-NE-C-1698**

**CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA**

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**NOTE :** This is the second part of my End of Tour Report, which emphasizes the Field Management and Coordination (Team Leader) of the Horticulture Improvement and Training Subproject (HITS) in the Yemen Arab Republic from May 1987 to July 1989. The first part, which was prepared and submitted to the involved institutions in December 1989, concentrated only on my entomological activities with the HITS project from October 1984 to July 1989.

## HITS TECHNICAL STAFF DURING THE WORKPLAN OF 1988 AND 1989

In addition to my overall field management responsibilities to implement HITS programs, I also provided direction and guidance to my technical staff weekly, monthly and sometimes daily. However, since all three staff members had their scope of work which, I had to revise entirely, they knew exactly what their duties were. Together with the counterparts we reviewed the weekly activities in our weekly staff meetings. Overall, I received the maximum cooperation from my technical staff and counterparts. I monitored personally the activities at Al Irra and Al Jarouba stations by frequently visiting Al Irra and occasionally visiting Al Jarouba (because Al Jarouba was located in Tihama near the Red Sea about 400 kilometers from Sana'a).

Staffing during HITS activities in 1988 and 1989 is as follow:

1. **Mohammed Sharaf Al Din**, was involved as Co. Manager of Agricultural Development support program (ADSP) from 1981-1983. Mohammed was also part of HITS Design Team representing MAF as a Yemeni specialist in 1981 and 1982 to design the HITS project. After Mr. Saraf Al Din returned from the U.S. in 1986, he was again appointed Co. Manager of the ADSP. In 1987, Mohammed received MAF and USAID approval to join the HITS project as an extension specialist.

I asked Mr. Sharaf Al Din to assume responsibilities for HITS technical and material support to some of the selected and enthusiastic private sector individuals for fruit and fruit tree production. Because of his fine personality and compatibility with Yemeni farmers and investors in horticulture, Mohammed was able to establish an excellent communication with the private sector individuals, who were receiving HITS support. Mr. Sharaf Al Din supervised planting of hundreds of thousands of apple rootstocks and was assisting in establishing the private sector nurseries in different locations in Yemen. I also asked Mohammed to supervise two of HITS horticulture stations, which I believe he managed professionally. Mr. Sharaf Al Din remained with the HITS project to continue his activities. Mohammed was always a pleasant person to work with.

2. **Mayser Zuhdi Al Abushi**, was involved with the HITS projects from 1983. He planted the first deciduous mother trees at Al Irra Station in 1983 and 1984. Mayser was assigned to HITS as an extension specialist through Cal Poly Pomona as TCN in 1985. I asked Mr. Zuhdi to continue and concentrate his activity in extension and in-country training programs. Mayser was involved to establish demonstration plots in different parts of Yemen and arranging numerous farmers meetings and field days at the demonstration plots.

I asked Mayser to supervise HITS stations before Mohammed Sharaf Al Din was appointed to this position. He was hard working individual and

accepted field work even on the weekends or some holidays. Mr. Zuhdi established several mother blocks in different parts of Yemen. He was able to assist some of the farmers in expanding their orchards professionally. Mayser's employment contract with HITS was terminated in September 30, 1989.

- 3. Abdul Hameed Abdul Magid**, was selected after I interviewed several applicants in Sudan and Jordan for the vacant horticulture specialist position in HITS. After I finally received the approval from MAF and USAID for his assignment with HITS, he began to work with us on October 1988. After we released HITS team survey report evaluating and identifying the potential MAF nurseries for tree production, I realized that Abdul Hameed would be the right person to pursue the upgrading of five MAF selected nurseries as a new area in the HITS project. Dr. Magid adapted himself quickly to the nature of his scope of work. I asked him to concentrate on upgrading MAF nurseries and to prepare a comprehensive report. He visited all these five nurseries several times and studied their status very carefully and as a result he submitted a 50-page proposal for the use of PL-480 funds for upgrading five Yemen Government Nurseries.

I found Abdul Hameed knowledgeable in his area of expertise, and I enjoyed his pleasant personality. He continued his assignment with HITS until December 31, 1989.

- 4. Responsible for HITS field management (Team Leader) and Entomologist**, I joined the project on September 29, 1984. I served the project as Entomologist until May 9, 1987, and then I was selected as a Team Leader and Entomologist for HITS until July 1, 1989. After successfully completing a five year assignment, I left Yemen two months earlier than scheduled and returned to Cal Poly to take the position of HITS Project Director at Cal Poly University until December 31, 1989.

During the early part of my assignment as HITS Chief of Party the two following technical staff members were still associated with the HITS project::

- 1. Raymond G. Lockard**, HITS Horticulturist, joined the project in February 1986. With his counterparts, Dr. Lockard initiated, conducted, and supervised several research projects such as variety testing on deciduous fruit trees at Al Irra Station. Cooperating with a British project he was the chief editor of the first Horticulture Handbook of Yemen, to which all HITS technical staff contributed. Ray was medically evacuated permanently to the U.S. in March of 1988.

2. **Gary Baltzer**, joined the project as Horticulture specialist in February of 1986. Mr. Baltzer prepared several feasibility studies for HITS private sector activities. He was assigned as manager to Al Irra Station for a short period of time and he assisted in the completion of the History of Al Irra Station. His contract was terminated in December 1987. I enjoyed Gary's pleasant personality.

# **HORTICULTURE IMPROVEMENT AND TRAINING SUBPROJECT (HITS)**

## **INTRODUCTION**

The Horticulture Improvement and Training Subproject (HITS) was a seven-year, \$14.385 million activity which functioned as one of the subprojects of the Agricultural Development Support Program (USAID Project 279-0052), a Title XII Collaborative Assistance program in the Yemen Arab Republic. HITS was implemented by California State Polytechnic University, Pomona under a contract between the United States Agency for International Development and the Consortium for International Development (Contract # AID/NE-C-1698). Pre-implementation activities commenced in 1981 and the project agreement was signed in February, 1983. HITS was approved through December 31, 1989.

The goal of the Agricultural Development Support Project (ADSP) and all its component subprojects was to increase income and improve the quality of life for rural inhabitants in the context of broad-based and equitable social and economic development.

The goal of the Horticulture Improvement and Training Subproject (HITS) was to increase rural incomes in the Yemen Arab Republic (YAR) through agricultural development with a subgoal to increase the quantity, quality, and diversity of fruits produced in the YAR.

The purpose of HITS was to institutionalize within the Ministry of Agriculture and Fisheries an expanded and improved capacity to support increased fruit production through extension, plant protection, and delivery of disease-free plant materials for improved fruit varieties to the fruit subsector.

According to the design of the project, the purpose of HITS was to assist the country to become self sufficient in fruit production by focusing on an intensive program of training and extension. This was to be accomplished by separate but interrelated activities, described in the HITS End of Contract Report.

**KEY AREAS OF ACTIVITIES DURING THE COURSE OF  
HITS WORKPLAN FOR 1988 AND 1989:**

- \* HORTICULTURE STATION IMPROVEMENT**
- \* HORTICULTURE PRODUCTION AND IMPORTATION**
- \* HORTICULTURE RESEARCH**
- \* EXTENSION AND TRAINING**
- \* PLANT PROTECTION**
- \* PRIVATE SECTOR DEVELOPMENT INITIATIVES**
- \* UPGRADING OF MAF NURSERIES**
- \* PROJECT FIELD MANAGEMENT AND  
COORDINATION**

**The following were identified as specific outputs of the project were continued during the course of HITS implementation programs in 1988 and 1989):**

1. Improved horticulture training and demonstration field stations (two stations);
2. Expanded plant protection department and trained personnel in plant protection methods ( one department);
3. Training of extension agents, horticulture specialists, horticulture technicians, agriculture inspectors, and nurserymen ( continued);
4. Expanded horticulture information production and distribution program for farmers, nurserymen, and private horticulture input suppliers (three programs);
5. Development of improved fruit varieties in insect/disease-free condition (extensive); and
6. Farmer demonstration program and workshops (minimum of ten ).

The Horticulture Improvement and Training Subproject have been highly successful in achieving the project's purposes. In most cases, the HITS project greatly exceeded the outputs identified in the logical framework as being indications of success.

## **IMPROVEMENT OF TWO HORTICULTURE FIELD STATIONS**

### **1. AL IRRA DECIDUOUS HORTICULTURE FIELD STATION**

#### **Station Objectives:**

Al-Irra Station which is located about 10 kilometer north of Sana'a, was established with the goal of providing a well-planned and organized facility that would serve the Yemen government and the local farmers. Different services that were provided to MAF personnel and the Yemeni private sector individuals have been described in the HITS End of Contract Report. In addition, A History of Al Irra Station, which contains detailed information was published in December 1987, describing the establishment and accomplishments of the station as of that date.

#### **Major Accomplishments during 1987-1989**

1. Recommendation of 4 apple varieties (the fourth suitable apple variety was identified in the fall of 1988, when HITS observed that the winter banana variety was bearing fruit in full capacity at Al Irra Station as well as at one of the demonstration plots in higher elevation near Sana'a), 10 peach varieties, 1 nectarine variety, and 2 plum varieties for distribution throughout the central highlands of Yemen. The Santa Rosa plum variety bore fruit for the first time in 1989, was very well accepted by the Yemeni, and has been identified as the third suitable plum variety in Yemen. Finally, one of the apricot varieties at Al Irra bore fruit in full capacity in 1989 and was recognised as a suitable variety in Yemen.
2. The collection of chill unit measurements for base data in the central highland was continued in 1988-1989.
3. Dormancy intensity testing of apple and peach varieties which was started in the 1986 season continued until 1988.
4. The Al-Irra Station infrastructure was completed. Major repair work of the facilities and buildings at Al Irra was completed during the spring of 1989. This included new roofings, interior and exterior repairs of

the classroom, offices, houses, storage reservoir, and all other facilities. Two existing wells and water pumps were completely repaired after several years of uninterrupted service.

5. The fruit yield and maturity records for apple, peach, nectarine, and plum varieties were continued until 1989.
6. Collection and distribution of more than 100,000 buds per year from the budwood tree block were continued through the 1989 season.
7. More than 107 extension agents, YARG trainees in the 1989 work plan, were trained in the following horticultural activities:
  - a. Pest management
  - b. Weed control
  - c. Pruning
  - d. Orchard lay-out
  - e. Planting
  - f. Budding
  - g. Fertilization
  - h. Soil management
  - i. Fruit thinning.
8. Both modern and old irrigation systems were used and demonstrated at Al Irra Station, and a new Bubbler Irrigation System was installed by station personnel in the Spring of 1989. This irrigation system was designed by Mr. Carpenter, a TDY and irrigation advisor from California, but financed and installed by HITS. The Bubbler Irrigation System was demonstrated to MAF officials and Yemeni trainees and farmers, and it was very well received by all these parties.

### **Al Irra the most successful Demonstration Horticulture Station in YAR**

After intensive implementation programs in research, training, production, and plant protection at Al Irra during the last few years, the station has now become an excellent resource for providing disease-free quality rootstocks and budwood to other MAF and private sector nurseries. It has also become a valuable facility for providing training and demonstration experience of different year-round cultural practices in the highland area of Yemen.

From early 1988 through 1989, HITS project field management, in close coordination with the HITS staff and MAF officials, arranged several field days and visits to Al Irra Station to demonstrate the seasonal practices and the periodical achievements of the station. In the spring of 1988, more than

100 people, including high ranking officials of MAF, USAID officials, ADSP Team Leaders, private sector individuals, and Yemen news media (National Radio and Television and newspaper reporters) attended one of the field days at Al Irra Station.

At the conclusion of these demonstration and field days, the project received many positive comments from the various officials and guests. The field days have had a very positive impact in encouraging the private sector individuals to follow our recently established fruit tree production approach. The HITS field days have served to encourage private sector investment toward the ultimate objective of many Yemen self-sufficient in horticulture production. Interest on the part of MAF and private sector individuals has increased attention to Al Irra Station and HITS project after they observed the quality of fruit production of suitable varieties of apples, peaches, nectarines, plums, and apricots in the fruit seasons of 1988 and 1989. It should be noted that over forty tons of fruit were produced at Al Irra Station in 1988, and almost the same amount was produced in 1989.

## **2. AL JAROUBA TROPICAL-SUBTROPICAL HORTICULTURE FIELD STATION**

The history, objectives and development process of Al Jarouba Station were described in detail in HITS End of Contract Report. In this report a brief description of the development process during HITS work plan of 1988 and 1989 is outlined.

### **Station Objectives:**

Al Jarouba Station, located on the Tihama near Hodeidah Port on the Red Sea and is at the site of a previous USAID project (279-0024). It was established to serve as a horticulture field station for tropical-subtropical fruit trees in Yemen.

After the outbreak of citrus canker in the Tihama citrus growing area including Al Jarouba Station, more than 185,000 citrus budded trees and seedlings were destroyed in 1986. This action was the first major citrus canker eradication process in Yemen and was started at Al Jarouba Station with the idea that the same action could be undertaken in the other infected citrus growing areas.

## **Major Accomplishments During 1988 and 1989**

The production, training, and research objectives of the station were switched from citrus to mangoes, guavas, papayas, sugar apples (Annona), and bananas. ( More information concerning the accomplishments in fruit tree production at Al Jarouba Station during 1988 and 1989 has been provided in page 10 of this report).

1. The transfer of Al Jarouba Horticulture Field Station to Tihama Development Authority (TDA) was one of the objectives in the last two years. In spite of USAID and HITS attempts to transfer the station to TDA ( in terms of operation and operational costs), the station was still administered by HITS project. However, the station was closely monitored and numerous training programs were conducted with the full participation of HITS staff and counterparts during 1988 and 1989.
2. During 1988 and 1989, intensive discussions and negotiations between MAF, USAID, HITS and TDA were held and the work plan and the ground work were done. Al Jarouba Station was turned over to TDA in September of 1989, and TDA assumed the operational responsibility of the station.
3. Al Jarouba's electrical and wiring systems have under gone major repair, after having severe problems. At the same time all existing AC units were completely repaired in 1988. However, because of poor contractor performance, some of the same problems reappeared. Repair of the station's physical infrastructure, engine rooms, houses and irrigation systems was partially completed. The parts for the repair of tractors were ordered and received from the U.S.
4. The nursery activities in two of the shadehouses for the production of thousands of mangoes, papayas, guavas and annonas were in full operation( for more information, see the production section of this report in page 10).
5. The sprinkler irrigation system was used to develop the many mother blocks which were demonstrated to be the best variety of many trees to grow in Tihama area. Besides the mango mother block, several other mother blocks were planted with guavas, papayas, Annonas, bananas and some avocados during 1988.
6. Thousands of shade trees were planted around the new mother blocks as wind breaks in 1988 and 1989 to protect the fruit trees from the heavy Tihama winds and storms.
7. Numerous training programs were conducted at Al Jarouba Station

with the full participation of HITS technical staff and counterparts to teach various cultural practices and plant protection on tropical-subtropical fruit trees. Several opening and closing ceremonies for all these training programs were arranged at Al Jarouba with the participation of high ranking MAF, USAID, and TDA officials. The speeches emphasized the importance and success of HITS training programs during 1988 and 1989.

At most of the HITS training programs, the Yemen news media ( Yemen National Television Radio and newspaper reporters) gave full coverage to the events.

## **HORTICULTURE PRODUCTION AND IMPORTATION**

### **Purpose and Objective:**

HITS project purpose was to support the demand in the Yemen Arab Republic for rootstock, seed, and budded trees of adaptable fruit varieties. The objective of HITS in these activities was to provide assistance to the Ministry of Agriculture and Fisheries and the private sector in the importation and production of high quality, disease-free trees which are suitable for the Yemen Arab Republic.

### **Introduction**

A few years following the declaration of an embargo on fruit importation by the President of the Yemen Arab Republic it was strongly emphasized that Yemen was to become self-sufficient in fruit production. MAF was assigned the leadership responsibility by the President of the Yemen Arab Republic. High level officials in MAF have an intense urgency to use every possible means to rapidly increase fruit and fruit tree production in Yemen.

In the summer and fall of 1987, high ranking MAF officials began intensive discussion with USAID and HITS to establish fruit tree production, as it had become the first priority with MAF. USAID and HITS had already recognized the importance of and need for such a program. Since USAID recognized that most of the original project objectives were progressing well (such as research, extension and training, plant protection), the AID Mission in Yemen, in close consultation with HITS management, was more receptive to an MAF request for an expansion of deciduous fruit and fruit tree production at Al Irra and MAF nurseries.

At the same time, HITS field management realised that with this very important task and with a technical staff of only three long-term personnel (reduced from twelve), HITS would be under severe time constraints. This

task would also be an additional major obligation in terms of managerial and staff responsibility to fulfill the obligation to import and produce more fruit trees.

## **IMPORTATION IN 1988 AND 1989:**

The HITS project was involved in the importation of seed, rootstock, and budded trees in limited quantities to be planted at two stations from 1983.

During 1988, HITS project imports included: 7,000 budded peaches; 13,000 budded apples from Egypt; 100,000 nemaguard seeds; 115,000 apple rootstocks MM 106; and 700 deciduous trees of miscellaneous varieties from the U.S. These trees and plant products were distributed and planted by HITS staff and counterparts at Al Irra Station, demonstration plots, MAF nurseries, and the selected private sector nurseries.

HITS project personnel, along with their counterparts, MAF representatives, and the plant quarantine inspectors, managed the consignment after their arrival at Sana'a Airport. The imported plants and plant products were transferred from the airport to the Tree Distribution Center after the primary arrival and inspection procedures had been carried out by HITS and plant quarantine personnel.

After the successful importation of trees and planting season in 1988 and the successful establishment of MAF and a few private sector nurseries, MAF and more private sector individuals required more budded trees, rootstocks, and seeds. MAF requested more plants and plant products to meet the production targets for 1990 and 1991. Consequently, USAID authorized HITS to use its funds to order and import more trees for 1989.

In 1989, the HITS project imported 24,500 peach trees, 95,000 apple rootstocks MM106, 200,000 nemaguard peach seeds. Since suitable varieties of budded apple trees were not available at selected qualified nurseries in the U.S., the Minister of Agriculture and Fisheries personally requested HITS field management (Team Leader) to lead a Yemeni team to purchase and import apple trees from Egypt. The head of Yemen Plant Quarantine, Central Ministry, and private sector representatives were included in this delegation to Egypt. This trip resulted in the importation of about 75,000 budded apple trees from Egypt, of which 30,000 were for MAF and 8,000 for HITS, while the rest were for private sector individuals. The 8,000 apple trees were part of HITS commitment to import fruit trees to YAR for 1989.

HITS assisted MAF and the private sector in preparing orders for trees, seeds and budwood needed to meet production targets for 1990 and 1991.

## PRODUCTION IN 1988 AND 1989:

The Horticulture Improvement and Training Subproject (HITS) responded positively to the MAF request to provide technical and material support to MAF and private sector nurseries in the Yemen Arab Republic to increase fruit tree production. **The following is a summary by years:**

### PRODUCTION IN 1988

#### AL IRRA STATION

a. Budded apple trees	20,000
b. Budded peaches	2,000
c. Local and nemaguard seedlings	<u>20,000</u>
Total	42,000

#### AL JAROUBA STATION

Budded Mangoes	1,600
Mango seedlings	12,177
Guava	5,000
<u>Annona</u>	<u>6,000</u>
Total	24,777

#### FRUIT

Apples	3,800 kg
Peaches	3,300 kg
Plums	4,100 kg
Nectarines	<u>1,000 kg</u>
Total	12,200 kg

### PRODUCTION IN 1989

#### AL IRRA STATION

a. Apple rootstock	30,000
b. Budded apple trees	27,000
c. Budded peach trees	13,000
d. Budded apricot and plum trees	<u>1,500</u>
Total	71,500

#### AL JAROUBA STATION

Budded Mangoes	15,000
Polyembryonic mango seedlings	<u>15,000</u>
Total	30,000

18,000 local mango seeds in different varieties were purchased and planted at Al Jarouba Station for propagation.

FRUIT: Apples; peaches; nectarines; and plums produced at Al Irra Station from selected varieties: 12,000 kg.

In 1988 and 1989, 300,000 nemaguard peach seeds were imported. Of these,

40 to 50% were planted in can-M trays at Al Irra Station after a complete stratification process. Then the nemaguard seedlings were distributed from Al Irra to MAF and some selected private sector nurseries for propagation purposes.

In 1988 and 1989, part of the 210,000 apple rootstocks MM106 imported in 1988 and 1989 were properly planted in the stooling beds and budding plots at Al Irra. The planting and modern nursery techniques at Al Irra Station were repeatedly demonstrated to Yemeni private sector individuals and MAF nurserymen to show how the same methods could be applied at their sites. All available land at the station was for fruit tree production and Al Irra's nursery operations were in full capacity. In accordance with MAF's request, thousands of apple rootstocks were distributed to some MAF and private sector nurseries selected to receive HITS material and technical support. All these selected nurseries were supervised and monitored by HITS technical staff and counterparts.

### **Survey and Evaluation of MAF and Private Sector Nurseries Receiving HITS Technical Support for Fruit Tree Production**

In addition to HITS technical and material support to the 9 MAF and 3 private sector nurseries charged with expanded fruit tree production, MAF requested HITS to supervise and evaluate the nurseries supplied with HITS plant materials. The project field management formed survey and evaluation teams which toured the nurseries throughout the country during October and November 1988. During the survey and evaluation process, the teams focused on the following aspects of production in various targeted nurseries:

- Management
- Land Preparation
- Tree Planting and Maintenance
- Conditions of Stooling and Budding Plots
- Environmental Influence
- Degree of HITS Supervision
- Recommendations

This review rated the nurseries according to their performance and management. The top three nurseries were awarded trophies and certificates which were personally presented to nursery managers by the Minister of Agriculture and Fisheries. The evaluation by HITS staff members identified and recommended nurseries which were to continue receiving HITS support.

## **Annual Tree Production Meeting at the MFA**

HITS field management and staff members were involved in the expanded annual horticulture meetings held at MAF for 3-4 days in 1988 and 1989. HITS staff actively participated in those meetings, which were attended by the Minister, Deputy Minister, other high ranking MAF officials, representatives of other donor projects, and nurserymen. At the last meeting in the spring of 1989, the Minister of Agriculture and Fisheries recommended that HITS make progressive efforts in assisting both private and public sectors and called for a strict follow-up of HITS recommendations. This statement was a positive reflection on HITS activities in Yemen.

All three HITS technical staff members were selected to form a technical committee to draft recommendations for the fruit tree production plan of 1989 for the Yemen Arab Republic.

## **HITS Continuous Support to other MAF Nurseries:**

Nine MAF nurseries received HITS technical support toward increasing fruit tree production in the last two years of HITS activities. In 1988, a total of 95,000 apple rootstocks and 78,000 nemaguard seeds were distributed to MAF nurseries to establish apple stooling beds and budding plots to increase the number of budded trees available for distribution in 1989. HITS field management in close coordination with MAF increased its support additional MAF nurseries which had better management and operation skills and which also had more potential for expanded fruit tree production. HITS provided 30,000 apple rootstocks, which had been planted and maintained by HITS nursery management supervision, to one of these nurseries located in Saadah. The Minister of Agriculture and Fisheries was invited in a joint trip with HITS field management to Saadah to visit the successful HITS assisted nursery in Saadah and also one private sector nursery (Sadegh Harmal) in the same area. This was a part of HITS expanded fruit tree production at Al Irra Station, and throughout the country. HITS provided technical support to MAF nurseries that received the rootstocks and seeds. HITS management and staff had numerous site visits to all of these nurseries to ensure the success and continuity of HITS objectives in fruit tree production in Yemen. For the same purpose, more than 109 trainees from MAF and private sector nurseries were trained in nursery management techniques in four in-training programs at Al Irra Station.

## **HORTICULTURE RESEARCH IN 1988 AND 1989**

### **Purpose and Objective:**

The purpose of HITS research was to support the demand in the Yemen Arab Republic for increased fruit production through applied research activities.

The objective was to test and recommend new adaptable fruit varieties to enable the private sector to expand the production needs of the country in coordination with Agricultural Research Authority (ARA).

The research activities on varietal testing with the imported deciduous fruit tree at Al Irra station continued in the last two years of HITS implementation programs. The HITS horticulturist, who initiated and implemented the research activities, was medically evacuated permanently to the U.S. in March 1988. Responsibilities for the supervision of on-going horticulture research at Al Irra Station were then assumed by the HITS field management (Team Leader). The research was continued by two Yemeni counterparts, Mr. Amer Aghbari (candidate for Ph.D. program) and Mr. Abdul Aleem Saif, who were assigned to the HITS horticulturist.

### **Achievements during 1988:**

#### **1. Fruit Varieties:**

The project identified 3 apple, 10 peach, 2 nectarine, and 2 plum varieties as being suitable for production in Yemen. Fruit yield, size and weight data were collected during 1988. These data will be useful in determining the best yielding varieties among those already recommended for Yemen. These data were presented in the fruit evaluation report. A new apple variety, Stark Adina, and two new peach varieties, Gulf Queen and Gulf Bride, were planted at the station this year for evaluation. The Le Conte pear looks very promising this year and will be evaluated again during the next season before it is recommended as a suitable variety.

#### **2. Chilling and Dormancy:**

Research into determining the cumulative chill units at Al Irra Station continued to the next season. The data allowed more accurate prediction as to the suitability of new varieties of deciduous fruits. A paper on this subject was presented by the HITS horticulturist and his counterpart at the annual meeting of the American Horticulture Society in Orlando, Florida. Methods of inducing plants to enter into or come out of dormancy and to advance or delay flowering were investigated by the following techniques: use of abscissic acid, timing of manual defoliation of trees, timing of cessation of irrigation, and use of dinitro-o-cresol to bring plants with high chill units out of dormancy.

#### **3. Mineral Nutrition-DRIS:**

Soil and plant tissue analysis using the DRIS system were collected in 1988

on the varieties at Al Irra Station. These data were useful in determining the mineral nutrition requirements of the fruit trees recommended by the project. Mr. Othman Al Koshab, HITS Ph.D. student at Oregon State University (OSU), with USAID approval, returned to Yemen to do this applied research at Al Irra Station. After several months, Othman completed his applied research in Yemen and returned to the U.S. (OSU) to write the results of his research for his Ph.D. thesis. After he completed his Ph.D. program and graduated from OSU, he returned to Yemen in the spring of 1989 and joined HITS project as a member of the technical staff for research.

**4. New Workplan for Research:**

HITS prepared a detailed workplan for research at Al Irra Station. This workplan was distributed to MAF, ARA, USAID, and other donor projects.

**5. Data Collection:**

Data collection on chilling hours continued on a weekly basis for the three on-going experiments.

**6. New Suitable Variety:**

Final data collection continued on Winter Banana as a late and new suitable variety of apple in Yemen.

**Achievements during 1989:**

The following is a summary of HITS research activities carried out in 1989:

1. The fourth suitable apple variety was identified in the fall of 1988, when it was observed that the winter banana variety was bearing fruit in full capacity at Al Irra Station as well as at one of the demonstration plots at a higher elevation near Sana'a. MAF officials and private sector individuals expressed their satisfaction since the Yemeni would be able to harvest quality apple fruit in two seasons each year; one in early summer from the three varieties ( Anna, Dorset Golded and Ein Shemer), and the second harvest ( winter banana) in mid- fall.
2. Santa Rosa plum variety, which bore fruit for the first time in 1989 and was very well accepted by the Yemeni, was identified as the third suitable plum variety in Yemen.
3. Few different apricot varieties were planted in 1984. Initially there was no indication of fruiting; however, finally one of the varieties at Al Irra bore fruit in full capacity in 1989 and was recognised as a potentially suitable variety in Yemen.

## **EXTENSION AND TRAINING IN 1988 AND 1989**

### **Purpose and Objective:**

The purpose of HITS extension and training activities was to support increased fruit production in the Yemen Arab Republic.

The objective of this part of HITS activities was to train a cadre of professionals, technicians, and extension specialists in MAF and the private sector in basic fruit production, nursery management, plant protection, and extension skills. It also included the expansion and upgrading of MAF horticulture, plant protection, and extension information production and distribution programs for farmers, nurserymen, and private sector through extensive use of radio, television, extension pamphlets, and visual demonstration aids.

The activities of HITS extension and training in the following areas were continued in the 1988 and 1989 workplan:

### **Achievements During 1988**

#### **1. Demonstration Plots:**

In collaboration with Yemeni farmers, eleven new demonstration plots were selected and established in different geographical and climatic conditions. These new demonstration plots, in addition to 15 others which had been established in the last 3-4 years, served two main purposes:

a) varietal testing of deciduous, tropical and subtropical fruit trees in comparison to varietal testing at Al Irra and Al Jarouba Stations and b) technology transfer of modern fruit horticultural practices to the farmers and extension agents.

#### **2. In-country Training:**

In addition to the heavy involvement of HITS in fruit and fruit tree production, in-country and short-term training programs were still part of project priorities in 1988 and 1989.

Three short courses were held at the Al Irra Deciduous Horticulture Station. Two one-week practical training courses, the first in December 1987 and the second in February 1988, emphasized seasonal cultural activities. Thirty-nine trainees participated in these two training programs. A third 4-week training focused mainly on deciduous nursery management and plant protection. Sixty-eight trainees including farmers, MAF and private sector nurserymen and extension agents participated in this training program. This was the highest number of trainees to participate in a HITS training course. This training was part of the expanded fruit tree production program throughout YAR. The trainees learned how to bud rootstocks, to work in stooling beds, and to collect budwood. Trainees were also taught the principles of internal plant

quarantine, movement of plant and plant products, the safe use of pesticides, and the identification of the most important insect pests and diseases of fruit trees.

The training course on fruit propagation (mangoes) and plant protection was held at Al Jarouba in November 1988. Thirty one participants representing TDA and Hodeidah Agricultural Office attended the training. As in other training programs, certificates were awarded to the participants in the closing ceremony.

The total number of trainees who participated in HITS in-country training programs in 1988 was 107.

### 3. Degree Training in the U.S:

Othman Al Koshab and Mansour Al Dalas, two of HITS long-term participant trainees, returned to Yemen in 1989 after completing their Ph.D and M.S. programs at Cal Poly, respectively. As part of the institutionalization of the program, both of these two trained Yemeni returned to HITS project to serve as technical staff.

### 4. Short-Term Participant Training Program in the U.S:

Abdul Malik Hamim, a counterpart to HITS Entomologist in Integrated Pest Management (IPM), completed a training program in IPM at the University of California, Riverside from May 17, 1988 to July 1, 1988.

Mohamed Al Owa, a HITS counterpart and Al Jarouba Station Manager, completed a training program in fruit farm management at California State Polytechnic University, Pomona from June 1, 1988 to July 22, 1988.

### 5. Training Needs Assessment:

Following a request from the Extension and Training Department of MAF, in December 1987 HITS brought Mohamed Belhaj, an Arabic-speaking specialist, as TDY to conduct a comprehensive training survey needs for the MAF extension service. Results of this assessment have been provided to USAID and MAF (Belhaj, 1987).

### 6. Field Days and Extension Visits:

Several field days were held at the farmers' demonstration plots, primarily in Tihama, Hajja, Al Mahweet, and Sana'a areas. A number of cultural practices such as tree propagation, planting, pruning, fruit thinning, and harvesting were demonstrated. On one of the field days at Al Irra Station, more than 100 people attended, including high ranking MAF officials, USAID officials, ADSP Team Leaders, private sector individuals, and the Yemen news media. The success of Al Irra Station in deciduous fruit production and nursery management was demonstrated.

### 7. Pamphlets and Video Tapes:

Two new pamphlets on fruit care and fruit tree propagation were prepared and distributed. Several video tapes were produced for training and extension purposes. Among the video tapes for Yemen National Television

were video tapes on stool bed management and the safe use of pesticides.

#### 8. Citrus Mother Plots:

Forty three citrus mother trees were planted in Saadah, while forty six plants of different citrus varieties were planted in Al Batanah. These plots were visited regularly. Thousands of budwood were collected from Al Irra and Al Batanah and distributed to MAF and private sector nurseries.

### **Accomplishments during 1989**

#### 1. Demonstration Plots:

Closely coordinated technical supervision was provided to the 11 demonstration plots established in 1988 and to the 5 new plots established in 1989.

#### 2. In-country Training:

In-country training, which has been one of the most important programs of HITS, was continued. One of the highlights of the HITS in-country training program was that after many attempts HITS in coordination with TDA, finally succeeded in conducting the first training program for 15 Yemeni female extension agents at Al Jarouba Station in May 1989. After this session, 20 male trainees participated in training. Both groups were taught the cultural practices for tropical and subtropical trees, and about plant protection, and the safe use of pesticides.

Similar training programs were conducted with about 35 young male and female Yemeni trainees at Al Irra Horticulture Deciduous Station in May and June 1989.

#### 3. Field Days and Extension Visits:

Field days and extension visits were continued in old and new demonstration plots with the local farmers. Some of the old established HITS demonstration plots were in poor condition as a result of neglect by the farmers.

#### 4. Video Tapes:

Several video tapes of HITS training programs and the field days were recorded and available for use in Yemen Radio and Television at the MAF and HITS office.

#### 5. Short-Term Participant Training in the U.S:

Ahmad Saif Abdul Haq, one of the counterparts to the HITS Entomologist in Integrated Pest Management (IPM), completed a short-term training in IPM, at Oregon State University, Corvallis.

Mohamed Sharaf Al Din, a Yemeni HITS technical staff member, participated in a short-term on-the-job training program at USDA in extension work.

## **PLANT PROTECTION**

### **PURPOSE AND OBJECTIVE:**

The purpose of HITS plant protection activities was to support increased fruit production in the Yemen Arab Republic through improved plant protection.

The overall objective was to expand and improve the plant protection department of MAF to ensure the production, importation, and distribution of insect- and disease-free trees and vines to farmers and to identify and control existing insects and diseases in the Yemen Arab Republic.

Emphasis was placed on plant protection which was recognized as being critical to the success of HITS activities and which was one of HITS major components.

HITS plant protection activities focused primarily on entomology and plant pathology. After the HITS plant pathologist left the project in the fall of 1987, there was no continuation of this activity.

**NOTE:** I have prepared and submitted a comprehensive End of Tour Report as HITS Entomologist concerning all of HITS entomological activities and contributions in the Yemen Arab Republic from October 1984 to July 1989. This report was submitted as Part One of my End of Tour Report to MAF, USAID, CID, and Cal Poly University Pomona in January 1990. For detailed information about the achievements of HITS entomology and plant protection, please contact the above mentioned institutions.

## **PRIVATE SECTOR DEVELOPMENT INITIATIVES**

### **Purpose and Objective:**

HITS project purpose for this module was to support small to medium-sized farms in their efforts to establish their fruit tree nurseries for increased fruit tree production.

The module objective was to provide effective support to the private farmers to enable them to expand the capacity of fruit tree production in the Yemen Arab Republic.

### **Introduction**

The USAID Mission in Yemen has always been interested in the concept of HITS involvement to support private sector individuals in Yemen. However, the idea could not receive a positive response from MAF officials. MAF believed the twenty one government nurseries throughout the country could meet the fruit production needs of Yemen. However, most of the MAF nurseries encountered obstacles which hindered intensive fruit tree production. The major preventive factors were lack of sufficient training of nursery personnel, lack of facilities and equipment, and lack of incentives for the managers and the personnel to promote their diligence in improving managerial and staff job performance. In spite of these impediments, HITS was working in close coordination with MAF identified and selected some of the government nurseries which had potential for improvement. Subsequently, HITS project began to increase its material and technical support to these nurseries in order to increase their productivity.

### **Achievements in the Private Sector Approach in 1988 and 1989:**

HITS field management, in close consultation with its staff and USAID, realized that even the selected government nurseries might not be able to meet Yemen's fruit tree production goals. There was no doubt that the private sector must get involved actively in fruit and fruit tree production. Thus, HITS project management, through its daily meetings and visits at the Central Ministry of Agriculture and Fisheries, and after long hours of discussion for months in late 1987, was able to convince MAF officials that the involvement of the private sector for the expanded fruit tree production and self-sufficiency of Yemen was imperative. At the same time, the project had the full support of USAID, in particular the support of the Supervisory Agricultural Development Officer and the Project Officer.

Due to sufficient climatic diversity, Yemen has a tremendous potential for fruit and fruit tree production. With all these positive features, HITS began to support farmers with small and medium-sized farms by helping them establish fruit tree nurseries. HITS and MAF together selected

private sector farms in different locations to receive technical advice and plant material support for establishing nurseries. Using their background, experience in fruit tree production, and willingness to be trained by HITS personnel as criteria, five private sector nurseries and three HITS demonstration plots were selected to receive apple rootstocks and nemaguard seeds to start establishing fruit tree nurseries with complete HITS supervision in 1988.

The farmers who received HITS technical support were encouraged to participate in HITS training programs at Al Irra and Al Jarouba Stations and to attend the extension field days. HITS training programs in cultural practices and the extension field days were well attended by private sector individuals.

After the success of the approach and initiatives taken by HITS to support private sector individuals and the improvement and success of nursery management for fruit tree production in 1988, demands from the private sector to get involved in fruit tree production were overwhelming. Several private sector investors stimulated by the quality of services rendered by HITS to previous farmers, expressed interest in HITS technical and material support to establish nurseries and fruit tree orchards. At the same time the private sector of Yemen realized the tremendous economic benefits and income to be derived from cash crop production. In 1989 the HITS field management office in Sana'a was stormed by farmers and private sector investors requesting the establishment of fruit tree nurseries. Farmers and investors put tremendous pressure on MAF officials to ask for HITS support in this respect.

In 1989, in addition to HITS distribution of imported apple rootstocks to the same five private sector nurseries which were receiving HITS support in 1988, for the first time two of the private sector individuals asked HITS field management to assist them in the direct importation of apple rootstocks from the U.S. Al Roeini from Amran, north of Sana'a, imported 30,000, and Sadegh Harmal from Saadah 50,000 rootstocks. These two private sector nurseries were being directly supervised by HITS in planting and management. All private sector nurseries which received HITS support when being established were planning to expand their productivity by following HITS advice to employ modern technology in nursery management. After HITS positive performance in fruit and fruit tree production and the involvement of some enthusiastic Yemeni private sector individuals in 1988 and 1989, more Yemeni farmers were encouraged to follow the HITS production plan. This short period could be called the period of Yemen's Green Revolution, which under HITS leadership will lead the country to fruit and fruit tree self-sufficiency in the near future, thereby saving millions of dollars.

## **UPGRADING MAF NURSERIES**

### **Purpose and Objective:**

HITS project purpose for this module was to provide technical and material support to five selected MAF nurseries to upgrade their production potential.

The objectives of this part of HITS new activity were to assist the five selected nurseries to upgrade their overall management and to improve their fruit tree production with the assistance of a HITS Horticulture Specialist and using PL-480 funds.

### **Introduction**

A comprehensive survey of 21 existing MAF nurseries was initiated and conducted by HITS from July 18, 1987 through September 16, 1987. The purpose of the survey was to identify those nurseries with the greatest potential for expansion to help YARG successfully meet its target of increased fruit production. The final 95-page survey report detailed the requirements for bringing each nursery up to its potential, including soil, water, construction, equipment, personnel, etc., and was submitted to USAID and MAF in May 1988. The survey team was instructed to evaluate the nurseries and to prepare a priority list with a view to selecting a limited number for upgrading. Nurseries chosen for upgrading were restricted to those which could produce apples, peaches, pears, plums, nectarines, citrus or mangoes.

Following the release of HITS Fruit Nursery Survey Final Report and Recommendations, in a meeting with the Deputy Minister of MAF, other MAF officials and HITS field management, five MAF nurseries were selected. These were: Resaba, Al Jarabah, Jahana, Al Batanah, and Al Rujum. These nurseries are in different geographic and climatic locations in the Yemen Arab Republic.

### **Accomplishments in 1989:**

After HITS Fruit Nursery Survey Report was completed and submitted to MAF and USAID in May 1988, the report was reviewed by these two institutions. Because of the limited number of technical staff and heavy load of activities at HITS, USAID approved the appointment of a new horticulturist who would implement the upgrading plans of MAF nurseries. Based on this approval, HITS field management travelled to Sudan and Jordan to interview and identify one qualified person as a third country national to fill the position. Finally, a specialist was selected from Sudan and was placed in this position in October 1988. After HITS field management revised and prepared a new scope of work for the existing staff and counterparts, a new scope of work was prepared for the newly selected horticulturist to focus on upgrading the five MAF nurseries and to

prepare a proposal for the use of PL-480 funds available in the Central Planning Organization (CPO) of Yemen.

After a careful study of HITS survey report and several visits to the five selected MAF nurseries by the new HITS Third Country National staff (TCN), a 50 page comprehensive and detailed proposal for the use of PL-480 funds was prepared and submitted by HITS to MAF and USAID in June 1989.

The proposal was reviewed by MAF and USAID, and finally a plan was submitted to CPO requesting the release of PL-480 funds to implement the upgrading plan of the five selected government nurseries.

## **PROJECT FIELD MANAGEMENT AND COORDINATION MAY 9, 1987-JULY 1989**

It is apparent that field management in any project in developing countries is extremely important for the success or failure of that particular project. There are several factors which are important in management and coordination tasks. The most important is "the establishment of a good working relationship with the host country officials and the counterparts". This should be considered the most important component of the work. HITS project management faced several crises from the beginning of the implementation programs. The initial evaluation of the project by an evaluation team assigned by USAID in early 1987 was not positive. There was serious doubt as to the feasibility of continuing HITS project. The new HITS field management from mid-1987 through 1989 recognised a need for improvement in working relationships and communication among and between MAF, USAID, Yemeni farmers, and HITS personnel.

The daily presence and appearance of HITS field management (Team Leader) in the Central Ministry of Agriculture and Fisheries, morning meetings with the involved Ministry officials and daily afternoon visits to the USAID Mission were extremely important for the improvement of communication and working relationships in the last two years of HITS implementation programs. It was also arranged for HITS technical staff to have regular visits to MAF to discuss their current activities directly. The situation was so improved that the same MAF and USAID officials expressed their satisfaction with HITS at the JAFR meeting which was held in Sana'a in the fall of 1987. One MAF official said in his speech that MAF, USAID, and HITS should be considered a team and a family.

Due to the limited funds available, HITS reduced the number of technical staff from eleven technical assistants in the previous years to three. With only three technical staff and their counterparts, the work load and demand to provide support for Yemen fruit production increased. As a result, HITS field management, the technical staff, and their counterparts were under tremendous pressure to respond positively to all the demands from MAF and private sector individuals to perform quality work. There was a general belief that HITS was successful in its implementation programs in spite of work pressure and staff reduction. In fact, HITS field management conveyed the impression to the few remaining staff but increased number of counterparts in every weekly staff meeting that in spite of pressure, all concerned had to work closely together to ensure the success of the project. It was repeatedly emphasized that in light of HITS recently gained publicity and positive impressions by MAF, USAID and private sector individuals, HITS management and staff members had to continue to uphold its good reputation.

This was during the period when HITS made every effort to respond positively to the demands to establish fruit and fruit tree production throughout Yemen. HITS field management provided leadership in the implementation of HITS overall activities. HITS close collaboration with MAF and USAID was multidirectional. Horticulture production and research, training and extension, plant protection and private sector activities were integrated.

HITS management insisted on exposing HITS staff and counterparts to activities and HITS overall and periodical achievements by arranging field days at Al Irra Station, HITS training opening and closing ceremonies, etc., to which MAF always invited the Yemen news media to cover the events. On all of these occasions, high ranking MAF, USAID officials, interested private sector individuals, and the staff of other donor projects were invited. HITS staff and counterparts were able to explain and demonstrate their activities on all these occasions in a very professional manner.

HITS field management was very much interested in involving all HITS Yemeni professional counterparts in the project implementation programs to Yemenize HITS programs in the Yemen Arab Republic. The counterparts enthusiastically expressed their interest in HITS growing and progressive HITS programs, and they performed their duties side by side with HITS technical staff very well.

HITS field management, staff and counterparts actively participated in the preparation of HITS workplans for the fiscal years 1988 and 1989. HITS staff and counterparts, along with HITS field management, attended a JAFR meeting held in Sana'a in September 1987. HITS also actively participated in a JAFR meeting held at Colorado State University (CSU, Fort Collins) in August 1988.

HITS field management and staff would not have been able to achieve project goals and objectives without good coordination and the support of MAF officials, the U.S. Ambassador to Yemen Arab Republic, USAID, in particular the encouragement of the USAID Supervisory Agricultural Development Officer and the Project Officer, CID, and Cal Poly University Pomona. HITS field management received the best possible support and cooperation from the Director, Associate Director, Director of the HITS project and the staff of the International Programs Center of Cal Poly Pomona from mid-1987 through 1989.

During 1988 and 1989, the Yemen news media expressed a great deal of interest in the transfer of modern horticulture technology through HITS overall activities to Yemeni farmers and extension agents throughout Yemen. HITS field days and closing and opening ceremonies were broadcast on national television and radio the same day. There were several articles in the major Yemen daily newspaper "Al Thowra" and three

interviews with HITS field management in the Yemenia Magazine about HITS overall achievements, especially its success in establishing fruit nurseries for the purpose of expanding fruit production for MAF and the private sectors during 1987-1989. The USAID Mission in Yemen and other involved institutions gained a great deal of publicity through the overall positive comments about HITS in the Yemen news media in these two years.

## **RECOMMENDATIONS**

1. Training in every aspect must be a priority in the continuation of HITS programs in Yemen, in particular, in-country training programs for Yemeni farmers, private sector individuals and MAF nurserymen in fruit and fruit tree production, nursery management and plant protection.
2. In order to increase productivity and efficiency of work at the Central Ministry of Agriculture and Fisheries, short-term training should be provided in the U.S. at the Directors level to improve administrative and planning skills.
3. In order to make Yemen self-sufficient in fruit and fruit tree production, the HITS initiatives for expanded fruit and fruit tree production in Yemen for MAF and private sector nurseries should be continued and emphasized.
4. Seasonal cultural practices in horticulture should be demonstrated at Al Irra Horticulture Deciduous Station to extension agents, MAF nurserymen, and private sector individuals.
5. It is strongly recommended that applied research be continued at Al Irra Station in close coordination with the Agricultural Research Authority (ARA).
6. Four to five well established HITS demonstration plots should be selected in different geographical area for farmer's meetings and demonstrations of cultural practices and varietal testing of deciduous fruit trees in connection with the same observations at Al Irra Station.

7. To some extent efficient methods of irrigation systems, such as the Bubbler Irrigation System, which was installed at Al Irra Station should be studied carefully to be adapted and applied by Yemen farmers.
8. The Directorates of Agricultural Affairs and Plant Protection of MAF, which were most closely involved in and contributed the most to HITS programs, deserve in receiving the most support in the future.