

PD-AH-507

U N C L A S S I F I E D

AGENCY FOR INTERNATIONAL DEVELOPMENT

Washington, D. C. 20523

PROJECT PAPER

YEMEN: Farming Practices for
Productivity (279-0084)

September 23, 1989

U N C L A S S I F I E D

SOURCE SELECTION INFORMATION

Project Paper
Farming Practices for Productivity Project
USAID/Yemen
(Project Number 279-0084)

September 1989

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| AGENCY FOR INTERNATIONAL DEVELOPMENT PROJECT DATA SHEET | 1. TRANSACTION CODE <input type="checkbox"/> A = Add <input type="checkbox"/> C = Change <input type="checkbox"/> D = Delete | DOCUMENT CODE 3 |
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|---|--------------------------------------|
| 2. COUNTRY/ENTITY Yemen Arab Republic | 3. PROJECT NUMBER 279-0084 |
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| 4. BUREAU/OFFICE Asia/Near East Bureau | 5. PROJECT TITLE (maximum 40 characters) Farming Practices for Productivity |
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| 6. PROJECT ASSISTANCE COMPLETION DATE (PACD) MM DD YY 09 30 97 | 7. ESTIMATED DATE OF OBLIGATION (Under 'B' below, enter 1, 2, 3, or 4) A. Initial FY 89 B. Quarter 4 C. Final FY 97 |
|---|--|

| 8. COSTS (\$000 OR EQUIVALENT \$1=9.75 YR)*in YR equivalent | | | | | | |
|---|-------------|---------|-----------|-----------------|------------|------------|
| A. FUNDING SOURCE | FIRST FY 89 | | | LIFE OF PROJECT | | |
| | B. FX | C. L/C | D. Total | E. FX | F. L/C | G. Total |
| AID Appropriated Total | 1,600 | 500 | 2,100 | 29,000 | 11,000 | 40,000 |
| (Grant) | (1,600) | (500) | (2,100) | (29,000) | (11,000) | (40,000) |
| (Loan) | () | () | () | () | () | () |
| Other U.S. 1. | | | | | | |
| Other U.S. 2. | | | | | | |
| Host Country | | | | | 14,000* | 14,000* |
| Other Donor(s) | | | | | | |
| TOTALS | 1,600 | 500 | 2,100 | 29,000 | 25,000 | 54,000 |

| 9. SCHEDULE OF AID FUNDING (\$000) | | | | | | | | | |
|------------------------------------|-------------------------------|--------------------------|---------|------------------------|---------|-----------------------------------|---------|--------------------|---------|
| A. APPRO- PRIATION | B. PRIMARY PURPOSE CODE | C. PRIMARY TECH. CODE | | D. OBLIGATIONS TO DATE | | E. AMOUNT APPROVED THIS ACTION | | F. LIFE OF PROJECT | |
| | | 1. Grant | 2. Loan | 1. Grant | 2. Loan | 1. Grant | 2. Loan | 1. Grant | 2. Loan |
| (1) FN | 120 | 070 | | 0 | 0 | 40,000 | 0 | 40,000 | 0 |
| (2) | | | | | | | | | |
| (3) | | | | | | | | | |
| (4) | | | | | | | | | |
| TOTALS | | | | | | | | | |

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| 10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each) 075 012 080 064 052 053 | 11. SECONDARY PURPOSE CODE 140 |
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|---|-------------|-----------|--------|
| 12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each) | | | |
| A. Code | R/AG | TNG | BWW |
| B. Amount | \$7 million | \$2.75 m. | \$3 m. |

13. PROJECT PURPOSE (maximum 480 characters)

The purpose of FPP is to provide farmers in Yemen with the technology to increase net income through the increased production of high value cash crops. Technology is defined as knowledge of techniques that will increase production of new and existing cash crops together with access to the inputs and services needed to apply these techniques and the economic incentives to do so.

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| 14. SCHEDULED EVALUATIONS Interim MM YY 01 92 MM YY 06 95 Final MM YY 06 97 | 15. SOURCE/ORIGIN OF GOODS AND SERVICES <input type="checkbox"/> 000 <input checked="" type="checkbox"/> 941 <input type="checkbox"/> Local <input type="checkbox"/> Other (Specify) |
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16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a _____ page PP Amendment)

| | | |
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| 17. APPROVED BY | Signature: <i>Kenneth H. Sherper</i> Title: Kenneth H. Sherper Mission Director | 18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION Date Signed MM DD YY 09 23 89 |
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TERMS AND ABBREVIATIONS USED IN THE TEXT

| | |
|--------|--|
| ADSP | Agriculture Development Support Program |
| AID | United States Agency for International Development |
| AID/W | AID, Washington, D.C. |
| ARA | Agricultural Research Authority |
| Baladi | Local (e.g., baladi variety) |
| CACB | Cooperative and Agricultural Credit Bank |
| CHRDA | Central Highlands Rural Development Authority |
| CHRD | Central Highlands Rural Development Project (World Bank) |
| CID | Consortium for International Development |
| CP | Conditions Precedent |
| CPO | Central Planning Office |
| EOP | End of Project |
| EPA | United States Environmental Protection Agency |
| ERDA | Eastern Region Development Authority |
| ETS | Extension and Training Specialist |
| FAO | Food and Agricultural Organization |
| FPP | Farming Practices for Productivity Project |
| GDAA | MAF General Directorate of Agricultural Affairs |
| GDAET | MAF General Directorate of Agricultural Extension and Training |
| G DFA | MAF General Directorate of Finance and Administration |
| GDI | MAF General Directorate of Irrigation |
| GDM | MAF General Directorate of Marketing |
| GDP | Gross Domestic Product |
| GDPP | MAF General Directorate of Plant Protection |
| GDPS | MAF General Directorate of Planning and Statistics |
| GTZ | Deutsche Gesellschaft fur Technische Zusammenarbeit |
| HTD | Horticultural Technology Development Module |
| HITS | Horticulture Improvement and Training Subproject |
| IBRD | International Bank for Reconstruction and Development |
| IPM | Integrated Pest Management |
| KHa | Thousand hectares |
| KMT | Thousand metric tons |
| LT | Long term (e.g., training or technical assistance) |
| MAF | Ministry of Agriculture and Fisheries |
| Markaz | District, the political subdivision of a governorate (pl. marakaz) |
| MEST | Ministry of Economy, Supply, and Trade |
| MMT | Million metric tons |
| NADSP | National Agricultural Sector Management Project (World Bank) |
| ODA | Overseas Development Administration |
| OHA | On-Farm Horticulture Applications Module |
| PACD | Project Assistance Completion Date |
| PC | Pesticide Solubility Partition Coefficients |
| PCC | Project Coordinating Committee |
| PID | Project Identification Document |
| PMS | Pest Management Specialist |
| PP | Project Paper |
| PSU | Project Support Unit |
| RDA | Regional Development Authority |

| | |
|---------|--|
| SSA | Support Systems for Agricultural Module |
| SSHARDA | Sana'a, Saadah, Hajjah Agriculture and Rural Development Authority (Northern RDA) |
| ST | Short term (e.g., training or technical assistance) |
| SURDA | Southern Uplands Rural Development Authority |
| TA | Technical Assistance (Expatriate) |
| TC | Third country training (i.e., in countries other than U.S. or Yemen) |
| TDA | Tihama Development Authority |
| TFYP | Third Five Year Plan (1987-1991) |
| TS | Technical Support (Local) |
| UNDP | United Nations Development Program |
| WB | World Bank |
| YAR | Yemen Arab Republic |
| YARG | Government of the Yemen Arab Republic |
| YR | Yemeni Rial (YR1 1 = US\$ 9.75 as of September 1989) |

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PROJECT AUTHORIZATION

Country: Yemen Arab Republic
Project Name: Farming Practices for Productivity
Project Number: 279-0084

1. Pursuant to Section 103 of the Foreign Assistance Act of 1961 as amended, I hereby authorize the Farming Practices for Productivity Project for the Yemen Arab Republic, with obligations not to exceed U.S. dollars forty million (\$40,000,000) in grant funds over an eight year period subject to the availability of funds in accordance with A.I.D.'s budget and allotment process, to help in financing the foreign exchange and local currency costs of the project. The planned PACD is September 30, 1997.

2. The project will consist of the provision of goods and services intended to promote the production of high value cash crops in Yemen. The project will emphasize activities such as irrigation improvements, development and introduction of improved horticultural varieties, extension of appropriate cultural techniques to farmers through the country's extension system and private input distributors, targetted training for appropriate public and private sector individuals involved in agriculture, and support of a policy and regulatory environment conducive to agricultural development. Although the primary emphasis is on fruit production, support for other agricultural products (such as vegetables, nuts, honey, etc.) may also be provided under the project.

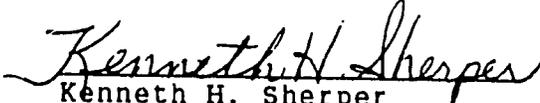
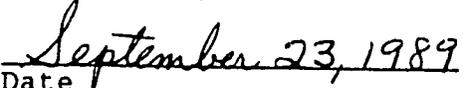
3. The Project Agreement which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority, shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

- a. Goods and services, except for motor vehicles, financed by A.I.D. under the project, shall have their source and origin in the United States, in the Yemen Arab Republic or in other countries included in A.I.D. Geographic Code 941, except as A.I.D. may otherwise deem in writing. Except as otherwise agreed in writing by A.I.D., motor vehicles financed by A.I.D. shall have their source and origin in the United States.
- b. Prior to the first disbursement under the Grant or to the commitment of the Agency thereof, the Grantee shall furnish to A.I.D. in form and substance satisfactory to A.I.D.:

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SOURCE SELECTION INFORMATION

1. Specimen signatures of agent(s) authorized to sign project amendments or project implementing documents on behalf of the Grantee.
 2. The name and office designation of the Grantee Project Representative who shall be at the Deputy Minister level or higher;
 3. The names and titles of the employees of the YARG designated to fulfill the required project counterpart positions.
- c. The following waivers to A.I.D. procurement regulations are hereby approved:
1. A source and origin waiver from A.I.D. geographic code 941 to Code 935 for the purchase of (i) twelve personal computers with monitors, printers, surge protectors and related equipment; (ii) six portable computers; and (iii) five photocopiers. The approximate value of such items is \$200,000.
 2. A source and origin waiver from A.I.D. Geographic code 941 to Code 935 for the purchase of fruit budwood and rootstock of an approximate value of \$100,000.
 3. The foregoing waivers are authorized by Handbook 1B, Chapter 5B4a(2) because the items to be purchased are either not available from countries in the authorized geographic code or cannot be adequately serviced or maintained due to a lack of spare parts, replacements, and service facilities, as a practical matter rendering them non-available. Authority for such a waiver has been delegated to the Mission Director pursuant to Delegation of Authority Number 654.
 4. I hereby certify that exclusion of procurement from Free World countries other than the cooperating country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program.


Kenneth H. Sherper
Director,
USAID/Yemen

Date

I. SUMMARY AND RECOMMENDATIONS

SOURCE SELECTION INFORMATION

A. Recommendation

It is recommended that the Director approve a grant of \$40 million to the Government of Yemen to finance the Farming Practices for Productivity Project (FPP), with an estimated life-of-project cost of \$54 million. It is also recommended that the Director authorize an initial grant of \$2.1 million to be made in FY 1989.

It is further recommended that the Director approve a waiver of source-origin requirements to permit procurement of up to \$200,000 in computer and photocopy equipment from Code 935 countries and a waiver of source-origin requirements to permit procurement from Code 935 countries of up to \$100,000 in planting and rootstock material and other material necessary for the research and extension program to be procured in lots too small for international tendering.

Finally, it is recommended that the Director recommend to the Assistant Administrator for the Asia and Near East Bureau the approval of a waiver of source-origin requirements to permit procurement of up to 48 vehicles (including motorcycles) from Code 935 countries, with an estimated total value of \$500,000.

B. Summary Project Description

The goal of FPP is to increase production of high value cash crops on small and medium-scale farms by raising the productivity of land, labor, and water resources. Fruit will be emphasized initially; at a later stage, project activities may be expanded to cover other high value agricultural commodities, including vegetables and possibly nuts, honey, etc. The project will emphasize activities with a near-term pay-off on-farm, such as improvements to existing irrigation systems, introduction of improved horticultural varieties, and cultural techniques which are proven and ready to extend to the farmer through Yemen's extension system, mass media, and private input distributors.

The project will be coordinated by the Ministry of Agriculture and Fisheries (MAF), with separate modules implemented through the General Directorate for Agricultural Affairs (GDAA), the Agricultural Research Authority (ARA) and the General Directorate for Planning and Statistics (GDPS). Specific activities will be undertaken in coordination with other relevant Directorates and institutions.

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Project activities will be organized into three modules:

1. On-Farm Horticulture Applications (OHA), coordinated by the Agricultural Affairs Directorate (GDAA), will work with extension and management personnel of the Regional Development Authorities (RDAs) for the Tihama and the Central and Southern Highlands as well as with local farmers and input distributors to: (i) promote improved cultural practices for high value horticultural crops, (ii) promote availability and use of improved varieties, and (iii) introduce improved irrigation techniques.
2. Horticulture Technology Development (HTD), implemented through the Agricultural Research Authority (ARA), will support applied research, station development, and extension outreach for deciduous fruit trees, mango and papaya, grape, and datepalm, including screening of indigenous and exotic varieties and of deciduous budwood and rootstock varieties; on-farm and on-station testing of cultural practices, pest management, fertilizer, irrigation, and dormancy management techniques; and development of the technical capacity of station personnel in research and extension outreach. As resources and progress in these areas permit, project work may extend into variety screening and applied research for other products (e.g. vegetables, nuts, coffee, honey, other fruits, such as berries and melons, etc.).
3. Support Systems for Agriculture (SSA), centered in the MAF Directorate of Planning and Statistics (GDPS), will undertake research and seek to promote a policy and regulatory environment that encourages the technically sound and economically efficient development of services to support farmers and ensure efficient private irrigation, marketing, agribusiness, input supply and processing channels.

The project also provides for a project support unit, a small reserve fund for locust control (as required by AID policy for the region), and limited "bridging" activities to ensure a smooth transition between horticulture activities supported under the Horticulture Improvement and Training Subproject (HITS) under the Agricultural Development Support Program (ADSP) and FPP.

The project will provide commodity support, training, and technical assistance in support of these three modules.

Implementation of the project will be carried out in three phases, with at least two external evaluations as well as occasional internal AID/YARG assessments to review project implementation and determine the extent to which the policy environment supports agricultural production and productivity in Yemen.

C. Summary Findings

The project analyses support the conclusion that the project is economically, technically, socially, environmentally, and institutionally sound and supports the development goals of the YARG. On the technical level, the project builds on the experience of the HITS project in deciduous fruit variety testing and extension and on YARG progress in strengthening Regional Development Authorities (RDAs) to provide extension and other services to farmers. The project will support bubbler irrigation and other improvements in irrigation methods that reduce on-farm water use substantially, a critical requirement for the expansion of horticulture in Yemen. It will also promote greater use of fertilizer, high-yielding varieties, integrated pest management, and other techniques appropriate to Yemen but not yet applied on a wide scale.

The project's economic rate of return is estimated to be above 15 percent, based on Yemen's comparative advantage in the production of high value crops and the tremendous potential for expansion in this area. The project promotes a sound regulatory environment for horticultural development and of services to support it, and provides the support necessary for private farmers, input suppliers, and marketers to take advantage of this opportunity, enabling farmers to improve farm productivity dramatically.

The project includes a primary focus on fruit crops. Farm budget analyses show that deciduous fruit tree production offers sufficient incentive for farmers both to switch from irrigated wheat production to fruit orchards and to improve fertilizer, pruning, and harvest practices on already established orchards. Bubbler irrigation systems show a 19 percent return on investment in financial terms. In economic terms, both fruit and vegetable production are economically attractive compared to irrigated wheat, and would remain financially attractive under a wide range of policy scenarios. Thus the project is judged financially and economically feasible.

The project is socially sound and is consistent with YARG and AID policy regarding the distribution of benefits. Project beneficiaries will be concentrated among small to medium size farmers with holdings of one to five hectares; other

beneficiaries will include small agribusiness suppliers and marketers who will gain from new opportunities to develop nurseries, distribute needed inputs, and market expanded fruit and vegetable production.

The technologies offered by the project are compatible with social conditions and, in some cases, are already being adopted. The project design incorporates features to ensure that women in the agricultural sector are able to take full advantage of project opportunities.

With respect to the environment, the project will reduce demand on groundwater and promote more effective use of this critically limited resource. The project will also promote pest control methods that reduce the danger of pesticide contamination and assist the YARG to prevent the introduction of pests and diseases into Yemen. Only EPA-registered pesticides that are not sufficiently persistent or water soluble to be leeching within the soil profile will be used in the project. Yemen's arid climate also limits the possibilities for water transport of pesticides.

The project supports the development of private and public institutions in the agricultural sector and is consistent both with YARG policy regarding the division of responsibility among the sectors and with the comparative strengths and capabilities of each.

D. PID Issues

The review of the PID raised 12 issues regarding the final design of the FPP. While each issue is dealt with in the appropriate section of the project paper, it may be helpful to summarize the resolution of these major issues.

1. Project Administration and Management. The management structure proposed is considerably simpler than that in the PID. The number of modules has been reduced to three, all of which will be implemented in cooperation with MAF. The largest share of the technical assistance will be handled by a single contractor, which is expected to be a consortium based on private sector as well as university expertise. Some additional technical assistance and commodity support beyond that provided by the technical assistance team is also envisaged.

2. Project Methodology and Impact. The final design shifts the emphasis strongly in the direction of on-farm adoption of production-increasing technologies. It provides specific targets for productivity increases and for adoption of improved technology and incorporates a methodology for tracking and assessing progress toward these targets.

3. Policy Climate. The final design strengthens the emphasis in the PID on supporting a regulatory environment favoring rapid private sector growth. It provides support to YARG analysis to improve the regulatory climate and includes incentives to implement needed changes identified. Further analysis indicates, moreover, that horticulture production is and will continue to be profitable in a wide range of policy regimes.

4. Mortgage. Given the central role the FPP will play in AID assistance to the agricultural sector over the next eight years, the Mission views the mortgage level as appropriate. Moreover, the project design incorporates at least two decision points at which funding levels can be adjusted or the project terminated if progress is less than satisfactory.

5. Level of Technical Assistance. The final design substantially reduces the level of technical assistance and increases other activities, particularly training.

6. Beneficiaries. The project design targets small farmers, both male and female, for the majority of assistance and will also work directly with small-scale private input suppliers to ensure ready availability of technologies promoted by the project.

7. WID. FPP will build on and expand the successful experiences of the ADSP in incorporating women professionals and farmers into AID-supported activities. The design uses both specific targets and design features to facilitate women's involvement in project activities and ensure their effective participation.

8. Contracting. The design addresses the scope for Title XII and Gray Amendment contracting.

9. Environmental Issues. The design team included an environmental expert who analyzed environmental issues related to horticulture production in Yemen and recommended design features to address potential problem areas. The findings of this analysis are presented in the Annexes.

10. Water Conservation and Water Policy. The proposed irrigation technologies are designed to reduce water consumption. The project does not address the issue of water pricing, as most of the areas to be assisted rely on privately owned pumps or diversion structures, making water pricing difficult or impossible. Given the scarcity of water resources, diversion from grain production to high-value crops is appropriate. Fruit trees, moreover, are generally less

heavy consumers of water than alternative high-value crops. The issue of aquifer mining is a serious one, but one that must be addressed at the sectoral level, not at the level of a subsector such as horticulture, particularly given the relatively minor percentage of the total acreage devoted to such crops.

11. Host Country Contribution. The final design raises the contribution of the host government and Yemeni private sector above the 25 percent target.

12. Technical Issues.

a. Research sustainability: FPP supports the consolidation of research activities into a single institution and strengthens ties to the production-oriented Regional Development Authorities. Both these design features are chosen to maximize sustainability.

b. Research priorities: The integration of research and extension activities within FPP and the strong on-farm demand for improved technologies in the rapidly growing horticulture subsector are expected to generate strong pressures to keep research focused at the applied level. The technical assistance team will further reinforce this emphasis.

c. Irrigation: Promotion of bubbler and other technologies have been combined into a single component within the horticulture applications module.

II. BACKGROUND AND RATIONALE

A. Overview of Agriculture in Yemen

1. Structure of the Sector

Agriculture is a vital component of the Yemeni economy, accounting for 24 percent of GNP (30 percent of GDP) in 1987 and employing approximately 70 percent of the labor force. The role of agriculture in the national economy has declined as income from other sources, particularly remittances from overseas workers and oil exports, has increased. However, agriculture remains the single largest productive sector in the Yemen economy.

Yemen's harsh geography limits the cultivable area to approximately seven percent of the land area, or 1.35 million hectares, of which roughly 1 million hectares is cultivated in a typical year. Grains (principally sorghum and millet) occupy 83 percent of this area, other field crops (legumes, cotton, fodder, and sesame) 8 percent; vegetables 5 percent; and fruits 4 percent.

Yemen's uncertain rainfall has encouraged a rapid expansion of irrigation. Nonetheless, only about one-quarter of the land is irrigated. Much of this is irrigated only irregularly by the collection of streamflow in seasonal wadis (termed spate irrigation) or other traditional means. Installation of pump irrigation systems is expanding rapidly.

Yemen's geography results in a highly differentiated agroclimatic environment, with a tropical region along the coast (the Tihama), sub-tropical zones in the lower elevations, and temperate conditions in the upper highlands. The steep hillsides give rise to equally steep gradients in rainfall and temperature conditions, making it possible to produce a wide range of annual and permanent crops.

Tree crops, grapes, and melons have been cultivated in Yemen for centuries. However, rainfed fruit production is highly limited and the total area is currently around 5000 hectares (about 12 percent of the fruit acreage). Irrigated production has expanded rapidly and tree crops (including grapes) are estimated by the World Bank to account for approximately 30 percent of the land under pump irrigation, or 35,000 hectares.

Yemen's diverse climatic conditions make possible the cultivation of an extremely wide variety of fruits and other tree crops (coffee and qat, for example). Grapes and dates are currently the most important products, as shown in Table 1.

Table 1: Fruit Production in 1988

| | <u>Area</u> | | <u>Production</u> | | <u>Value</u> | |
|--------------|-------------|----------------|-------------------|----------------|-----------------|----------------|
| | <u>KHa</u> | <u>Percent</u> | <u>MMT</u> | <u>Percent</u> | <u>YR1 Bil.</u> | <u>Percent</u> |
| Grapes | 15.0 | 34 | 133 | 49 | 2.5 | 51 |
| Dates | 10.6 | 24 | 16 | 6 | 0.2 | 5 |
| Banana | 6.5 | 15 | 34 | 12 | 0.6 | 13 |
| Papaya | 2.5 | 6 | 55 | 20 | 1.0 | 20 |
| Apricot | 2.2 | 5 | 8 | 30 | 0.2 | 4 |
| Peaches | 0.6 | 1 | 3 | 1 | 0.1 | 1 |
| Pomegranate | 0.5 | 1 | 1 | -- | -- | 1 |
| Orange | 3.7 | 8 | 3 | 1 | 0.1 | 2 |
| Mango | 1.3 | 3 | 7 | 2 | 0.2 | 4 |
| Lemon | 0.5 | 1 | 5 | 2 | 0.1 | 3 |
| Other* | 1.2 | 3 | 10 | 4 | 0.2 | 5 |
| TOTAL | 44.5 | 100 | 275 | 100 | 4.9 | 100 |

* Includes, in order by tons produced, mandarin, figs, guava, quince, apple, pear, almonds, and others.

Although fruit production accounts for only about four percent of the cultivated acreage, it provides an estimated 12 percent of value-added and accounts for an estimated 18 percent of production in gross value terms. Labor associated with the production of fruit, grapes, and dates is estimated by the World Bank at eight percent of the labor required for agriculture and five percent of the total labor requirement in the agriculture and livestock sector.

Fruit production is widely distributed throughout the country. The Central Highlands (notably Sana'a Governorate) dominate in the production of grape, apricot, peaches, and pomegranate, while the Tihama region dominates in the production of dates, banana, papaya, and mango. Deciduous tree crops other than apricot, peaches, and pomegranate are concentrated in the Northern Highlands, particularly Saadah Governorate, which accounts for half of total acreage in these crops. Citrus is grown primarily in the Eastern Region, particularly in Marib Governorate.

Fruit production in Yemen is practiced by both large and small farmers. As a broad generalization, large plantations are concentrated in the Tihama (e.g., banana) and in the Eastern Region (e.g., citrus), while fruit production in the Highlands is predominantly a small farmer activity. The 1986 fruit sector study, for example, found holding size under fruit to average 0.31 hectares for grape and 0.44 hectares for apricot. Farming system studies of two areas in the Central Highlands found an average of only 33 trees per farmer, equivalent to about one-tenth of a hectare at typical planting densities.

A large share of the total tree population is thus found in small household plantings. Only a small portion of this fruit is sold on the market, with the majority being consumed in the household. (It appears likely that this fruit is undercounted in national production statistics, suggesting that both fruit production and fruit consumption may be well above official levels.) Grapes, dates, and a few other crops, by contrast, are almost entirely produced for the market. New plantations of all crops are heavily oriented toward market production.

Productivity levels in existing plantations are extremely low, with yields averaging 38 percent of the U.S. average for grapes, 14 percent for apples, and 17 percent for peaches. Low yields are a product of inadequate cultural practices as well as reliance on unimproved varieties. Fewer than 20 percent of the respondents in the 1986 survey reported ever spraying their trees, for example, while fewer than half practice pruning and only 20 percent applied chemical fertilizers during orchard establishment.

Development of support institutions for the agricultural sector is still at a very early stage in Yemen. Formal research began only in 1983 with the establishment of the Agricultural Research Authority. Only three of the planned five agricultural research stations have begun operation. Extension is carried out primarily under the regional development authorities, which are being established with assistance from the World Bank and other donors; no national system currently exists. A large proportion of development activities in the sector are carried out under the rubric of donor-funded projects.

The private sector is responsible for virtually all agricultural marketing activities, which are largely free of regulation. The private sector is also increasingly active in the supply of inputs. However, activities in this area are sharply limited by the shortage of foreign exchange. They have also been impeded by the channeling of donor-provided inputs (e.g., grants of fertilizer from Saudi Arabia) through public sector institutions at subsidized prices. Private nurseries and farmer sales account for the largest share of trees available for planting. In 1985/86, the private sector imported 249,000 fruit trees (41 percent of total imports), many of which were destined for large plantations.

2. Recent Performance

Since the advent of the oil boom among Middle East oil producers, Yemen's economy has begun the transformation from a stagnant subsistence economy to a dynamic and growth-oriented one. This transformation is driven primarily by remittance flows from Yemenis working in neighboring oil producing states,

by high levels of donor aid, and recently by oil revenues from newly discovered oil reserves. Real growth in GDP is estimated to have averaged 5.5 percent annually during the 1984-87 period.

The agricultural sector has not participated fully in the modernization of the economy. Growth in agricultural production during the Second Five-Year Plan period (1982-86) averaged 2.4 percent annually, compared to the target level of 4.2 percent.

Performance varied greatly within the sector. Grains and other field crops generally fell short of planned targets, partly due to drought conditions in some years. Production of fruit and vegetables, by contrast, expanded more rapidly than expected, spurred by a ban on the importation of these commodities in 1983. Fruit production grew at an estimated six percent rate overall, while grape production grew at 12.5 percent and date production at 16.6 percent annually.

Expanding disposable incomes have fueled demand for high-value agricultural produce, which is expected to continue to grow by between five and ten percent each year. In response to this demand and to the high returns offered by fruit production, significant numbers of Yemeni farmers are making investments to increase fruit production, both by raising yields on existing area and by expanding the area planted.

The area planted in tree crops increased by 15 percent between 1984 and 1988, from 38,800 hectares to 44,500 hectares, or roughly 3.5 percent annually. Total output increased by 49 percent, from 184 million metric tons to 275 million metric tons, an annual rate of over 10 percent (total production figures are somewhat artificial, as we are literally adding apples and oranges).

Growth has been most dramatic in the traditional fruits. Grape production grew 63 percent between 1984 and 1988, for example, while peaches rose 62 percent. With the exception of dates, no tree fruit showed an increase of less than 35 percent in the period. This performance is particularly impressive given that most of the trees planted after 1984 were not yet bearing in 1988.

It is difficult to determine whether local production has caught up with demand. At an estimated 23 kg. per capita in 1986, fruit consumption is still quite low (approximately one-quarter the level in the U.S.). Fruit imports prior to the ban averaged approximately 100,000 metric tons, an amount nearly equivalent to the 1984-88 increase in fruit production. During that time, however, the growth in income and population

increased underlying demand for fruit by approximately 25 percent (given cumulative real income growth of 31 percent and an income elasticity of .8), implying a demand at 1984-equivalent prices of 355 KMT. It must also be noted that the ban has not been fully effective. Large but unquantifiable amounts of fruit and fruit products (juice, canned and dried fruit) are brought into the country unofficially.

B. Constraints and Opportunities in Tree Crop Production

The world oil price decline and the resulting fall in workers' remittances, foreign aid to Yemen, and earnings from the country's own oil resources have made it clear that the country's future depends on broadening the base of the economy and encouraging the growth of productive sectors, particularly those with the potential to save or generate foreign exchange. To attain sustainable long-term economic growth, the short-term opportunity offered by oil revenue must be used to make public and private sector investments that will increase domestic production.

Yemen's population is predominantly rural, and accelerated growth in the agricultural sector will be of major importance in shaping the country's economic future. Although large areas of the country continue to rely on rainfed production, such production accounts for a decreasing share of total sectoral value-added. The greatest potential for growth clearly lies in the expanding irrigated sector, where both labor costs and pumping costs make high-value crops more attractive economically and financially than field crops.

High transport costs and the perishability of fresh produce reinforce Yemen's comparative advantage in production of fruits and vegetables for the local market. The potential for exports in the near term is limited, although Yemen has traditionally exported grapes and raisins to the Gulf, as well as limited amounts of other products. Fruit and vegetable exports in 1987 totalled 59 million Yemeni rials, accounting for 19 percent of non-oil merchandise exports.

The potential to increase farm profits and incomes through improved yields is substantial. High value crops such as fruits and vegetables occupy roughly half of Yemen's irrigated land--and the percentage is increasing each year. However, as noted earlier, agricultural yields in Yemen remain well below international standards.

Yemeni farmers have demonstrated a willingness to move aggressively to capitalize on opportunities for increased income. However, their ability to achieve increases in tree crop production is limited by the following constraints:

1. Limited access to inputs. Restrictions on the importation of inputs and the underdevelopment of private distribution channels greatly limits farmer access to fertilizer and other inputs. As a result, application rates are low and farmers are sometimes forced to use inappropriate pesticides or fertilizers.
2. Low irrigation efficiency. Most farmers currently use flood or furrow irrigation, resulting in low field efficiency and unnecessarily high levels of water use. Transmission losses are estimated at up to 50 percent in some areas due to the use of unlined channels to bring water to the field.
3. Inadequate cultural practices. As noted above, few farmers follow such important practices as pruning. Planting densities are also too low in many cases.
4. Limited use of high-yielding varieties. Although substantial potential for increased production from "baladi" varieties is evidenced by the increase in output achieved since 1984, greater use of improved varieties would improve output and export potential.
5. Poor access to technical information. Extension services are only beginning to be established and input suppliers are not yet in a position to provide the farmer with relevant advice on technical matters.
6. Lack of technical packages adapted to Yemen. Work has begun on varietal screening and development of packages for improved varieties, but virtually no work has been done on cultural practices for "baladi" varieties.
7. High marketing margins. While fruit markets are believed to be highly competitive, transport costs are excessively high, due to the operation of a cartel. This, combined with underdevelopment of much of the nation's infrastructure and high post-harvest losses, reduces incomes for farmers.

Where improved technology packages have been tried, yield increases have been dramatic. Unfortunately few such packages have been developed or adapted for Yemen. Even fewer are effectively available to the farmers.

The FPP project will address all of these major constraints, either directly by working with extension agents, mass media, and input distributors to improve access to technology or indirectly by improving the regulatory environment for the

sector. It will seek to induce farm-level change through the development and dissemination of improved technologies adapted to Yemeni conditions and through improving the business environment and technical capabilities of the input supply system.

III. PROGRAMMING CONSIDERATIONS

A. Prior USAID Involvement in Horticulture

Throughout the 1980s, USAID support for agricultural development in Yemen has been based on the Agricultural Development Support Program (ADSP). This project, implemented under Title XII collaborative assistance, is aimed at "modernizing and revitalizing Yemen's agricultural sector" primarily through institutional development, construction of infrastructure, and training.

ADSP assistance to the horticultural subsector has been concentrated in the Horticulture Improvement and Training Subproject (HITS), which began in December 1982. The subproject, now scheduled to terminate in December 1989, will be extended to help smooth the transition to new activities planned under FPP. This transition is described in a Memorandum of Understanding developed in connection with this extension, with some of the activities described therein being funded by FPP.

Activities conducted under HITS, most of which are directly relevant to FPP, include: (a) establishment of two horticultural research, training and demonstration stations at al-Irra (near Sana'a) and al-Joruba (in the Tihama); (b) establishment of 36 horticultural demonstration plots on farmers' fields throughout Yemen; (c) training for a cadre of technicians and extension specialists in MAF and the private sector in basic fruit production, nursery management, plant protection and extension; (d) expansion and improvement of the Plant Protection Directorate within MAF; and (e) expansion and improvement of MAF's horticulture, plant protection and extension information program.

Project accomplishments achieved under HITS include: (a) identification of three apple, nine peach, three nectarine, and two plum varieties that are suitable for Yemeni conditions and are now being recommended to Yemeni farmers; (b) expansion in the production of adaptable fruit varieties by public and private sector nurseries (Yemen has gone from a country producing less than 15,000 budded trees per year to one producing over 80,000 budded trees annually); (c) training provided for more than 150 persons annually, including female extension agents; (d) and support for the expansion of private sector nurseries.

A final evaluation of the HITS activity is planned for FY1990, findings of which are likely aid in the implementation of FPP. A previous mid-term evaluation, conducted in February 1987

noted that the project had "provided useful technical assistance in the areas of plant production, extension, and short-term training." At the same time, it highlighted a number of management and sustainability issues and concerns. Progress has been especially slow in the Tihama, where living conditions are difficult and the distance from Sana'a complicates project management.

B. Relation to Current USAID Strategy and Program

USAID/Yemen's last two Action Plans describe the evolution of AID's agricultural strategy towards an increased emphasis on production and productivity, a focus expected to be sharpened still further in the FY1990 Country Development Strategy Statement (CDSS) now being drafted. Implementation of this strategy builds on past investments in institutional and human resource development by the YARG, with support from AID, the World Bank, and other donors. It also reflects a shared perception that the emphasis in development programming should shift from institution building toward programs with a greater immediate impact on production through direct involvement at the farm level.

While ADSP has included support for some on-farm activities, its early emphasis was on strengthening public sector capacity, particularly in MAF. It has also focused on improving human resources through training, the development of the Faculty of Agriculture at Sana'a University, and support for secondary agricultural training institutions at Ibb and elsewhere.

More recently, ADSP became one of the first projects embodying the shift in USAID strategy from institutional development to production and productivity and from a reliance on public-sector approaches to a strategy based on assistance to both the public and private sectors. While some activities funded under HITS will be continued under FPP, the emphasis will shift more toward production, on-farm activities, and the development and strengthening of input distribution channels.

FPP will support the Action Plan's specific objectives of:

1. Increasing by at least 3.1 percent the annual production of fruits and vegetables;
2. Developing and transferring appropriate technical practices to small, medium-scale and, as appropriate, commercial growers in targeted areas with good growth potential;
3. Increasing efficiency of on-farm water use;

4. Increasing access to critical agricultural inputs including fertilizer, seeds, equipment, pesticides and credit;
5. Reviewing the appropriate roles and responsibilities of the public and private sectors in agriculture and promoting privatization where reasonable; and
6. Strengthening analysis and ongoing dialogue on broader economic and regulatory issues affecting the sector.

FPP will be supported in this effort by a number of other planned or ongoing projects receiving AID support:

1. ADSP funded some of the studies (notably the fertilizer study) which supported the USAID's revised strategy and are reflected in the current FPP design. Continuing ADSP activities will support human resource and institutional development (mainly in the Directorate General for Planning and Statistics).
2. Under the Technical Services and Feasibility Studies (TSFS) project, USAID financed an Agricultural Prices and Incentives Study and will undertake an Agricultural Credit Survey and other studies over the next year designed to clarify the policy and regulatory barriers to rapid growth in agricultural production.
3. P.L. 480 local currency generations partially finance facilities that will be utilized under FPP, including construction at the Faculty of Agriculture at Sana'a University, support to ARA headquarters near Dhamar, a multipurpose demonstration farm at Wadi al-Jawf, construction of small catchment dams, and local costs on several agricultural studies. Negotiations are currently being conducted on significant contributions for construction of an irrigation demonstration farm and training center for the Eastern Region Development Project, construction of a connecting canal to Marib Dam, the upgrading of five MAF fruit tree nurseries and research stations. P.L. 480 local currency generation may be used to finance other construction in conjunction with FPP activities.
4. The Yemeni Enterprise Support (YES) project, expected to begin in FY1990, will finance private sector training and seminars, promote private sector capital investment and undertake studies and economic dialogue on agribusiness development, among other areas, complementing activities under this project.

5. Other support is possible through AID centrally-funded projects such as ARIES, which carried out the recently completed study on agribusiness problems and potential.

C. Conformity with Yemen's National Strategy and Programs

The Government of Yemen assigned high priority to agriculture in its Third Five Year Plan (TFYP, 1987-1991):

There is no doubt that top priority should also be given to maximizing production and investment in agriculture. To this end, all agricultural investment projects should have a direct growth effect on production and income

This decision recognizes the predominantly rural character of Yemeni society (nearly 85 percent of Yemen's population lives in towns smaller than 10,000 people, and 65 percent live in towns smaller than 1,000) and the importance of agriculture in rural development. Just over half of rural income comes from agricultural production, the remainder being derived from worker remittances (35 percent) and non-farm enterprises (14 percent).

A sectoral growth target of three percent annually has been set in the Third Five Year Plan. To achieve this level, a total investment of three billion Yemeni rials (in constant 1986 prices) is planned during the period, amounting to eight percent of total investment and 21 percent of investment in directly productive sectors (excluding education, infrastructure, etc.).

Fruit production, identified as the subsector with the greatest growth potential, is targeted to grow by 34.8 percent during the plan period. This is the largest expansion in any subsector in both absolute and relative terms. Over one-third of the growth in agricultural production is expected to come from the fruit subsector. This priority is in line with the emphasis on saving and generating foreign exchange from all sectors.

The FPP is fully consistent with this aim and with the means identified in the TFYP to achieve it. The plan emphasizes the need to "acquaint farmers with modern production methods which raise land productivity . . . through research and extension activities, development information programs, and expanded agricultural credit."

The plan stresses the need for applied research and for measures to promote utilization of scarce land and water resources in the most rational and efficient manner possible. It encourages the application of advanced plant production techniques and the introduction of appropriate equipment and irrigation systems that can augment the productivity of land and other factors of production. It also stresses the need to introduce new seed and seedling varieties together with improved plant protection procedures.

The TFYP encourages private investment in the production, processing and marketing of agricultural products. High-value and regionally exportable crops are to be promoted in appropriate locations. Finally, the TFYP includes efforts to train agricultural technicians and to introduce new technologies to farmers.

The FPP project reinforces the YARG's TFYP development strategy by focusing on (1) applied agricultural research; (2) technology adaptation and transfer; (3) water conservation; (4) private sector development; (5) promotion of high-value crops; (6) training; and (7) establishment of sound policies that will enhance agricultural productivity and increase production in those areas where Yemen enjoys a comparative advantage.

D. Other Donor Programs

Several bilateral and international donors in Yemen support agricultural sector activities with direct relevance to FPP. Donor activities in the horticultural area include programs supported by the World Bank, UNDP/FAO, and several bilateral donors.

The World Bank is the major donor in the sector. World Bank-funded projects have focused on establishing the Regional Development Authorities, with projects under way in all five regions. IDA financing has also supported the national agricultural research program in the Central Highlands, Southern Uplands and the Tihama, in coordination with ARA.

World Bank assistance is planned for the \$50 million National Agricultural Development Project (NADP) to improve coordination and technical support at the central level by strengthening MAF, coordinating technical operations nationwide, and consolidating operations of the RDAs. The first phase of the project will concentrate on institution building in MAF with specific emphasis on planning, research and extension. FPP financed activities will be closely coordinated with the NADP, which is also scheduled to begin implementation in 1990. The World Bank is also supporting activities in water and irrigation management, planning, and RDA women in development programs.

GTZ, the West German aid agency, supports two major projects related to agricultural development in Yemen. The Al-Mahwit Regional Development Project is helping to prepare a water master plan for the province, rehabilitate small irrigation schemes, and establish two private sector nurseries for fruit trees. It has also established an extension service reaching approximately 6,000 farmers, with an active women's section. A second program has supported establishment of a National Plant Protection Service to test pesticides and control procedures, develop a national system of pesticide warnings and legislation, and train pesticide extension advisors and users. This program is evolving towards increased use of integrated pest management practices.

During the next five years the GTZ project will strengthen the plant quarantine program through training of personnel and providing equipment. It will also develop a pesticide analysis laboratory to monitor pesticides for adulteration. The program concentrates primarily on vegetables. Sharing of certain practices and test results with FPP is anticipated. The enhanced quarantine activities will directly benefit private nurseries supported by the FPP project in importing disease-free plant material, and will assist the limited importation of new rootstocks and fruit varieties for FPP's technology development activities.

Great Britain's ODA provides technical assistance and limited financial support to agricultural irrigation and mechanization in the Tihama. It also provides significant support to the Central Highlands Rural Development Project, particularly in the Dhamar region, including the provision of nine experts in extension, agronomy, farm mechanics, livestock, women's agriculture activities, horticulture, farm management, and fruit tree production.

Close cooperation with the Dhamar program is planned under FPP, including joint testing of promising rootstocks and fruit varieties identified through the applied research program in the FPP and demonstration of fruit production packages developed under FPP in the Dhamar region. ODA also supports a virology research laboratory and plant virus identification activities at the University of Sana'a which will help support the plant quarantine effort envisaged under FPP.

Dutch aid in areas relevant to FPP include co-financing of \$50 million to the TDA for extension services, a horticulture development activity in Radah, and programs in potato research, extension, production and storage. Dutch assistance also supports monitoring water tables and quality in three northern regions under the Water Resources Assessment Project. Finally, the Dutch assistance program emphasizes assistance related to women in development.

Japanese aid to Yemen takes the form of commodity assistance, including approximately 500 million yen annually in agricultural machinery, fertilizer and pesticides provided to the MAF for distribution to government farms, RDAs, development projects and, in limited quantities, to the private sector for sale at subsidized prices. Japanese grants of fertilizer totaled 1,228 metric tons in 1987, evenly split between Ammonium Sulphate (21-0-0) and Di-Ammonium Phosphate (18-46-0). Grants of pesticides totalled 49,000 MT (primarily Fenitrothion/Fenvalerate 30EC and Fenvalerate/Dimethoate 40EC).

Japanese grants of the fertilizers and pesticides represent a significant proportion of Yemen's recorded imports of these commodities, and coordination between U.S. and Japanese aid will be necessary in order to effect changes in fertilizer importation or distribution practices.

United Nations development programs, supported by UNDP and FAO, are shifting away from institutional development and toward activities oriented to production and the private sector. UNDP/FAO activities directly relevant to this project include assistance to MAF plant quarantine facilities, substantial financial and TA support to the ARA research headquarters in Dhamar and to the Central Highlands Regional Development Project, support to the new National Agricultural Extension Training Center, improved irrigation through the introduction of PVC piping in the Zabid area of the Tihama (galvanized in the rockier Sana'a province) and assistance for prevention of post harvest losses.

Other related UN activities include a Soil and Land Classification Survey now under way, studies on agribusiness and agricultural export potential, natural resources conservation, watershed management, and assistance for the design of small dams. Negotiations are under way for support to the Marib Regional Agricultural Development Project and a detailed agricultural census expected to begin in 1990.

Donor coordination within the agricultural sector in Yemen is inadequate, but it has improved with the establishment of a coordinating committee chaired by the UNDP. Further planning to coordinate FPP start-up will be an important activity during the project's early implementation.

IV. Detailed Project Description

A. Project Strategy and Rationale

The YARG has made tremendous strides over the past ten years in building the institutional capacity needed to support agricultural development. Although further progress is clearly needed, Yemen now has in place the basic elements of a support system capable of providing the assistance that Yemeni farmers must have in order to realize the tremendous production potential of the country. The experience to date provides three lessons that are the basis of the FPP design:

1. Yemeni farmers are eager to gain access to improved technologies. The rapid growth of fruit and vegetable production in Yemen was possible because farmers have been willing and able to apply production-enhancing technologies in response to market opportunities. Professionals active in the agricultural sector report that they are virtually inundated with farmer requests for assistance in increasing fruit and vegetable production or help in getting inputs.
2. The YARG's limited resources are most effective when focused on areas which have the greatest potential for success. Experience in Yemen and elsewhere underscores the need to avoid spreading services too thinly, particularly in the early stages of institutional development, as well as the dangers of relying on the public sector for too broad a range of services, reducing the scope for private activity while undermining the effectiveness of vital government services in such areas as policy and applied research.
3. Private input suppliers and marketers will respond strongly to meet farmer demand for services and to market their output. The energy and dynamism of Yemeni small businessmen and farmers has been amply demonstrated by recent experience in the expansion of irrigation, fruit and vegetable production, and marketing. This experience is in line with growing evidence worldwide that private input suppliers can play a vital role in bringing technologies to the farmer as long as the policy signals are right.

Based on these lessons learned, FPP includes a focus on the following areas:

1. Emphasis on Technology Improvement and On-Farm Production: While FPP will continue the varietal testing supported under HITs, it will emphasize the adaptation and development of technical packages that can be directly applied by farmers in Yemen. Applied, farmer-oriented research and extension are essential in order for FPP to be successful.
2. Close Cooperation with RDAs: In contrast to previous activities (many of which were focused on institutions in Sana'a and worked only indirectly with RDAs), FPP will work directly with the RDAs, which have major responsibility for implementation of the OHA component. Successful implementation in turn depends on the extent to which productive links are established with private farmers and input suppliers.
3. Direct support for input distribution systems: Private suppliers of inputs, particularly fertilizer, other agricultural chemicals, seedlings, and irrigation equipment, will receive direct assistance under the project's training, technical assistance and extension activities. As noted above, successful implementation of FPP depends on the extent to which productive links are established with private farmers and input suppliers in Yemen.
4. Strengthened Analysis of the Policy and Regulatory Regime: The project recognizes from the outset that the assistance anticipated will have minimal impact on agricultural development in Yemen if the agricultural policy environment is not right. Module three is intended to provide the analytical tools and policy studies to promote and sustain the development of a supportive policy environment.

The on-farm focus requires greater attention to assigning priorities among crops and regions in order to achieve a real impact at the field level. The project will therefore rely on a phased approach, beginning activities in a limited number of zones and products and expanding activities as dictated by experience gained and resources available.

This phased approach is also consistent with the need to ensure that adequate progress continues toward a regulatory environment favoring sound development of agribusiness and input supply systems, and with the need to coordinate with other donor-funded programs. It is clear that a major investment in the adaptation, development and extension of improved technologies can only pay off in an environment where farmers have ready access to information, markets, and agricultural inputs.

Project strategy centers around training, technical advice and commodity assistance for technical personnel in direct contact with farmers, including extension staff and input suppliers. The project's key on-farm horticultural applications (OHA) module will assist RDA and MAF personnel to develop and extend commodity-based technical packages in selected regions. The horticultural technology development (HTD) module will work with ARA to promote development of future packages through varietal testing and other on-station and on-farm research. The Support Systems for Agriculture (SSA) module will increase the nation's capacity to apply the recommended packages on a large scale by supporting a policy environment conducive to the rapid expansion of private input supply operations on a financially and technically sound basis.

B. Project Goal

The goal of the FPP project is to increase the production of high value cash crops on small and medium-scale farms in Yemen by raising the productivity of land, labor, and water resources. Although the project's expected impact extends beyond the farmers who will directly participate in project-funded activities, the most immediate impact on production and net farmer income will be in the areas where the project is working.

The target for achievement at the goal level is an average annual increase of 12 percent in the tonnage of target fruits produced in the districts in which the project is working, beginning in the third year of project activities in those districts (initial target fruits are stone fruit, e.g. apricot/peach/nectarine; pome fruit, e.g. apple/pear; and grape for the uplands, mango/papaya and date for the lowlands).

The target growth rate is twice the TFYP level of six percent annual growth for fruits and slightly above the rate of ten percent achieved in the 1984-88 period, according to MAF statistics. While it would be desirable to measure goal achievement in terms of net income, rather than physical production, the extreme difficulty of measuring small farmer income and the uncertainty regarding farmgate prices make this impractical.

C. Overall Project Purpose

The project's purpose is to provide farmers with the technology needed to increase net income through increased production of high value cash crops. Technology is defined as knowledge of techniques that will increase production on new and existing cash crops, together with access to the inputs and services needed to apply these techniques and economic incentive to do so.

The planned target for purpose achievement is set as full adoption of one or more technical packages by at least 20 percent of the farmers producing target horticultural crops in project districts and partial adoption by an additional 30 percent. Quantitative targets cannot be set at this time due to the lack of data on the number of farmers with fruit tree plantings in the districts identified for project start-up.

D. Project Modules

FPP will be organized into three basic modules, each of which has an assigned purpose, outputs, and inputs. The three modules and the purposes of each are as follows:

1. On-Farm Horticultural Applications (OHA), with support from the General Directorate of Agricultural Affairs (GDAA) within MAF, will work with the Regional Development Authorities to transfer knowledge of technical packages for target crops to the farmers in selected districts and among selected extension personnel and input suppliers.
2. Horticulture Technology Development (HTD) will support OHA by working through ARA to adapt and develop at least twelve technical packages for production of target fruits using improved and "baladi" varieties. HTD will also develop the capacity to test and extend such packages in the future, particularly in the areas of applied research, varietal screening, integrated pest management, and coordination with extension, including cooperation in the production and distribution of extension materials.
3. Support Systems for Agriculture (SSA) will establish a policy, regulatory, and analytic environment that will promote sound development of the agricultural sector, including the agricultural production, marketing, and input supply systems that support it. Among other activities, this module will improve the systems for control of pesticide and planting stock importation, undertake feasibility studies and economic analyses in the horticulture sector, and carry out the wide range of analytic and institutional development activities needed to establish a sound policy environment.

Project activities will be carried out through the Ministry of Agriculture and Fisheries. As noted earlier, operational responsibility for OHA rests with GDAA and the appropriate RDAs. Module two (HTD) will be largely implemented through ARA. Module three (SSA) will be largely implemented through the GDPS.

A Project Coordinating Committee (PCC), chaired by the Minister of Agriculture and Fisheries and including the USAID Director, individual YARG project heads (one each from GDAA, ARA and GDSP), USAID Project Officer and leader of the technical assistance team, will provide overall guidance and support in implementing each of the three modules. Further logistic, management and administrative support will come through a separate Project Support Unit (PSU), which will serve as a secretariat for decisions made by the Coordinating Committee and provide back-up support to the long-term technical assistance team.

E. The On-Farm Horticultural Applications Module

1. Background and Problem Statement

Agricultural extension in Yemen is carried out primarily by the Regional Development Authorities, of which there are three in the highlands (Southern Uplands (SURDA), Central Highlands (CHRDA), and Northern Region (NRDA)), one in the Tihama (TDA), and one in the Eastern Region (ERDA). Extension is supported by the MAF Extension Directorate and the DGAA, which is responsible for coordinating MAF activities with the RDAs. However, there is no national extension service as such.

Creation of the RDA system began with the establishment of the TDA and has received substantial assistance from the World Bank and other donors. The extension system is strongest in the older RDAs (SURDA, CHRDA, and TDA), particularly in parts of these regions where major donor inputs have been made. It is relatively weak or non-existent in other areas.

The extension system uses a modified form of Training and Visitation (T&V), with three levels. The RDAs consolidate Governates with similar development potential. CHRDA, for example, includes Sanaa and Dhamar Governorates, each of which has an extension coordinator and five subject matter specialists (agronomy, plant protection, horticulture, livestock, mechanization, and home economics). Within each region, there is a block center for each district (in principle; not all districts have established centers yet).

Each block in turn has an extension supervisor and a senior agronomy expert, as well as experts or assistants in the other five specialty areas. Individual blocks support eight to ten extension centers, which are staffed by an extension agent. The agent is usually an elementary or intermediate school graduate from the area who has received one year's training at the MAF Training Center. The system relies on semi-monthly meetings at the block center to transmit information to the agents and plan upcoming activities.

The main activities of the extension centers are the establishment of demonstration plots on the fields of lead farmers (designated contact farmers). The agent is also responsible in principle for supporting farmer associations (which are very limited in coverage), conducting extension meetings, field days, and market-day programs, and providing help in response to farmer requests.

Coordination with the research service is limited to semiannual meetings for exchange of information, occasional field visits by research personnel in response to requests, and attendance by researchers at field days. Both of the latter occur only infrequently. There is no on-farm research, but researchers may occasionally conduct verification trials.

The extension system is responsible for promoting and supporting all agricultural subsectors. In practice, farmer interest is greatest in the area of horticultural production and this activity receives substantial support, although it is not the main focus of extension work.

The system has only a limited number of verified technical packages for horticultural production, particularly for "baladi" varieties. Horticultural activities have centered around demonstration of improved varieties with little attention to production problems faced by the majority of horticultural producers. In addition, only limited technical support is available for informal agent activities in this area.

The system suffers from a lack of resources and, given its recent establishment, from a shortage of experienced personnel. There is virtually no contact with the input supply system, whether to transmit extension information, gather information on farmer-reported problems, or coordinate the availability of inputs recommended by the extension system.

Within the private sector, the input supply system is expanding rapidly, but is still deficient in its capacity to provide farmers with the inputs they need or the technical support to use them correctly. While some input suppliers have technically-trained personnel (many of whom were formerly associated with donor-supported projects), many do not. The inability of input suppliers to obtain a full range of chemical and biological inputs (fertilizer, pesticide, seedlings, etc.) prevents effective service to the farmer and encourages use of inappropriate materials.

There are approximately 25 medium-sized dealers specializing in agricultural inputs, and an additional 30-50 licensed dealers who sell agricultural inputs as well as other products. There are an estimated 1,000 or more small dealers who sell

agricultural inputs as an incidental part of a general retail business. In addition, international experience suggests that fruit traders and merchants may be willing to supply inputs to the growers with whom they have an established relationship, but this has not been confirmed in Yemen. Fruit marketing is well-established, and the feasibility of using this approach will be explored during implementation.

2. Purpose and End-Of-Project Status.

The purpose of the OHA system is to transfer technologies for high value cash crop production to farmers in the project areas. Transfer of technologies will take place through development of technical packages for target crops and areas and transmittal of these packages to farmers through the extension service, agribusiness and private input supply systems. By the end of the project, it is expected that a system for effective transfer and support of horticultural packages will be in place in seven districts (two in Central Highlands, two in Southern Uplands, one in the Tihama, and two in other regions). This system will include technology packages for both improved and "baladi" varieties, extension and private sector personnel trained in their application, an input marketing system capable of delivering the inputs required through the private sector, and an extension system with the capacity to continue and extend the technology transfer process.

3. Programs to Be Implemented Under the Module

OHA activities will be organized into technical programs designed to support ongoing extension operations under the RDAs. Six programs will be developed initially, with the potential to add additional programs in the second or third phase of the project if progress in the first six areas warrants expansion:

- a. The Irrigation technologies program will conduct demonstrations and train extension and irrigation company personnel to promote the use of water-saving or cost-saving irrigation technologies (including bubbler) and improvements to existing systems.
- b. Five commodity programs will be undertaken: stone fruit (peaches, apricots, and nectarines), pome fruit (apples and pears), tropical fruit (mango and papaya), grape, and date. Each program will conduct demonstrations on-farm and training programs for extension agents, private nursery personnel and inputs suppliers, and farmers (including farm women)

in the application of recommended technology packages. One or more packages will be developed in each commodity program for "baladi" varieties and one for improved varieties. Depending on the geographic extension of project activities and technical experience, more than one package may be developed for "baladi" or improved varieties under some or all of the commodity programs. For example, a low-input package may be developed for household production managed by farm women, or packages may be developed for different rainfall conditions.

- c. If progress in the first six programs warrants extension of project activities, commodity programs will be developed for some or all of the following commodities: nut (almond), coffee, and/or honey production. Expansion into selected vegetables is also possible, depending on the extent to which early activities in fruit are successful.

The training and demonstration activities will follow one of two models, depending on whether other donors are carrying out major activities with the RDA concerned:

- a. Where no donor program is currently in place, OHA will provide major support to the extension program, including support to development of the extension capacity, training in extension methods, and organization of demonstration plots. These activities will focus on the target horticulture crops.
- b. Where another program is under way, OHA activities will be limited to assistance in organizing demonstration of recommended packages in conjunction with existing demonstrations and training for extension and private sector personnel.

Activities under this module will be initiated first in the Central Highlands, Southern Uplands, and Tihama RDAs, with full-scale activities in at least one district in each region.

Preliminary discussions with the CHRDA suggest that activities should be initiated in Khowlan, expanding to either Raymah or Haraz in Sanaa and to one markaz in Dhamar. Project activities will also be initiated in one markaz (perhaps Zabid) in Hodeidah (TDA) in the first phase, with an emphasis on either date or tropical fruit.

Likely areas for further expansion include Saadah Governorate in the Northern Region. The selection of specific areas for

field work will be made in cooperation with the YARG based on three criteria: (1) the presence of an extension system with appropriate staffing levels; (2) the importance of horticultural production in the region; and (2) the presence of other donor programs (given the YARG policy of discouraging donors from undertaking parallel programs in the same region).

4. Module Outputs

While the specific outputs to be produced in the OHA program will be adjusted during preparation of annual workplans based on evolving experience, it is anticipated that the following activities will be achieved over the life of the project:

- a. Demonstration plots: In each extension center in which the project is working, the project will assist the agent in establishing two "baladi" demonstrations and two improved variety demonstrations for each program operating in that markaz, plus one bubbler demonstration and one other irrigation demonstration.
- b. Training for extension agents and input distribution personnel: One training session will be held annually for each technical program in each markaz where the project is active. Over the life of the project, more than 100 such sessions will be held, with each extension agent attending as many as three or four training sessions annually. Sessions will also be attended by private input distribution personnel, extension agents from outside the project area, other ARA and MAF personnel, and private farmers. Class size will be limited to 10-20 individuals in order to provide ample opportunity for hands-on experience with the skills being taught (such as pruning and grafting). To the extent possible, efforts will be made to ensure that at least half the personnel trained are from the private sector.

Additional activities, such as field days, extension workplans, and training sessions in extension methods, will be held but cannot be quantified at this stage.

Finally, this component will include a financial reserve for locust control, if required, in accordance with AID policy for the region; and limited "bridge" funding to cover continuation of certain activities underway or planned under HITS.

5. Module Inputs

The main AID-financed inputs anticipated under this module include: commodities to strengthen extension capacity including motorcycles in the Tihama and 4x4-type vehicles in the hilly areas; one long-term extension horticulturalist and one long-term irrigation specialist based in Sana'a; short-term technical assistance in extension methodology and horticultural production practices; supplemental operating expenses, including support to farmers establishing demonstration plots equal to half of the additional cost incurred; upgrading of extension centers if needed; and training operating costs. U.S. or third-country short-term training will also be provided to senior extension personnel and private sector agribusiness personnel. If feasible, assistance from Peace Corps personnel may also be sought and incorporated into this element of the project.

YARG inputs will include the assignment of technical counterparts for each member of the long-term technical assistance team; extension personnel and management personnel in MAF and the RDAs to implement project activities; operating expenses for the extension program, support for which needs to be expanded throughout the life of the project; training facilities in MAF and the RDAs; and planting material for demonstrations of improved varieties.

Private sector inputs, which are not included in the project budget, will include farmer contributions to the demonstration farms (costs over and above the farmers' usual costs will be shared on a 50-50 basis with the contact farmer in return for full cooperation in experiments and demonstration activities); private sector input suppliers' time and related expenses for attendance at training sessions; and other farmer inputs of time and material in the application of the technical packages.

F. The Horticulture Technology Development Module

1. Background and Problem Statement

Formal agricultural research in Yemen is of relatively recent origin. FAO/UNDP initiated the first such program in 1970, beginning work that led to the establishment of the research station at Taiz which now forms the core of ARA's network. ARA itself was organized in 1983 and now has six stations. The headquarters has recently been transferred to a new station at Dhamar, supervising work at the regional stations (Taiz, Zabid, Surdud, Ibb, and Radaa). Additional stations in the Northern Highlands and Eastern Region are in the early stages of development.

Work in the horticultural area to date has been limited to on-station varietal screening and some work with cultural practices. Contact with the extension service is restricted to joint planning meetings and occasional professional contact as described above. The skills of Yemen's research scientists are being rapidly upgraded through experience and formal training, but the system is still in the earliest stage of development.

This situation provides a unique opportunity to establish applied, farmer-oriented research on a sound basis in Yemen, without having to overcome the bias toward theoretical work that plagues many research systems worldwide. By moving quickly to establish and strengthen ties with extension and private sector professionals in the agricultural sector, FPP will help ARA make the greatest contribution possible to agriculture in Yemen.

Farmers have been experimenting informally since the dawn of agriculture in Yemen, however. This work is responsible for the extensive development of horticulture in Yemen. Such informal research by both small and large farmers continues today and is likely to provide "targets of opportunity" that can be supported during the life of the project.

The success of the on-farm applications activities under OHA will depend on the quality of the technical packages adapted and developed. The initial packages will be undertaken by the OHA technical assistance team in cooperation with personnel from ARA, based on experience in Yemen to date and international standards for horticulture management. Work under the HTD module will then provide the basis for modifying these packages and developing new ones over the life of the project, drawing on project experience and the findings of the applied research program.

2. Purpose and End-Of-Project Status

The purpose of the HTD Module is to develop technical packages for small farmer horticulture and to strengthen Yemen's applied research capacity to adapt, develop and extend such packages in the future. By the end of the project, it is expected that at least 12 technical packages will have been adapted or developed for at least five commodity programs as well as for small-farmer irrigation.

3. Programs to Be Implemented Under the Module

Five programs will be implemented under this module, which will operate under the overall umbrella of ARA with participation from other research stations and institutions such as Al-Irra and the University of Sana'a, the private sector, MAF, and the RDAs:

- a. The Technology Package Development Program will be the principal activity of this module. This program will refine the technical packages to be used in the OHA activities and develop extension and training materials to support these packages.
- b. Varietal Screening will continue, with an emphasis on the five commodity groups identified for emphasis under OHA.
- c. Under the Research Systems Program, the project will support establishment of a gene bank to preserve "baladi" varieties and provide a base for future research by planting selected representatives of "baladi" varieties on the stations; improvements in a soils lab to support both research and extension activities; and, depending on progress in other activities, a training program for horticulturists in tissue culture.
- d. Integrated Pest Management research will be continued with an emphasis on techniques suitable for application by small and medium-scale farmers.
- e. A Research and Study Grants Program will provide grants to support the following activities: (1) on-farm research trials by ARA researchers in collaboration with the RDAs; (2) collaborative horticulture research by ARA researchers in cooperation with personnel from the private sector, Sana'a University or other institutions; and (3) stipends for women students from outside of Sana'a studying agriculture at Sana'a University. The study grants program will also fund targetted long-term off-shore degree training at the M.S. and/or PhD level for research personnel, targetted short-term training for technical and managerial personnel at private input supply firms, and targetted short-term and M.S. training for MAF and other personnel.

The technology package program will include five sub-activities: on-station and on-farm testing of cultural practices in cooperation with personnel from the OHA module; evaluation of test results to determine the most effective and economically attractive packages; formulation of packages of specific recommendations for horticulture layout, orchard establishment, irrigation, pruning, fertilization, pest control, and other cultural practices; development of materials--handouts, posters, videotapes, etc.--for farmers, national media, extension workers, and input suppliers describing the package; and training for agents and input supply personnel in application of the package.

An important aim of the HTD module will be to instill in research and extension personnel alike the understanding that agricultural technology is evolutionary, a process of successive approximations moving toward a theoretical optimum that can never be reached in practice. Both the researcher and the extension agent must view their roles as part of a collaborative effort with the farmers to develop techniques that work on-farm. At all levels, they must recognize that the success of the program depends on going forward with what is available, not waiting for the ideal package or repeated verification trials before providing recommendations to the farmers.

4. Module Outputs

The principal output of the HTD module will be 12 or more technical packages for farmers. These packages, as noted above, include in addition to the recommendations themselves extension material suitable for various audiences (small and medium-scale farmers, farm women, input supply personnel, extension agents, etc.), and technical assistance and training programs for extension agents and private agricultural input suppliers. Each package will be modified annually on the basis of ongoing experience, research findings, and feedback from farmers, agents, and suppliers, as well as technical developments in the field.

Other outputs will include research findings funded through the research grants program and the research support systems identified above (soils lab, gene bank, and other equipment). The specific quantities of these outputs, and others such as the results of the integrated pest management program, are difficult to express in quantitative terms at this time.

5. Module Inputs

The AID-funded inputs to this component will include: three long-term advisers (one each in horticulture research, extension methods, and integrated pest management); short-term technical assistance; short- and long-term training in the United States and third countries; research and in-country study grants; extension training equipment and operating expenses; preparation of video tapes; orchard establishment for varietal screening and the gene bank; equipment and supplies for the soils lab and integrated pest management programs; and researcher expenses for on-farm trials and extension coordination activities (e.g., attendance at field days).

YARG inputs will include the assignment of technical counterparts for each member of the long-term technical assistance team; research personnel in ARA and MAF to implement project activities; operating expenses for the research program, support for which needs to be expanded throughout the life of the project; and use of ARA facilities and material for adapting, developing, and packaging improved varieties.

G. The Support Systems for Agriculture Module

1. Background and Problem Statement

Yemen currently benefits from a fairly open investment environment, with some exceptions. As trade and economic activity expand, both within Yemen and internationally, the challenge will be to preserve the openness of the current system while strengthening necessary incentives for Yemeni farmers and streamlining existing procedures to handle a larger volume of activity.

Many of the policy and regulatory issues facing the agricultural sector lie outside the jurisdiction of the Ministry of Agriculture and Fisheries. The greatest problem at present is the import licensing procedure, which is cumbersome and prone to delays and uncertainty. This problem results from the combination of administrative inexperience in the relevant offices and foreign exchange rationing resulting from an extreme foreign exchange shortage. Investment approvals are also reported to be a problem in some instances.

Although these regulatory systems lie outside the direct scope of this project, failure by the YARG to permit importation and support a policy environment that promotes productive investment in agriculture will severely reduce the effectiveness of the FPP and other horticulture development programs. At the present time, for example, fertilizer supplies are extremely limited and application rates have fallen well below historical levels because farmers simply cannot get fertilizer.

Clearly, there is little utility in developing recommendations for fertilizer, pest control or other improved technology packages if farmers cannot get their hands on them easily. The proposed strategy for dealing with this problem is closely linked to the project's phasing, which is discussed in section F below.

The Ministry of Agriculture and Fisheries also plays a significant role in regulation of agricultural inputs, both theoretically and in practice. MAF activities in this area

clearly lie within the scope of the FPP. MAF's primary responsibility is to ensure that adequate supplies of inputs are available to the farmers, a role that is best filled by allowing the maximum scope for development of a vibrant and competitive private sector. MAF's second responsibility is to protect the health and safety of Yemeni farmers, input suppliers, and consumers.

This role, a legitimate and important one for the development of agriculture in Yemen, requires the establishment of a regulatory and policy environment that provides incentives for all market participants without imposing overly cumbersome restrictions or discouraging investment.

The need for improved and streamlined systems is greatest in three areas:

- a. Pesticides. Pesticide importation must be regulated to ensure, at a minimum, that no unsafe chemicals are brought into the country and that packages contain adequate warnings and are suitable for the Yemeni market (e.g., package sizes are sufficiently small to discourage rebagging). At the same time, the regulatory environment should not overly restrict the importation of pesticides known to be safe, as such restriction encourages misuse of chemicals imported illegally.
- b. International trade in plant material: The MAF has a responsibility to prevent the importation of disease, whether transmitted on fresh fruits or in planting material. As Yemeni exports develop, the need for a phytosanitary certification system will also become a priority. The MAF also has a role to play in advising importers, many of whom are inexperienced and therefore prey to dishonest nurserymen abroad, but this role cannot extend to technical control over private importers without risking becoming a barrier to growth.
- c. Irrigation installation: Incorrect installation of new technologies such as bubbler and trickle systems would both impose a financial hardship on the farmers and endanger the acceptance of the technology. As MAF is promoting these technologies under the FPP and other programs, it is appropriate to develop a system for certifying (but not licensing) irrigation firms and a registry of complaints that farmers can check before selecting a contractor.

- d. Other Policy Issues: Other policy issues--many of them related to pricing and the trade regime--also affect horticultural development in Yemen. GDPS needs to develop the capacity to examine and/or commission outside studies to review the impact these issues have on agricultural development in Yemen and, where appropriate seek a wider audience for the research findings and promote needed adjustments.

The rapid development of the agricultural sector is generating pressures for increased information both within the YARG and from the private sector. MAF is receiving increasing requests for technical advice and assistance from private investors, for example, which it is not equipped to deal with at present. The large investments being made in public and private sector nurseries and other parts of the system also need to be monitored to help private suppliers avoid oversupply and identify gaps in time to fill them.

MAF is working to build capability in the areas of pesticide importation and plant quarantine, with the assistance of several donors. A draft pesticide law has been prepared, for example, and lists of prohibited chemicals promulgated. Additional assistance is necessary in these areas, however, including training for personnel at the operational level and streamlining of procedures to ensure that Yemen's limited institutional capacity is not overextended.

Finally, this module is aimed at strengthening MAF's own ability to undertake and commission policy-related research on issues that directly affect horticulture development in Yemen. From time to time, such studies will be funded in order to better define and understand the policy environment and, where needed, promote needed adjustments. In at least some instances, such studies will undoubtedly be relevant not only for horticulture but also for the entire agricultural sector.

2. Purpose and End-Of-Project Status

The purpose of the SSA module is to establish a policy, regulatory, and analytic environment that promotes the sound development of agriculture in Yemen, including the input supply networks that support it. By the end of the project, it is expected that an improved regulatory system will be in place that permits the rapid growth of the sector while providing appropriate protection to Yemeni suppliers, farmers, and consumers. This system will include a phytosanitary and quarantine service, an improved import approval process for pesticides and chemicals, and a system of certification for import suppliers and irrigation companies.

An important distinction must be made between certification and licensing. In the former case, suppliers may apply for certification, which they will receive if they meet certain conditions and which may be taken away if their performance is poor. Certification is not mandatory, in the sense that firms may enter into operation and remain in business without certification. Under a licensing system, by contrast, government approval is needed to operate and to remain in business. Experience with licensing indicates that the system generally becomes a major barrier to expansion of private sector operations, is prone to various types of abuse, and restricts competition.

3. Programs to Be Implemented Under the Module

The SSA module will be located within the GDPS and will undertake most of its activities within this unit, including the planning and analysis leading to recommended improvements to the regulatory systems in MAF. Implementation of these regulations will be carried out in cooperation with the appropriate MAF or other YARG agencies. A system of nursery certification, for example, would probably need to be located in the Horticulture Department, not in GDPS.

Five programs will be undertaken under the Support Systems for Agriculture Module; additional ones can also be developed during the course of implementation to take advantage of targets of opportunity that may present themselves:

- a. Horticulture Investment Support: FPP will assist the DGPS to prepare in coordination with GDAA horticulture profiles for the establishment of orchards in the target products, and, as resources permit, in other products (these profiles will not only provide guidance about which areas to invest in; they will also be used to avoid misallocation of resources by advising potential investors about areas in which future investment may be inappropriate). These profiles will be made available to investors on request, together with assistance in modifying them to meet the specific situation of the investor. The profiles will help new investors in the sector to avoid costly technical errors. In general, FPP will not undertake detailed feasibility analysis for individual investors.
- b. Import Regulations and other Policy Issues: The GDPS will undertake a review of the existing policy and regulatory environment for horticulture and horticulture inputs, including a review of similar

systems in the United States, Europe and elsewhere in the Arab world. Based on this review, the DGPS will formulate recommendations for changes in the existing system to streamline procedures and improve their effectiveness. The GDPS will then work with the appropriate MAF or other agencies to achieve the adoption of approved improvements. Other studies likely to be supported under this module include updates of the fertilizer, horticulture sector, and pricing and incentives studies, along with related economic and financial analyses and water conservation studies related to agricultural development in Yemen. At a broader level, these studies will help support the ongoing USAID-YARG policy dialogue on issues related to agriculture.

- c. Market System Analysis: The GDPS will prepare in coordination with the General Directorate of Marketing (GDM) a series of market system analyses to identify the current state of development and the main constraints to expansion in the target subsectors. A minimum of five commodity system analyses will be undertaken, each of which will provide information on: the current extent of production and its distribution geographically and among farm classes (large, small, household, etc.); the current distribution of varieties, including "baladi" varieties; the rate of expansion in acreage planted and the status of the various orchards (bearing, non-bearing); the availability of seedlings and their source (nurseries, farmers); the availability of other inputs needed for this crop; and the marketing system for the product. If resources permit, market system analyses will also be conducted for the irrigation, agricultural chemicals, and nursery subsectors and for other products. Market system analyses will be based on existing information, supplemented with small-scale surveys carried out in conjunction with the extension service, local universities, and ARA.
- d. Support to Horticultural Input Supply: At least two activities will be carried out under this program: (1) development of a certification system for nurseries and irrigation suppliers; and (2) transfer of the seedling production function from the MAF nurseries to the private sector. The latter activity will be designed and executed bearing in mind the need to maintain control over rootstock and budded seedling quality, the valuable contribution made by the public nurseries, and the potential for

continuing support to private nurseries. A specific plan to achieve this transition will be developed early in the project. This plan may, for example, provide for MAF nurseries to sell an increasing share of their output for final growing out to private nurseries, shifting gradually to the sale of rootstock to private nurseries and then to technical support only.

- e. Monitoring and Evaluation: GDPS will take the lead in developing and implementing a monitoring and evaluation system for the project. This system will rely on the market system analyses, as updated, reports of project activities, and monitoring of nationwide production and import data to provide a periodic appraisal of the status of the horticulture subsector. The system will also produce the information required to evaluate and adjust project activities during implementation. More broadly, efforts to improve the GDPS's ability to perform and sustain its policy and analyses function will also be supported.

4. Module Outputs

The principal outputs of the SSA module may be summarized as follows: at least five investment profiles (one for each target commodity); at least five market system analyses; one or more policy studies such as updates of the fertilizer and the pricing and incentives studies; one or more studies of the regulatory environment; analyses of the regulatory system for domestic inputs suppliers and importation, together with recommendations for improvement; and periodic status reports (similar to situation and outlook reports) for the horticulture subsector. The module will also produce various internal reports relating to FPP progress and achievements.

5. Module Inputs

Under the SSA module, AID will provide long and short-term technical assistance (at least one long-term adviser, initially in the area of economic analysis and later in the area of agribusiness development, and substantial short-term assistance); partial funding for in-country costs of surveys and travel associated with the market analyses and other studies; short-term study tours and short-term training in-country and overseas; and limited assistance to support the cost of analysis and report publication.

The YARG will provide the staff and facilities of the GDPS, GDM, and other MAF offices; designated technical counterparts for each member of the long-term technical assistance team;

operating expenses at increasing levels throughout the life of the project, including partial support to relevant surveys and analyses; and the resources of the existing public sector nursery system.

H. Project Phasing

Given the rapid evolution of the horticulture subsector in Yemen and uncertainties at the macroeconomic level, it is critical to ensure that the FPP design maintains sufficient flexibility to adjust to changing circumstances. In particular, AID regards project success as dependent on the existence of a policy and regulatory environment conducive to sound and rapid growth of private sector horticultural production, input supply, and marketing.

At the present time, horticulture development is inhibited by limited access to critical inputs, particularly fertilizer and agricultural chemicals. While this situation is attributable primarily to the shortage of foreign exchange, it nonetheless will greatly reduce the feasibility of project activities if it is not rectified in the near future.

These two considerations (as well as AID-internal programming constraints) are addressed by dividing the project into three phases, as follows:

1. Phase One will last from the project's initiation to approximately the end of the third year.
2. Phase Two will cover approximately years four through six.
3. Phase Three will include the last two years of the project.

At the end of Phases One and Two, a major internal assessment will be conducted by AID, the contractors, and the Government of Yemen. This assessment will address five main topics:

1. What have been the project's achievements to date?
2. In light of these achievements, is it appropriate to expand project activities into new geographic zones or new products, or is further work needed to consolidate ongoing activities?
3. How should ongoing programs be modified to improve their fit with prevailing circumstances?

4. To what extent are project activities likely to be sustained once the project ends?
5. Is the policy and regulatory environment consistent with rapid growth of the sector?

The final question will be addressed in large part by comparing actual levels of importation of fertilizer and other agricultural inputs with national requirements. If import levels are marketing systems are providing needed inputs at increasing rates, the environment will be judged adequate.

Based on the findings of these two assessments, the project design and implementation may be modified in one or more of the following ways:

1. Project activities may be reprogrammed within existing levels (transferring funds from HTD to OHA or vice versa, for example, or increasing in-country versus overseas training).
2. A portion of the project's resources may be reprogrammed to finance the importation of agricultural inputs (probably fertilizer) if the regulatory environment is judged by AID and the YARG to be good but import levels are seriously constrained by balance of payments problems outside the control of the YARG. Depending on the policy environment, a contingency representing ten percent of the AID project contribution (\$4 million) may be made available for this purpose.
3. The project may be scaled back, if progress in one or more of the modules is unsatisfactory or if the policy and regulatory environment is judged to be inconsistent with such a large investment in the sector.

The implications of this phasing for project implementation and budgeting are discussed in later sections of this paper.

I. Project Management

FPP will be implemented largely by MAF, ARA, and the RDAs. Coordination will be through a Project Coordinating Committee (PCC) consisting of the officially designated YARG managers of each module (e.g. one representative each from GDAA (for OHA), ARA (for HTD) and GDPS (for SSA); the USAID Project Officer; and the leader of the technical assistance team. The Minister of Agriculture and Fisheries will serve as ex officio head of this committee; the USAID Director or his designate will also serve as an ex officio member.

The Projecting Coordinating Committee will meet at least quarterly to discuss outstanding project issues, including policy, management, and implementation concerns related to FPP. Other meetings can be called at more frequent intervals as appropriate.

The small size of this committee (seven members at most), combined with the high-level support it should receive from its two ex officio members (the Minister of Agriculture and Fisheries, and the USAID Director) is designed to ensure that it is an effective coordinating unit, able to make decisions quickly and resolve any problems that may arise on relatively short notice.

The Project Coordinating Committee will be supported by a Project Support Unit (PSU) established by the project. The unit will be managed by the technical assistance team leader and supported by a Yemeni technical and administrative staff. A second expatriate with previous experience in management and logistic support may be hired for at least part of the project life to advise and implement management and logistic aspects of the project.

In addition to serving as a secretariat for the Coordinating Committee, the PSU will provide day-to-day coordination and support for all FPP project activities. In particular, it will be responsible for the administrative and logistic support required by all modules in such areas as training, commodity procurement, logistic support for the technical assistance team, etc. Annual work plans will also be developed within this unit for approval by the Project Coordinating Committee.

Finally, the Project Management Unit, with the active assistance and advice of the Project Coordinating Committee, will help organize a broad-based Horticultural Development Forum including representatives from relevant ministries, ARA, the RDAs, farmers, and private agribusiness and agricultural input suppliers. Members will be formally appointed by the Deputy Minister of Agriculture, with no fixed term.

The Forum will meet annually to discuss issues and, as appropriate, make recommendations relating to the horticultural sector and implementation of FPP. Forum members will also be available on an informal basis as resource personnel to advise project staff and support project activities.

At appropriate intervals--possibly every two or three years--the forum will also meet in conjunction with a national horticultural conference at which Yemeni scientists and horticultural personnel (including farmers and private input

suppliers) will present results of research work. International experts, agribusiness firms, and other donors will also be invited to attend these seminars to present the experience of other countries. From time to time, smaller crop-specific seminars and workshops may also be organized to discuss issues relating to specific crops or research findings.

J. WID Concerns

In keeping with recent guidance on this issue, WID concerns are integrated throughout the Project Paper rather than being confined to one isolated section. By way of summary, it should be noted here that efforts have been made to ensure that women are beneficiaries in each project module. Training and outreach programs aimed at women receive special emphasis.

The OHA module in particular has broad application to a wide range of WID concerns; this component cannot be successful unless special programs aimed at women are actively promoted and implemented. Extension programs, and training activities aimed especially at women are envisaged.

Similarly, the adaption and development of technology packages under the HTD component will have to take the role of women in Yemen's agriculture into account. Among other things, this module also features a scholarship program aimed at increasing the number of women in the Faculty of Agriculture and related programs at Sana'a University. Although implementation here will be difficult (the Faculty of Agriculture vies with the Faculty of Islamic Law in having the least number of women enrolled), attempts will be made to remove at least one bottleneck by providing living stipends for women from outside Sana'a to study at the university.

V. COST ESTIMATE AND FINANCIAL PLAN

Total project cost is estimated at \$54 million. A.I.D. will contribute \$40 million (nearly 75 percent of project cost), including training, commodities, operating expenses, technical assistance, and other costs, as shown in Table 2.

Table 2: USAID Contribution (LOP)

| <u>Project Element</u> | <u>Estimated Contribution (US\$)</u> |
|------------------------|--------------------------------------|
| Technical Assistance | \$18,000,000 |
| Training | 5,500,000 |
| Commodities | 4,600,000 |
| Other Expenses | 1,500,000 |
| Administration/Yemen | 4,000,000 |
| Administration/US | 2,000,000 |
| Audit and Evaluation | 400,000 |
| <u>Contingency</u> | <u>4,000,000</u> |
| TOTAL: | \$40,000,000 |

The Government of Yemen will contribute the equivalent of \$14 million (slightly over 25 percent of project cost). The YARG contribution will be primarily in the form of personnel for staffing and other in-kind goods and services (initial project design estimates suggested a Yemeni contribution of \$16.5 million; the figure indicated in the Project Paper thus represents a minimal level of in-kind support which is likely to be exceeded). The illustrative budget for the YARG contribution is shown below in Yemeni Rials (\$US1=YR9.75) in Table 3.

Table 3: YARG Contribution (LOP)

| <u>Project Element</u> | <u>Agency</u> | <u>Estimated Contribution (YR)</u> |
|------------------------|-------------------------------|------------------------------------|
| OHA Module | MAF/GDAA/ RDAs staffing | YR46,000,000 |
| HTD Module | ARA staffing | 23,250,000 |
| SSA Module | MAF/GDPS/ GDM staffing | 16,600,000 |
| Management | MAF staffing | 16,400,000 |
| Operational | General Support | 20,600,000 |
| <u>Contingency</u> | MAF | <u>13,650,000</u> |
| TOTAL: | | YR136,500,000 |

SEE FAR 3.104

Foreign exchange costs (including the full cost of technical assistance) are estimated to total 71 percent of AID's contribution to the project and just over 50 percent of total project costs.

Project cost estimates reflect USAID/Yemen experience and other information collected during project design. Inflation has been estimated at 5 percent annually for foreign exchange cost and 15 percent annually for in-country costs, while the rial-dollar exchange rate is projected to shift from 9.75 to 11.5 by the end of the project. As inflation at 15 percent would be expected to lead to greater devaluations in the rial than those projected here, the estimates are highly conservative in dollar terms.

Although not shown as separate line items in the budget, the project also includes a small reserve fund for locust control (as required by AID policy for the region) and limited funding to continue HITS-type activities until the technical assistance team under FPP is fully mobilized. Both these activities are to be managed out of the OHA module.

SEE FAR 3.104

VI. IMPLEMENTATION PLAN

A. Roles and Responsibilities

Primary responsibility for implementation of FPP rests with the YARG Ministry of Agriculture and Fisheries. As described earlier, a Project Coordinating Committee will be organized to coordinate activities and provide direction. This committee will in turn be supported by a Project Support Unit established under the project.

Specific operational responsibility for actual implementation of each of the project modules is shown below:

1. On-Farm Horticultural Applications: GDAA, working with the appropriate RDAs, will have overall coordination and planning responsibility. Activities in the field will be implemented in close cooperation and with the support of the relevant RDAs having responsibility for extension activities in each particular project area. Efforts will also be made to work closely with farmers and private input distributors during the course of implementation.
2. Horticulture Technology Development: The Agricultural Research Authority, which is responsible for applied research in Yemen, will oversee this module. ARA will coordinate research with personnel at other YARG facilities, including the Al-Irra and al-Joruba stations established under HITS, and Sana'a University. Here again, the module will be developed with the participation and support of private farmers, agribusinesses, and input distributors.
3. Support Systems for Agriculture: Implementation of this module, including project monitoring and evaluation activities within SSA, will be the responsibility of the MAF General Directorate for Planning and Statistics in coordination with other appropriate Directorates such as GDM.

Several other YARG institutions will be involved in the FPP at a comparatively minor level. The Central Planning Organization and the Ministry of Economy, Supply, and Trade will be asked to participate in the Horticulture Forum and will support and monitor project activities in accordance with their established responsibilities in the Yemeni Government. Work at the local level will be coordinated with the Agricultural Offices, local councils and other local authorities, following existing procedures.

Other Directorates of the MAF will also be involved to a limited extent in activities falling under their jurisdiction. These include the Plant Protection Directorate, the Directorate of Extension and Training, the General Directorate of Marketing, and the Irrigation Directorate, all of which will be called on from time to time to support or participate in project activities, in accordance with their respective roles and responsibilities. These organizations will also participate within the SSA module in the design and implementation of improvements to the policy and regulatory structure affecting their operations.

1. USAID Responsibilities

USAID/Yemen's involvement will follow standard project management procedures. The USAID Office of Agriculture will appoint a Project Officer, whose primary responsibilities will include management of technical assistance procurement, support to implementation, and financial and technical monitoring. The Project Officer will also have responsibility for procurement of goods and services until the technical assistance team is in place.

The USAID Director, or his designee, will also serve as an ex-officio member of the Project Coordinating Committee and attend meetings of the Horticulture Forum along with the USAID project officer for FPP.

The Project Officer will be assisted within USAID by a Project Committee, including representatives of the Program, Controller's and Contracting Offices. The Project Committee will review overall project progress and problems on a semi-annual basis and approve the contractor's work plans and objectives. Building upon its recent success in agricultural policy matters, USAID is also expected to take an active role in dialogue on possible policy and regulatory reforms to follow up on SSA-supported analysis and recommendations.

2. Technical Assistance Contractor Responsibilities

The services of a private U.S. firm, university, or non-profit organization will be contracted to provide technical assistance and training services to the FPP. The contractor will be managed under the AID-direct contracting mode, help organize the Project Support Unit within GDAA, and actively participate in the Project Coordination Committee. Under their contract, the contractor will also submit workplans and reports to USAID and the Project Coordinating Committee for approval.

The technical assistance team leader will have direct management authority over all team members, including local-hire technical and administrative personnel. The team leader will report in turn to the Project Coordinating Committee, which will provide overall policy guidance and direction and ensure effective liaison with other MAF and YARG agencies participating in the project.

Informal coordination between TA team members and the management and technical staff of the institutions with lead responsibility for specific components will naturally take place on a day-to-day basis. For example, the research and other personnel assigned to the HTD component will report to the team leader and through him or her to the PCC. At the same time, they will work closely with the Director and technical staff of ARA and will, in effect, have a secondary reporting responsibility to the Director.

The technical assistance contractor will be responsible for organizing the Project Support Unit, recruiting short- and long-term technical assistance, procuring goods and services purchased in Yemen or overseas, and arranging all training activities, whether in the United States, Yemen, or third countries.

In addition to the special technical and substantive studies and reports required for the project, the contractor will also be required to prepare and submit the following reports:

1. An Overall Project Workplan, including a workplan and budget for the first year, will be submitted within three months of the team leader's arrival in Yemen.
2. Annual Workplans and Budgets for each subsequent year, the latter following a similar format to the Conceptual Framework Matrix now used by USAID for the ADSP. The annual workplans will reflect and support project goals and purposes, and detail the specific implementation targets and actions for the year and link them to specific inputs of financial and other resources. The Annual Workplan will also discuss progress over the past year, problems encountered and corrective actions taken. The approval of USAID and MAF through the Project Coordinating Committee will be required as part of the approval process for this document.
3. Quarterly Implementation and Financial Reports discussing progress made against the Annual Workplan, expenditures incurred, problems encountered and corrective actions taken.

Other reporting requirements will be negotiated and specified in the Annual Workplans, such as specific technical reports or more detailed plans for specific activities.

3. YARG Responsibilities

YARG responsibilities include appointment of individual YARG project managers for each project module (the OHA manager will come from GDAA; the HTD manager from ARA; and the SSA manager from GDPS); establishment of a Project Coordinating Committee, with the Minister for Agriculture and Fisheries serving as ex-officio chairman and each of the project module managers also being represented; support for establishment of the Horticulture Development Forum; and appointment of appropriate counterparts to work with each member of the technical assistance team. Implementation of individual project modules by the respective YARG project managers and their organizations will require the full support and cooperation of individual counterparts and institutions at all levels (ARA, RDA, etc.).

B. Procurement Plan and Contracting Arrangements

USAID/Yemen and the project's Prime Contractor will be responsible for procurement of all goods and services and for the management of all AID-financed project costs within the guidelines specified in the Annual Workplans and agreed upon by the Project Coordinating Committee, USAID, and appropriate YARG agencies. Except in cases where procurement waivers are provided in this Project Paper or during implementation, the authorized source and origin of all eligible goods and services will be Geographic Code 000 (United States and Yemen).

1. Commodities

In general, commodities will be procured from Code 000 (U.S. and Yemen source and origin) and Code 941 countries. However, waivers will be sought to procure vehicles, computers, photocopy equipment, and plant material from Code 935 countries (all free world).

Expendable commodities such as office supplies will be purchased off-the-shelf in Yemen. Purchase of shelf items of non-Yemeni, non-U.S. source or origin is not expected to exceed 10 percent of the total local costs financed by AID.

Waivers for procurement of pesticides will be sought during implementation when the specific types and amounts of pesticides to be procured with AID funding are known, to the extent that such waivers prove necessary.

2. Technical Assistance Services

The services of the technical assistance contractor will be obtained through free and open competition. Institutions, firms, private voluntary organizations, or a combination thereof will be eligible. The RFP will state that offerors are encouraged to include the services of a U.S. research institution with experience in extension, such as a university or non-profit organization, and will encourage the full participation of Gray Amendment firms and institutions.

Restriction of competition to Title XII institutions or Gray Amendment firms alone would however seriously prejudice project success. The project requires that the technical assistance contractor combine expertise in research, training, and extension with strong skills in project management, procurement, agribusiness development and regulation, and other areas. Based on experience in Yemen and elsewhere, it appears unlikely that a university or university consortium by itself can provide satisfactory services in these diverse areas.

The scope and complexity of the FPP is also judged to make the project inappropriate for a Gray Amendment firm or other small business set aside. Bids by Title XII institutions and Gray Amendment firms as lead or subcontractors with other organizations will be encouraged. In evaluating proposals submitted, preference will be given to proposals including small and minority business participation, other factors being equal.

The project analyses and Mission experience demonstrate that the best way to obtain the highest quality of services for the FPP at an appropriate price is to allow free play to market forces, permitting U.S. institutions to organize themselves based on their comparative strengths and experience.

Given the uncertainties in the Yemeni economic environment and the need to retain flexibility in keeping with the project's phasing plan, a three-year renewable contract is recommended. The RFP will state that the Mission expects to extend the contract for an additional period of up to seven years without further competition. Assuming adequate contractor performance, a single contractor will remain in place throughout the life of the project.

The technical assistance team personnel requirements envisaged under the project may be summarized as follows (some modifications of this list may be made in the RFP or suggested by the offerors and written into the final contract):

- a. Long-term personnel: nine persons, including the team leader (86 months); a management/logistic support specialist (60 months); one deciduous horticultural extensionist (78 months); one irrigation extensionist (76 months); one research horticulturalist (76 months); an extension methods specialist (76 months); an integrated pest management specialist (76 months); an agricultural economist (48 months at the beginning of the project); and an agribusiness specialist (43 months beginning later in the project). The long-term technical assistance team will reflect a combination of both US and third country personnel.
- b. Short-term expatriates: 117 months, including project management and home office support (17 months); OHA (34 months); HTD (34 months); and SSA (32 months)
- c. Long-term local-hire: 22 staff members, including personnel for project management (administrator of Project Support Unit, 86 months; financial manager, 86 months; training coordinator, 86 months; and secretary, 86 months); OHA (women's extension trainer, 84 months; general extension trainer, 84 months; administrator, 85 months; two secretaries, 85 months each; three drivers, 85 months each); HTD (administrator, 85 months; financial manager and grants coordinator, 84 months; research coordinator, 84 months; extension publications manager, 84 months; two drivers, 85 months each); and SSA (monitoring and evaluation specialist, 84 months; reports specialist, 84 months; secretary, 85 months; and driver, 85 months)
- d. Short-term local-hire: 63 months, estimated at 21 months for each module

The RFP will note the desirability of staffing several of the positions with Arab-speakers and the ready acceptance in Yemen of technical personnel from other countries in the region. The project budget reflects the assumption that some of the long-term TA positions will be staffed by such personnel in the project out- years.

3. Summary of Procurement Plan and Method of Payment

Although the largest portion of project expenses will be channeled through the principal technical assistance contract, some project support (both goods and services) will be managed

directly by USAID. On a pilot basis, efforts may also be made on occasion to "test" procure needed goods and services using host country contracting methods.

Project expenses channeled through the technical assistance contractor will be handled through two separate mechanisms:

- a. Most off-shore costs, including the salary and allowances of long- and short-term personnel on the technical assistance team, procurement of major items (e.g. vehicles), and off-shore training, will be handled on a disburse-and-reimburse basis (or, if the prime contractor is a non-profit firm, on an advance-and-voucher basis). Accounting and billing for these expenses is expected to be provided by the contractor's home office, and G&A is expected to be paid under the contract for these services.
- b. Most in-country costs and minor off-shore procurement (e.g., planting material or irrigation equipment needed for demonstrations) will be handled by the contractor staff in-country; administrative personnel for this function are budgeted under the contract. These costs will be managed through an advance-and-voucher system, under which the USAID controller will advance funds to a dollar account and a rial account managed by the contractor and held in a Yemeni bank.

The second funding channel will be used to finance most project operating costs, including in-country training; demonstration plots and other extension activities; applied research activities and preparation of extension materials; TA team operations; surveys, publications, and in-country consultants for the SSA module; in-country travel by project and YARG personnel; the horticulture seminars and workshops, etc.

Prior approval of the YARG project manager for the individual project module concerned will be required for these expenditures, and the contractor will be expected to follow prudent procurement procedures (comparative shopping, pro forma invoice bids, etc.). Management of the funds will be the responsibility of USAID and the U.S. contractor, however. Because the accounting for these activities is expected to be conducted wholly in-country and the management costs associated with these expenses are considered a direct contractor cost, it is anticipated that G&A will not be charged on these expenses.

Figure 1: Main Procurement Responsibilities

| <u>Good or Service</u> | <u>Responsible Agent</u> | <u>Method of Payment</u> | <u>Approximate Amount</u> |
|---|--------------------------|--|---------------------------|
| Commodities required prior to TA team arrival: Vehicles for TA team Initial set of extension vehicles Office upgrade for TA team and first two districts First horticulture workshop Initial surveys | AID | Direct L/Comm | \$400,000 |
| Technical assistance and other project services Long-term team Short-term TA Off-shore training In-country training Other off-shore procurement Other in-country procurement | AID | Direct reimbursement | \$30,000,000 |
| Research and study grants | AID | Grant (stipends) or advance-and-voucher (research) | \$1,000,000 |
| Additional project goods and services needed to support project | AID | Direct | \$2,000,000 |
| Evaluation | AID | Direct reimbursement | \$400,000 |
| HITS bridge funding | AID | L/Comm or direct reimbursement | \$600,000 |

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C. Implementation Schedule

A preliminary project implementation schedule is shown in Figure 2. This schedule will be further refined and adjusted in the process of developing the first workplan.

Figure 2:
Preliminary Implementation Schedule

| <u>Action</u> | <u>Date</u> | <u>Agent(s)</u> |
|-----------------------------------|-------------|-----------------|
| <u>Central Project Activities</u> | | |
| Grant Agreement Signed | 9/89 | USAID/MAF/CPO |
| Initial CPs Met | 11/89 | MAF |
| RFP Issued | 12/89 | USAID/MAF |
| Vehicles Ordered | 12/89 | USAID |
| Proposals Received | 3/90 | ACO |
| Contractor Selected | 5/90 | USAID/MAF |
| Contract Signed | 6/90 | USAID/ACO |
| Contractor Arrives | 8/90 | CONTR |
| First Horticulture Forum | 9/90 | USAID/MAF/AFA |
| First Annual Workplan Due | 11/90 | ACO/MAF/USAID |
| Subsequent Workplans Due | 8/91-96 | ACO/MAF/USAID |
| Phase One Assessment | 7/92 | USAID/MAF/CONTR |
| Mid-Term External Evaluation | 9/93 | USAID/MAF |
| Phase Two Assessment | 7/95 | USAID/MAF/CONTR |
| End of Project Evaluation | 3/97 | USAID/MAF/IQC |
| PACD | 9/30/97 | USAID/MAF |

On-Farm Horticulture Applications Module

| | | |
|--|-------|-------------------------------|
| Preliminary Technical Assessment for Deciduous Tree Crops | 9/90 | CONTR/MAF |
| Identification of Initial Package for Peach Program | 10/90 | CONTR/MAF |
| Development of Extension Training Program for Peach | 12/90 | CONTR/MAF/CHRDA |
| Extension Agent Training Program for Peach | 2/91 | CONTR/MAF/ARA/TDA |
| Input Suppliers Training Program for Peach | 3/91 | CONTR/MAF/ARA/CHRDA/ SURDA |
| Development of Extension Training Program for Date | 3/91 | CONTR/MAF/CHRDA |
| Nurserymen Training Program for Peach | 4/91 | CONTR/MAF/ARA/CHRDA |
| Extension Agent Training Program for Date | 4/91 | CONTR/MAF/ARA/TDA |
| Input Suppliers Training Program for Date | 5/91 | CONTR/MAF/ARA/TDA |
| Establishment of 5 Demonstration Plots for Peach (Baladi) | 5/91 | CONTR/MAF/CHRDA/ SURDA |
| Nurserymen Training Program for Date | 6/91 | CONTR/MAF/ARA/TDA |
| Establishment of 5 Demonstration Plots for Date (Baladi) | 7/91 | CONTR/MAF/TDA |
| Establishment of 4 Irrigation Demonstration Plots | 8/91 | CONTR/MAF/CHRDA/ SURDA |
| Expansion into Fifth Markaz | 7/92 | CONTR/MAF/RDA/SSHRDA |

Horticulture Technology Development Module

| | | |
|--|-------|-----------------|
| Development of Research Plan | 10/90 | CONTR/ARA/USAID |
| Development of Criteria for Research Grants | 11/90 | CONTR/ARA/USAID |
| Procurement of Additional | 11/90 | CONTR |

Seedlings for Screening

| | | |
|---|-------|-------------------|
| Development of recommended package for improved peach | 11/90 | CONTR/ARA |
| Development of extension materials for peach | 1/91 | CONTR/ARA/MAF |
| Development of recommended package for improved date | 3/91 | CONTR/ARA/TDA |
| Establishment of Baladi Gene Bank at Dhamar | 4/91 | ARA/CONTR |
| Granting of first research grants | 4/91 | USAID/ARA/CONTR |
| Development of extension materials for date | 5/91 | CONTR/ARA/MAF/TDA |

Support Systems for Agriculture Module

| | | |
|---|-------|-----------|
| Baseline survey of target fruit producers | 5/90 | MAF/USAID |
| Development of monitoring and evaluation plan | 11/90 | MAF/CONTR |
| First investment profiles prepared | 12/90 | MAF/CONTR |
| First market analysis prepared | 2/91 | MAF/CONTR |
| First regulatory analysis completed | 4/91 | MAF/CONTR |
| Ten investment profiles prepared (2/product) | 6/91 | MAF/CONTR |
| Five market analyses prepared | 8/91 | MAF/CONTR |

E. Training Plan

Training for YARG staff and Yemeni farmers, input suppliers and agribusiness personnel will be a major focus of project activity. Training will be directed at three main groups and in every instance will be targetted to fill gaps, meet identified needs, benefit project activities, and support the long-term goals and purposes of the project:

1. Professional Personnel at MAF, ARA, and the RDAs will participate in short-term training courses in country, in third countries, and in the United States. A limited number of personnel in technical or managerial positions in MAF, ARA and the RDAs will receive targetted long-term degree training in the United States or third countries in programs that support overall project goals and objectives.
2. Farmers, Extension Agents and ARA Specialists in Horticulture will participate in in-country training courses. Extension supervisors and subject matter specialists at the block, governorate, or RDA level may be sent for targetted short-term training in the U.S. or third countries in programs directly relevant to the project.
3. Private Agribusiness and Input Supply Personnel will participate in in-country training courses and short-term training in the United States and third countries. These personnel will include professional and managerial personnel affiliated with Yemeni agrichemical distributors, nurseries, and irrigation companies.

As a target, the goal is to include individuals from the private sector in at least one-fourth of the short-term training slots overseas (U.S. and third country) and at least one-third of the in-country training slots. It is envisaged that not less than ten percent of all the training slots will be made available to personnel representing private sector agribusiness and input supply concerns.

Training will be the responsibility of the managers of individual project modules with the assistance of the technical assistance team leader and a full-time local-hire training coordinator. A training plan is to be developed early in the life of the project specifying areas and types of long-term study under each module.

In-country training will be conducted at the MAF training center, ARA, or RDA facilities. Trainers will be drawn from the technical assistance team and ARA, MAF, RDA and contractor personnel, supplemented by short-term technical assistance. This personnel requirement is included in the budget for short-term technical assistance, as it is anticipated that most short-term consultants will be called on to participate in at least one training session in-country and that the timing for their trips will be set to maximize their participation in training activities.

In addition to these formal training activities, FPP will involve a range of informal and on-the-job training. First, the technical assistance team will provide on-the-job training to counterparts and other Yemeni personnel. Second, the OHA module will include a high level of training for men and women farmers as part of the extension program. Most of this training will take the form of sessions organized around the demonstration farms, such as field days and market-day activities, as well as training for the demonstration farmers themselves in the course of the work.

Finally, the HTD component will include a program of stipends for female students majoring in agriculture, home economics, or other agriculture-related fields at the Sana'a University Faculty of Agriculture. It is anticipated that at least thirty female students from outside the Sana'a region will be sponsored for a four-year course of study over the life of the project, beginning with five in the project's second year and adding at least five more in every subsequent year. Since education at Sana'a University is virtually free, the focus of these sponsorships will be on providing expenses for living in Sana'a, a problem that seems to constitute a bottleneck for families that would otherwise be interested in having their daughters receive an education.

It is anticipated that up to 115 short courses will be given in-country over the life of the project, building up from three courses in Year Two to 26 courses in the final two years of the project. In general, one course will be conducted annually per district for each program active in that district at that time, but the courses will differ from year to year. Courses are expected to be limited to 1-2 weeks to permit attendance by farmers, private sector personnel and extension agents from the RDAs. Courses will be small, with a heavy emphasis on practice of the techniques (e.g., pruning) being transferred.

Attendance at these short in-country courses is anticipated to average 10-20 persons per course and to be made up of one-third extension agents and other RDA personnel, one-third MAF or ARA personnel, and one-third from the private sector. Special courses designed exclusively for women are planned.

While each course will be tailored to the individual circumstances and requirements of the participants, preparation of course material will be simplified by the high degree of overlap across courses. Many of the courses will include common elements, such as methods for storage and handling of pesticides, which will vary little from course to course.

Other courses will provide refreshers or more detailed information on subjects covered in earlier courses. For example, the initial course on upland peach for one district might be followed the next year by a similar course directed to a different geographic region, a refresher course for extension agents and private sector personnel from the year before, a course on improved peach varieties, or a specialized course on grafting for nursery personnel.

A total of 20 individuals are expected to receive long-term training at the Masters level, ten in the U.S. and ten in other countries. This training will be provided to MAF and ARA personnel, although individuals from the private sector and from other public sector organizations may be considered for long-term training if space and suitable candidates are available. Up to five PhDs may be provided for ARA scientists in areas targeted by the project.

Long-term overseas training will be concentrated in agricultural economics, pomology and tropical horticulture, breeding and selection, irrigation, pest control, and extension. A.I.D. funding under the project for MSc degrees will be limited to 36 person-months overseas per candidate (3-4 years, depending on the schedule). While candidates who have not completed their degree programs at the end of this period may choose to remain in training, funding for this training must be provided by the YARG or from other sources.

E. Monitoring and Evaluation Plan

1. Source and Use of Information

Good data is essential for both public sector and private sector planning. This need is particularly urgent in the horticultural sector in view of the relatively small domestic market for horticulture products, the limited potential for rapid export growth in the near term, the relatively high investment required to establish an orchard, and the long lag time between planting and production.

A current shortage in a particular product does not necessarily provide a good indication of the need for investing in new orchards, as large acreages may already be established but not yet bearing or existing trees may have the capacity to meet demand at a lower cost with better management. Such a

situation clearly has implications for both the private and public sectors. Private investors need a sound basis for making investment decisions, whether in the orchards themselves or in input supply, marketing, irrigation, and related areas. Public institutions need information to allocate research and extension funds, nursery support, and import restrictions (as long as the latter are based on non-market allocation systems).

The SSA module includes a number of activities designed to improve the information available for investment planning by the public and private sector. These activities will improve data availability on acreage, production, and yield for key horticulture crops. These data serve a dual purpose under FPP. First, they will directly support and contribute to project activities, including agribusiness support. Second, they will generate much of the information needed for project evaluation at the goal and purpose levels.

This data-collection activity will disaggregate production by size of holding, providing a better understanding of the current sources of production for the main horticulture crops and assisting project managers to track the project's impact on small farmers and women managing household production units.

A comprehensive data collection, monitoring and evaluation plan will be developed during the first year of the project, specifying in more detail the types of information available and to be generated by the project, how this information will be collected and analyzed, and the reports to be generated for project monitoring and evaluation. This plan will emphasize repeated, small-scale surveys rather than one-time, large-scale data collection efforts.

2. Evaluation Plan

At least two external evaluations will be conducted during the course of the project:

- a. First, a process evaluation will be organized under an IQC or other mechanism and will be conducted approximately 18 to 24 months after the contract team has mobilized. This process evaluation will focus on the extent to which effective relationships have been established with YARG counterparts and the effectiveness of the management systems in place. In effect, it will assess the likelihood that the project, as currently organized and implemented, is poised to achieve overall project goals. An element of this evaluation will necessarily also review the policy environment and the extent to which policy signals are in place that promote horticultural development in Yemen.

- b. Second, an impact evaluation will be organized approximately six years into the life of the project. Although noting project progress at the input and output levels, it will also assess the extent to which objectives at the purpose and goal level are being met. It will also serve to set directions for future A.I.D. support in agriculture, if appropriate.

External evaluations of this type will be supplemented from time to time by internal assessments conducted by A.I.D., YARG, and contractor personnel which reexamine the feasibility of support to the horticultural sector in view of domestic policy conditions, with particular attention given to the availability of inputs through the private sector.

Both types of evaluation will support project implementation. The external process and impact evaluation will take an independent look at project progress and recommend mid-course corrections, following accepted A.I.D. and YARG practice.

The internal assessments will have a different role, although they will also provide an opportunity for internal stock-taking by the parties responsible for the project. The primary purpose of these assessments will be to determine whether private suppliers are able to import the inputs needed for an expansion of horticultural production (plant material and agrochemicals) and, if not, whether this situation results from an actual shortage of foreign exchange or from the continuation of YARG regulations (whether implemented by MAF or other units) that inhibit private activities.

Depending on the findings of these internal assessments, A.I.D. and the YARG will decide whether to (a) continue the project as planned; (b) use contingency funds to help finance limited additional quantities of agricultural inputs through the private sector; or (c) scale back project activities.

3. Issues to Be Addressed by Evaluations and Assessments

The primary questions, indicators, and data sources for project evaluation may be summarized as follows:

a. Goal-Level

Questions: To what extent are horticultural yields increasing? What factors are most responsible for increased yields? Why has production increased more in some areas (with or without direct project assistance) than others? Are women and small farmers participating equally in achievement of yield and income gains?

Indicators: Yields (per hectare) for target crops, disaggregated by source of production and region; country-wide production of fruits; crop prices; policy adjustments undertaken.

Data Collection Methodology: Examination of statistical data collected by the MAF, ARA and RDA activities. The data collection, monitoring and evaluation plan to be prepared in Year One will identify further the sources of information available and the need to supplement them through small-scale surveys of participating and non-participating farmers in the project area.

b. Purpose Level

Questions: To what extent has the project been successful in enabling farmers to adopt improved farming practices? What practices are they actually using? To what extent has the project been successful in assisting the private sector to expand support to farmers' utilization of those practices, whether directly through training or indirectly through improvements to the regulatory environment? Why are some farmers in the target areas utilizing improved practices and others are not? To what extent are women using the improved practices? To what extent are project-recommended inputs available through private suppliers? What factors facilitate or hinder that adoption?

Indicators: Number and location of bubbler systems installed; changes in use of inorganic fertilizer and other agrochemicals; sales of improved varieties of fruit trees; number of technology packages developed.

Data Collection Methodology: Data on purpose-level indicators is not currently collected by the MAF or the RDAs. The technical assistance team will work with the GDPS to develop and implement activities to collect this information through small-scale surveys in the project area, particularly surveys of input suppliers, irrigation supply firms, and nurseries (public and private).

c. Output Level

Questions: Have the planned number of technical packages been produced? Have the planned number of demonstrations been established? Have planned training courses been conducted? Have the horticulture investment profiles, market system analyses, regulatory studies, and horticultural production system data been produced and made available to interested parties in the public and private sectors?

Indicators: Hows many technical packages have been developed? How many packages are ready for extension (with extension materials and courses developed)? Is the material appropriate for women and other small farmers? Is the extension program being implemented effectively (field days, etc.)?

Data Collection Methodology: The information needed to assess project progress at the purpose level will be drawn from project workplans and reports and from examination of project records by the evaluation team.

VII. SUMMARY OF PROJECT ANALYSES

A. Technical Analysis

The project technical analysis is presented in the Annexes, which demonstrates that the applied research program and improved practices to be proposed (improved varieties, cultural practices for horticultural crops, including fertilizer application and pest control, and improved irrigation) are appropriate to conditions in Yemen and address the constraints to increased production of high value crops.

1. Fertilizer and Other Cultural Practices

The use of inorganic fertilizers was unknown in Yemen until the late 1960s. Although the use of fertilizers has increased dramatically since that time, growth has been sporadic and there has been a sharp reduction, due to the cutback in import levels since 1983, caused by the shortage of foreign exchange, import regulation policies, and a reduction in donor grants of fertilizer. Yemen's use of inorganic fertilizer is among the lowest in the world and is wholly dependent on imports.

Trials clearly indicate that high value crops are very responsive to fertilizer and that its proper application makes good economic sense. At the present time, urea currently accounts for more than three-quarters of the fertilizer applied. Input distributors and farmers are generally unfamiliar with N-P, N-P-K, and other compound fertilizers and their application, as these products are generally not available in Yemen. The limitation on import levels has contributed to high prices and has restricted development of the marketing and distribution systems for fertilizer, as well as limiting the quantities available.

In the case of fruit production, only a minority of farmers in Yemen regularly follow such standard cultural practices as pruning and pest control, due to the lack of technical information and the relative recency of the shift toward commercial production of these crops. The absence of these practices, together with the low yields achieved in Yemen, suggests that substantial yield increases could be achieved by introducing simple, well-proven techniques for orchard management.

The FPP project will rely primarily on transfer of these technologies to farmers and on support to the expansion of acreages in improved varieties. The project will promote the increased use of inorganic fertilizer and other inputs through training for extension agents, private farmers and input suppliers, as well as adaptive research to refine technical information available to users.

The project will also generate analysis and information on the regulatory environment for fertilizer importation and distribution and the need for improvements in current regulations and their application. This analysis is expected to promote greater availability of inputs over the life of the project, but, to the extent that the current shortage is the result of macroeconomic factors limiting imports (exchange rate valuation, etc.), increased information on the need for agricultural imports can have only a limited effect on import levels. Under the current system, however, import quotas are set by MEST based on recommendations from the technical ministries, including MAF, and consequently there is some scope for increasing the allocation for fertilizer and other agricultural chemicals in the absence of a full-scale reform of importation procedures.

2. Irrigation

a. Water Resource Setting. Over the past two decades a new technology, pump irrigation by wells, has swept much of the country. The boom in drilling and pumping, which is estimated to add approximately one thousand wells annually, is completely unregulated at present. There is no system of groundwater rights in the country or other control on private drilling. This situation has resulted in rapid declines in the groundwater levels in nearly all basins and in alarming drops in the more intensively used areas such as the Sana'a basin. The need for irrigation technologies that improve on-farm water use efficiency and reduce transmission losses between the well and the field is strong.

Irrigation has also expanded through the construction of permanent diversion weirs on major wadis to divert more flood flows onto the upstream reaches of their alluvial fans, particularly in the Tihama. This practice, heavily supported by donor funds, has proven flawed as the weir pools have rapidly filled with alluvium and the diversions have increased inequalities in water access between upstream and downstream users. Increased pumping in the lower reaches of the Tihama wadis is also resulting in seawater intrusion.

Despite the very large number of water resource studies completed in recent years, estimates differ widely on sustainable pumping levels and the rate of recharge in the major wadis and upland basins. The rapid fall in the water table and increasing seawater intrusion provide strong evidence that current rates are unsustainable, however. In this situation, more efficient use of the limited water resource is the only sound strategy and is being promoted by the World Bank, USAID, and other donors. The FPP project will assist farmers to adopt more efficient irrigation methods on higher value crops by training extension and input supply personnel in such methods and thus fits well within this strategy.

b. Bubbler Irrigation. One of the technologies to be promoted by the project is a relatively new irrigation technology, "bubbler" irrigation, which uses an exceedingly simple, low-head system of narrow-gauge tubes to distribute water by gravity from a central storage point (such as a tank) to furrows or small basins. Because the system operates without pumps or emitters and applies water in an easily controlled manner directly to trees and vines, it is highly appropriate in the Yemeni situation. It has been tested on four installations in the central uplands of Yemen and has worked well. The equipment necessary is readily available from plumbing shops throughout the country; thin-walled PVC piping suitable for bubbler irrigation is made in-country.

While the need for custom design and often for buried installation of the piping system results in high installation costs in Yemen's environment of high labor and materials cost, economic analyses indicate its economic viability for small farmers. Moreover, while the costs of pipe and fittings are high at present, competition between manufacturers of the pipe and production of pipe specifically for agricultural (rather than domestic) use could result in lower prices. The project will install demonstrations and work with local suppliers to increase the availability of bubbler irrigation to the farmers and farmer understanding of the system.

c. Other Irrigation Technologies. The project will also work with extension agents and input suppliers to demonstrate and apply other technologies to increase the field efficiency of water use and reduce transmission losses. The specific technologies will be selected and refined over the life of the project, but are expected to include installation of buried or surface piping to convey water to the field, replacing open channels, and flexible gate pipe to supply water to furrows, and other techniques identified through the applied research activities under the HTD module.

3. Horticulture Support Systems

Yemen's horticulture subsector is characterized by a great many very small producers working with traditional know-how and few inputs and, in consequence, achieving low yield and poor quality. As a result of the embargo on fresh fruit and vegetable importation in 1983 local prices have increased dramatically and there is great interest on the part of growers, large and small, in expanding production. While a handful of large growers import technology for their plantations without government assistance, the small farmers receive virtually no assistance.

This situation results from the lack of a system to generate information on horticulture crops and get it to the farmers. Applied research on these crops is only beginning and the extension system, also at an early stage in its development, is not yet able to serve as an effective channel linking farmers to research or other sources of information. The input distribution network is developing, but has been hampered by foreign exchange restrictions and other limitations.

The FPP Project responds to each of these deficiencies in the horticultural subsector:

1. It will support and expand applied research on fruit and possibly vegetable horticulture, providing assistance to ARA, the national research organization and supporting adaptive research by the RDAs, including work on the Al-Irra and Joruba stations. The project will also provide technical assistance to develop preliminary technical packages for "baladi" varieties, based on international practice and experience.
2. It will increase the extension agents' knowledge of horticulture methods and assist them to transfer this knowledge to farmers, particularly through establishment of demonstrations on farmers' fields.
3. It will increase the knowledge and capability of input supply personnel through training, both in-country and overseas.
4. It will support development of a policy and regulatory environment that is conducive to the rapid and technically sound development of the input supply system.
5. It will increase the availability of technical and economic information to planners and investors, supporting informed decision-making in the subsector.

The project thus goes beyond the traditional research- and extension-based approach to include the private input suppliers who are a vital part of the technology improvement process. The project will both increase the technical knowledge of the professional staff in private agencies and generate information to improve the regulatory environment in which they operate. This approach is expected to substantially strengthen the technical impact of the project.

The project design targets assistance both to existing, "baladi" orchards and to establishment of new orchards using imported varieties (or, in later years, selected "baladi" varieties). This approach helps to strengthen the project's technical feasibility, by increasing the number of farmers who can benefit from the project's assistance, raising the potential for substantial production increases in the short term, and decreasing the reliance on a single strategy (introduction of improved varieties).

While little work has been done on cultural practices for "baladi" varieties, it is expected that these varieties will respond well to introduction of such standard practices as pruning and disease control. The widespread prevalence of disease in Yemeni orchards and the evidence of micronutrient shortages have been noted by a number of observers, as have the absence of pruning, fertilization, and other practices that are standard worldwide for commercial orchard production. It is reasonable to expect that these varieties will respond to fertilization and other improvements in cultural practices, although this response may be less than that of improved varieties. Whereas traditional food crop varieties have often been selected to minimize variation in production under variable conditions, and therefore respond poorly to fertilization, fruit tree varieties have in all likelihood been selected, if at all, for taste and seasonal qualities, and for disease resistance.

B. Financial and Economic Analyses

The financial and economic analyses demonstrate that the project is economically sound and offers a high rate of return to farmers adopting improved horticultural practices. The analysis is based on four farm enterprises involving fruit and representative of the farming practices on which the project will focus. These are: (1) shifting from wheat production to apples, (2) improving production practices on existing apple orchards (3) improving practices on existing stone fruit orchards, and (4) installation of a bubbler irrigation system.

The results show extremely high returns at financial prices. Even after correction for distortions in financial prices in Yemen--specifically the overvaluation of the rial and the unusually high fruit prices resulting from the import ban--the results at economic prices are positive. The economic prices used reduce fruit prices by 70 percent, reflecting the differential between the current market price (e.g., YR 30,000/MT for apples) and the estimated economic price (e.g., Saudi Arabia cif price of \$520 converted at YR 15 to the dollar and increased by 20 percent to reflect increased transport

costs and losses for importation into Yemen, resulting in a price of YR 9360 or roughly 30 percent of the current market price). The exchange rate used for this conversion is well above the current open market rate of approximately 11.2 YR/dollar, and is thus a highly conservative estimate, indicating that project-supported activities should remain economically profitable under a wide range of economic conditions.

The results of the three fruit farm models may be summarized as follows:

| | Additional Annual Net Revenue/Hectare | |
|--|--|----------------------------|
| | Financial Prices (YR) | Economic Prices (YR) |
| Improving existing apple orchard: | 64,649 | 1,649 |
| Improving existing stone fruit orchard: | 60,570 | 4,570 |
| Shifting from wheat to apples: | 243,497 | 32,997 |

These results indicate that improved horticultural production is highly profitable to the farmers, suggesting that project activities should generate strong farmer interest. The economic analysis demonstrates that project-supported activities are profitable to the economy and would remain financially attractive even if output prices were to drop by 70 percent.

Analyses completed during the project design also indicate that installation of bubbler irrigation systems is a highly profitable activity. Savings in pumping cost and labor inputs would generate an annual return of 19 percent. These savings are based on an estimated installation cost of YR. 80,000/ha. If the system is installed in a location where a storage tank is already available, installation cost would drop to around YR 25,000, generating a 60 percent annual return on the farmers' investment.

In addition to the benefits derived from the improvements in fruit production and irrigation systems, the project is expected to generate benefits from its activities in policy reform affecting fertilizers, other agricultural inputs, and the private sector. Indeed, if these reforms do not take place, and the inputs needed by the farmers to improve production are not available, the demonstrated economic and financial feasibility of the project will be compromised. The phasing of project activities provides for the project to be modified or curtailed based on developments in this area.

1. The Policy Environment

The policy setting facing Yemeni farmers and input suppliers is considerably distorted. An undervalued exchange rate places domestic agriculture at a disadvantage against imports. This problem affects the horticultural subsector to a relatively lesser degree than other subsectors, due to the ban on official imports of horticulture products in any form. Illicit imports of fruit (canned fruit, dried fruit, and juice, in particular) appear to be high, however, based on the ready availability of these commodities on the market. Although no data on prices or quantities of these imports are available, it appears that the effective situation is one of relatively high nominal protection for domestic fruit production. Imperfections in the supply of illicit imports, a high risk premium, and the higher exchange rate prevailing for such imports operate as an effective tariff on fruit imports.

On the other hand, a tight import licensing and foreign exchange control system makes the availability of needed agricultural inputs uncertain. Direct government distribution of some inputs, although limited in recent years by the fall-off in donor supplies of inputs, further impedes development of an efficient input distribution system. Moreover, an industrial licensing system as well as the perception that government may undertake further direct production or distribution activities discourages private investment in agribusiness. Some inputs, such as pesticides, are imported illicitly, but the extent of this operation is unknown and it is generally believed that bulky inputs, such as N-P-K fertilizers, are not imported through this channel.

A third problem in the current incentive structure is the absence of a pricing structure for water reflecting its scarcity value and encouraging efficiency in water use. Together with the high prices for horticulture products, this situation has encouraged expanded cultivation of high water-using products, such as banana, which are probably inappropriate for Yemeni conditions. The FPP Project will focus assistance on horticulture products that are relatively less water-using and have been cultivated for centuries in Yemen under traditional terrace and dryland conditions, including grape, date, apricot, and others.

Improvements in the policy environment, particularly those affecting the availability of inputs and the economic pricing of fruits and vegetables, will be important to achieving productivity gains in financial and economic terms. In recent negotiations of the self-help measures for the PL480 agreement, YARG agreed to a substantial increase in the quantity of

fertilizer to be imported, based in part on the findings of the USAID financed fertilizer study. This example demonstrates YARG willingness to undertake policy reform when appropriate information is presented to decision makers.

2. Rate of Return Considerations

The project's benefits derive from increases in agricultural production and incomes achieved by fruit producers, packers, and others in the horticulture subsector. These gains cannot be quantified with confidence, because the project will focus primarily on training for extension agents and input suppliers and analysis to support investment and regulatory improvement, and will not work directly with a specific farm population.

The analysis of the project's rate of return presented in the Annexes is based on an assumption that project activities will reach 200 additional hectares of fruit production annually (1,600 ha. total, each with net benefits of \$3,000 annually at economic prices) and lead to the establishment of 1,200 bubbler irrigation systems (each realizing a water saving valued at \$1,000 annually). Using a 20-year planning horizon, these benefit streams result in an internal rate of return on the order of 15 percent.

3. Sustainability

The project's sustainability relies on three related factors:

- a. The ability of the extension and research system to continue and expand the transfer of technologies for improved horticulture production to the farmers
- b. The willingness and ability of farmers to continue applying technical packages promoted by the project
- c. The ability of private input distributors to continue and expand the supply of planting materials, inputs, and information to horticulture farmers

While the first factor is important, the sustainability of the project-promoted activities and of the benefits derived from these activities depends primarily on the latter two factors. A continuation of extension activities in horticulture after the project's termination, in other words, would support improved horticulture production, but these activities are neither necessary nor sufficient to sustain such improvements. Farmer acceptance and private sector support, by contrast, are necessary and, together, are sufficient to continue progress in horticultural production.

The evidence indicates that both horticulture production and the input supply systems that support it are sustainable in Yemen, given the profits to be made by efficient operators within these systems. When foreign exchange was available, the private sector imported fertilizer and the sales network extended to remote market towns. This situation persisted for several years, until macroeconomic conditions forced a reduction in imports.

Similarly, private sector tree nurseries have recently been established in response to demand, despite the competition offered by public sector nurseries and the absence of support for this activity. It is reasonable to expect that profits will continue to be made in supplying inputs, and that these activities will be self-sustaining.

Extension programs have a critical role to play during the next few years, as farmers make the transition to commercial horticulture production and as private input supply systems develop to provide them the necessary support. Once this transition has been completed and private suppliers are in place, however, international evidence suggests that input dealers may well be a more efficient and self-sustaining mechanism to transmit information and technology to the farmers.

Continuation of an active extension program for horticulture would clearly be highly desirable, but its feasibility depends on the resources available to the YARG, including future support from other donors. Given the high priority placed on food production and projected conditions of continuing budgetary stringency, YARG capacity to continue the training, research, and demonstration activities promoted by the project cannot be assured.

This rationale underlies the project's emphasis on promoting a regulatory environment that encourages the development of the private input supply system. This regulatory environment must protect the public interest (preventing the spread of diseased planting material and controlling pesticide use, for example) and at the same time promote the rapid and competitive expansion of the commercial dealer network.

Regulatory monitoring is particularly important during the early days of the growth of input distribution networks, when monopolistic features are most likely to occur and when farmers have little access to competing information, but over-regulation during this period can inadvertently contribute to, rather than reducing, monopoly and other distortions in the system. Maintenance of a sound regulatory environment, once established, requires relatively low levels of government resources and should be sustainable.

YARG recurrent cost implications for FPP-supported activities are not large. The project design emphasizes training and other support to existing units, particularly GDAA, GDPS, ARA, and the extension programs of the RDAs. While it is anticipated that applied research, training, and demonstration activities to be undertaken by GDAA, ARA, and the RDAs will continue after FPP completion, the project's strategy relies primarily on private sector activities for the sustainability of project-supported activities.

The recurrent costs associated with SSA module activities (such as plant quarantine and phytosanitary certification, regulation of input suppliers, and collection of information on horticultural production) are relatively modest. Many of these activities, moreover, are expected to receive support under other donor projects in the period immediately following FPP completion (including the NASMP and CHRDP II, both funded by the World Bank).

C. Social Soundness Analysis

The rural areas of Yemen continue to undergo profound social and economic changes resulting from the substantial remittances of the 1970s and early 1980s, continuously expanding commercial activities, and the outflow of labor. The previously isolated highlands are quickly evolving into a market system connected to the rest of Yemen by a growing road network, telephone and television. Semi-feudal and subsistence-oriented social structures are being modified by the overlay of a monetized and market-oriented society.

For many farming families, a continuation of small-scale subsistence farming makes less and less economic sense. Many farmers are therefore shifting into high value crops where returns per unit of labor and management input are much higher.

Horticulture production remains primarily a small-farmer activity, although larger farmers are investing heavily in the Tihama and the eastern regions of the country (notably Marib and Al-Beyda). As noted in Section II, small backyard fruit plots account for a substantial portion of total production, but a much smaller share of marketed production.

The FPP project will benefit four major groups: (1) farmers, whose incomes will increase through adoption of improved farming practices; (2) input distributors and other entrepreneurs, who will earn incomes from the distribution and sale of inputs for project-promoted technologies and as well as the fruit itself; (3) consumers, who will be able to buy more and better quality products; and (4) employees of the RDAs and other YARG agencies, who will receive training and technical support enabling them to perform their jobs more effectively.

The farmers to be reached by the project fall into three major groups: (1) medium-scale farmers with new or established orchards of 5-10 hectares; (2) small-scale farmers with new or established orchards of up to 5 hectares; and (3) women and other rural residents growing fruit trees in household gardens or dispersed holdings (e.g., field border plantings).

While many of the technologies to be promoted by the project, such as pruning and fertilization, are equally appropriate for each of these groups, their differing resource constraints and market orientation imply a need to evaluate programs for each group separately. Social differences also make it necessary to conduct separate programs for women farmers, whether they are managing medium- or small-scale holdings or backyard gardens.

Farming families in the Highlands share several common characteristics: the majority of the land is owned and farmed by single families; the average holding is between one and two hectares, frequently broken up into several parcels; tubewells have spread rapidly in the past 10-15 years and most of these are owned by more than one landowner.

Sharing of the costs of tubewells and their water is common; thus further sharing through installation of bubbler systems serving several adjacent parcels should be socially feasible, extending the benefits of this technology to small holders. Families remain the basic unit of production in the Yemeni agricultural sector. Farmers are generally receptive to innovations, particularly for high-profit crops such as fruit.

While the Uplands will be the primary focus of project activity, at least one of the seven technical programs will be concentrated in the Tihama (date and mango/papaya) and a third program, irrigation, will operate in both regions. The Tihama is viewed as an area of large holdings, but there are also a large number of small holdings in the region, many of which include plantings of dates, mango, and other fruit trees. These farmers, rather than the larger, commercial farmers in the Tihama, will be the target of project assistance.

Women in farm households in the project area will be a particular target of assistance, in view of their role in overseeing household fruit trees and their participation in all aspects of horticultural production and marketing. Under the current extension system, a home economics specialist (usually a woman) is one of six subject matter specialists posted (in theory) at each block center and each governorate extension center. A block center serves 8-10 extension centers, each of which is staffed by an extension agent. Each block center typically serves more than one district. Not all of the

positions (male or female) in the extension service have yet been staffed, however, nor are all staff actually posted to their assigned locations. Thus, for example, CHRDA has two women extension specialists (one "expert" and one "assistant") to cover all operations in Sana'a Governorate.

In the context of Yemeni society, it is difficult or impossible for male extension agents to contact women farmers in their households. Joint attendance by males and females at activities such as field days is rare. To address these problems and encourage the participation of women, the project design includes several features:

1. Training for extension agents will include all women agents in the project regions (experience in other projects indicates that women agents can participate in such training, if certain special arrangements are made regarding lodging, etc.).
2. Special field days will be conducted for women and an emphasis will be placed on market day activities and other programs in which women are more likely to participate.
3. The project will provide special study grants for women enrolled in agricultural programs at the University of Sanaa to increase the supply of candidates for the home economics positions and other technical positions in agriculture.
4. An effort will be made to establish demonstration plots on household and other small tree plantings to demonstrate the applicability of project packages to small-scale horticulture.
5. An effort will be made to identify women employees of private sector firms for training, particularly in-country training.

The project will also open up new opportunities for entrepreneurs to open or expand such businesses as nurseries, input supply, irrigation installation, transportation, and retail operations. Yemeni businesspersons are expected to respond aggressively to these opportunities, based on a strong tradition of business and trading activities. Private sector activity in Yemen has a strong family focus. Several of the most active trading families are evolving into highly diversified industrial holding companies. These organizations both compete and collaborate on a wide range of projects.

Although the large family-owned conglomerates play a leading role in the Yemeni business world, there is ample scope for smaller enterprises to enter the marketplace, grow, and flourish. Increasing contact with the Gulf and remittance income have fuelled a rapid expansion in such small enterprise activity, including an expansion of rural enterprises.

Because of this activity, little difficulty is anticipated in identifying businesspersons interested in obtaining training for their personnel in horticultural technologies. Horticulture is viewed as an area of expanding opportunities, despite the difficulties being experienced in importation at present. The Yemeni business community is noted for its willingness to obtain technical assistance and for its strong interest in training, moreover.

On the other hand, the complexity of Yemeni business relations and the strong hesitancy to enter into business relations outside the established circle make the project's limited intervention strategy an appropriate one for the Yemeni environment. Direct project assistance to the private sector will be limited to training and provision of information, such as investment profiles, through MAF. The project will not attempt to promote specific enterprises or investments, nor will it provide credit or other inputs to the private sector.

In sum, the FPP Project is socially sound. It builds on positive market trends to make family farms and rural enterprises more economically viable over the long run. It offers technologies that are culturally compatible and are already beginning to be adopted and spread by demonstration.

D. Institutional and Administrative Analysis

While the Ministry of Agriculture and Fisheries has official responsibility for agricultural development in Yemen, the lead role in development programming in Yemen is played by the five semi-autonomous Regional Development Authorities (RDAs). These organizations, which have received a large share of donor assistance channeled to the agricultural sector, have evolved into relatively effective organizations for rural development, with their own extension systems and other support services. The MAF General Directorate for Agricultural Affairs is responsible for coordinating MAF programs with the RDAs, which report to the Minister. GDAA also coordinates sector activities with the Agricultural Research Authority (ARA) and other organizations.

Donor attention is now being focused on the Ministry itself, to strengthen national planning, coordination, monitoring and support for activities at the regional level. The World Bank-supported National Agricultural Sector Management Project (NASMP) will strengthen key departments of the MAF, encouraging better coordination of technical operations and projects, and promoting more focused subsector activities.

As discussed in the project description section above, the FPP institutional design follows the existing division of reporting and implementation responsibilities. This approach is expected to minimize complications during implementation, although it does require the participation of several different institutions in project activities.

The project has been designed to dovetail as closely as possible with existing priorities, programs, and procedures. This approach is necessitated by the limited resources available to the YARG and the need to avoid additional burdens on a structure that is relatively new and already subject to heavy demands from a large number of donor-funded initiatives. Specific administrative features included in the design to reduce demands on the MAF and RDAs include:

1. Geographic focus: project activities will be concentrated in areas where other donors are not presently working; activities will begin in a limited number of locations and extend outward as progress and resources permit; activities taking place in the RDAs alongside those of other donors will be limited to training for extension and input supply personnel and organization of on-farm demonstrations.
2. Reliance on ARA for training support: the project will both utilize and strengthen ARA's capacity to provide training for extension agents and to develop extension materials (including video presentations). This activity will reinforce the applied focus of ARA activities and provide a sound technical basis for the training.
3. Product orientation of SSA module activities: Most of the activities programmed for the SSA module have been designed as stand-alone products that can be produced by teams combining expatriate and Yemeni expertise. The agribusiness profiles and market system analyses, for example, can be produced independently of each other and of other project activities. This approach reduces the danger of delays in one area leading to further delays elsewhere in the project.

The project provides a high level of short- and long-term training designed to build institutional capacity in both the public and private sectors. Other institution-building activities are limited to development of improved regulatory systems for the private sector, particularly with regard to importation permits, regulation of pesticides, importation and local production of nursery material, and irrigation system installation. Project activities in these areas will focus on reducing unnecessary regulation and administration and improving appropriate regulatory activities, so as to strengthen MAF ability to provide necessary protection for the private sector without adding to the administrative workload on MAF units.

E. Environmental Analysis

In response to the AID/W PID approval cable, the FPP design team and the pesticide/environmental specialist have prepared a detailed IEE for the two primary potential environmental impacts within the project in accordance with USAID's Regulation 22 CFR Part 216: (1) The expansion of irrigation systems for use by small farmers within the projects; (2) the use of pesticides for applied research trials (on-farm and on-station) and demonstrations in cooperating farmers' orchards.

1. Irrigation

Because the Project will offer irrigation technologies that will reduce water demands by 30-50 percent of current use, it will have the beneficial effect of reducing demand on groundwater and making more effective use of a critically limited resource. Additionally, the improvements to be offered in piping distributaries and better control of furrow irrigation will reduce open channels and standing water and thus eliminate existing habitat for schistosomiasis vectors. The project will not have any impact on field size or grading and will thus not affect buried antiquities.

Training for extension agents and input distributors in fertilizer use will emphasize proper application in the minimum amounts necessary to increase fertilizer efficiency. Thus the project's activities will minimize the small potential risk of excess nutrients remaining in the soil. It will also eliminate or discourage overwatering and thus the risk of leaching nutrients to the groundwater.

2. Pesticides

Pesticide use in trials and demonstrations will be limited to pesticides currently registered by the EPA for use in the United States on the fruit crops selected for emphasis in the

FPP Project. No pesticides will be used that are classified for restricted use in the U.S. because of high mammalian toxicity, and only compounds considered relatively non-persistent within the environment will be included in project activities. Quantities to be used will in any case be limited due to the nature of project activities, which are restricted on on-farm and on-station trials and demonstrations.

The major potential adverse environmental effects from the pesticides on the orchard ecosystem is contamination of the ground water. This danger will be minimized under the FPP by selection of pesticides that are not sufficiently persistent and soluble in water to be subject to leaching within the soil profile. Also, the possibilities for contamination of surface sources of water from pesticide use within the project are minimal because of the semi-arid nature of Yemeni environment and the limited level of runoff, particularly where bubbler irrigation systems are used.

Precautions for preventing secondary potential adverse environmental effects of pesticides within the project, such as poisoning of bees, are outlined within the general IEE document. The project will mitigate potential problems of pesticide misuse by supporting a position for a long term Integrated Pest Management Specialist who will develop appropriate pest control technologies for Yemen and advise in the development of technology packages for on-farm use. The IPM specialist will work with the Extension Communications Specialist within the Project to develop appropriate training courses and materials on proper pesticide use for extension agents and input supply personnel.

VII. CONDITIONS, COVENANTS AND NEGOTIATING STATUS

The Grant Agreement will be signed by representatives of the Central Planning Office and by the Ministry of Agriculture and Fisheries, in accordance with standard practice. MAF personnel participated in the final design of the project and the draft project paper was reviewed by senior officials at the Ministry. The final design reflects substantial revisions made to address their concerns with the initial design. Proposed project activities have also been discussed with personnel at ARA and key RDAs (CHRDA and SURDA) and have received their support.

A. Conditions

The Grant Agreement will incorporate the following conditions precedent to disbursement, in substance:

1. Prior to the first disbursement under the Grant, or to the issuance by the Agency of documentation pursuant to which disbursement will be made, the Government will, except as to the Parties may otherwise agree in writing, furnish to the Agency in form and substance satisfactory to the Agency:
 - (a) A statement of the name of the person holding or acting in the office of the Government specified in the Grant Agreement and of any additional representative, together with a specimen signature of each person specified in such statement;
 - (b) Evidence that an appropriate counterpart employee or employees have been designated or appointed by the Ministry of Agriculture and Fisheries to ensure that Project objectives can be accomplished.

B. Covenants

The Grant Agreement will seek to incorporate the following covenants, in substance:

- (a) The parties agree to establish an evaluation program as part of the project and at one or more points thereafter to undertake (a) an evaluation of progress toward attainment of the objectives of the project; (b) identification and evaluation of problem areas or constraints which may inhibit such attainment; assessment of how such information may be used to help overcome such problems; and (d) assessment of the continued validity of project components and the need for continued grant funding under each component.

(b) The Government agrees to facilitate the travel of contractors and consultants required by the project to the Yemen Arab Republic through issuance of necessary visas, and within the Yemen Arab Republic through the issuance of appropriate in-country travel documents. In addition, the Government agrees that technical assistance and evaluation contractors shall have unrestricted access to all project activities and sites and the free use of data needed to accomplish their respective tasks. The Government also agrees to provide appropriate office space and counterpart staff for each of the activities funded under this project. Finally the Government agrees to fund travel on the national carrier to the furthest point closest to the final destination of government candidates participating in training programs supported under the project.

(c) The Government agrees to encourage and support the production of fruit tree seedlings in the private sector. The Government also agrees to adopt a suitable agricultural policy while allows for the private sector to play a greater and increasing role in fruit tree seedling production.

(d) The Government agrees to work actively towards the establishment of a policy and regulatory environment that permits private sector input distributors to import, manufacture and/or distribute agricultural inputs.

(e) The Government agrees to increase its efforts to assist women to participate more fully in agricultural development, by hiring and training female extension workers, expanding extension programs targeted at rural women, hiring female professionals by the Ministry of Agriculture and Fisheries, and taking other actions as appropriate.

(f) The Government agrees to provide to project staff as required access to information related to the supply and availability of key inputs such as seedstock, irrigation equipment, pesticides and fertilizer (in terms of quantities as well as values) and other data essential to project monitoring and implementation.

ANNEX A:

PID APPROVAL CABLE

P 200358Z DEC 88
FM SECSTATE WASHDC
TO RUFHSN/AMEMBASSY SANAA PRIORITY 9571
RUEHAM/AMEMBASSY AMMAN PRIORITY 2131
BT
UNCLAS SECTION 01 OF 03 STATE 408839

AIDAC AMMAN FOR DOUG ROBERTSON

E.O. 12356: N/A

TAGS:

SUBJECT: FARMING PRACTICES FOR PRODUCTIVITY, PID REVIEW
{279-0084}

1. SUMMARY: PRC REVIEWED SUBJECT PID 17 NOVEMBER WITH MISSION DIRECTOR SHERPER PARTICIPATING. DRAFTERS WERE COMMENDED FOR WELL PREPARED PID, WHICH WAS RECOMMENDED FOR APPROVAL WITHOUT REQUIREMENT FOR ANPAC. AA/ANE HEREBY APPROVES PID. MISSION IS AUTHORIZED TO APPROVE PP AND TO AUTHORIZE PROJECT AT POST. HOWEVER, SEE PARA 12 BELOW REGARDING THE NEED TO MEET REQUIRED LEVEL OF HOST GOVERNMENT CONTRIBUTION. REQUEST THAT PP INCORPORATE GUIDANCE GIVEN BELOW. END SUMMARY.

2. PROJECT ADMINISTRATION AND MANAGEMENT: THE PRINCIPAL CONCERN EXPRESSED WAS THAT THE PROJECT, IN ITS PRESENT MULTI-MODULAR FORMAT {WITH SEPARATE CONTRACTS AND SEPARATE PROJECT OFFICERS FOR EACH MODULE}, WILL BE VERY MANAGEMENT-INTENSIVE, BOTH FOR USAID AND YARG COUNTERPART AGENCIES (ALTHOUGH PID SCHEMATIC DOES NOT DETAIL HOW FUNCTIONS WILL DEVOLVE UPON THE LATTER). BASED ON EARLIER EXPERIENCE, MISSION DIRECTOR ENVISAGES DIRECT CONTROLS OVER PRIVATE CONTRACTORS THROUGH

FOUR-PERSON USAID AGRICULTURAL OFFICE, WITH OVERALL RESPONSIBILITY VESTED IN MISSION'S SENIOR AGRICULTURAL OFFICER. PP ADMINISTRATIVE ANALYSIS SHOULD DISCUSS HOW ACCOUNTABILITY, CONFLICT RESOLUTION, AND OPTIMUM COLLABORATION WILL BE ASSURED VIS-A-VIS US ACTORS, THE YARG, AND YEMENI PRIVATE SECTOR. PP SHOULD ALSO DEFINE THE VARIOUS YEMENI GOVERNMENT COUNTERPART AGENCIES AND HOW THEIR PROJECT RESPONSIBILITIES WILL MESH WITH THOSE OF USAID AND THE PRIVATE CONTRACTORS, AND WILL SPECIFY HOW YEMENI "OWNERSHIP" OF THE PROJECT WILL BE ATTAINED AND DOCUMENTED IN SPITE OF THE YARG'S LIMITED FINANCIAL SUPPORT CAPABILITY. THE PP SHOULD ALSO SPELL OUT THE RELATIONSHIP OF THE PROJECT WITH THE ONGOING ADSP.

3. PROJECT METHODOLOGY AND IMPACT: PRC DISCUSSED HOW PROJECT WOULD RESULT IN ADOPTION OF IMPROVED TECHNOLOGIES AND WHAT IMPACTS EACH MODULE, THE PROJECT AS A WHOLE, AND HOW CONTRACTORS' PERFORMANCE WOULD BE

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JUDGED AGAINST AT PROJECT CONCLUSION. IT WAS FELT THAT PRODUCTIVITY GAINS, PER SE, WERE TOO IMPRECISE AS MEASURABLE OBJECTIVES. MAIN OBJECTIVE IS THE ACTUAL TRANSFER OF COMMERCIAL TECHNOLOGY FOR IMPROVED PRODUCTIVITY AND NOT THE CREATION OF A YEMENI CAPACITY TO GENERATE TECHNOLOGIES. THUS THE PRC RECOMMENDED THAT MEASURABLE TARGETS BE ESTABLISHED. FOR EXAMPLE, MODULES {LARGELY THROUGH EFFORTS OF EXPATRIATE CONTRACTORS WORKING WITH YARG INSTITUTIONS SUCH AS AGR. RESEARCH AUTHORITY} WILL DEVELOP TECHNICAL PACKAGES, ADOPTION OF WHICH WILL LARGELY DEPEND ON THE PRIVATE SECTOR'S PERCEIVED BENEFITS. THIS DEPENDENCE ON DEMAND-DRIVEN VARIABLES, HOWEVER, MAY PROVE DIFFICULT TO DEFINE IN TERMS WHICH CONTRACTORS CAN UNDERSTAND, RECOGNIZING THAT FARMERS' RESPONSE WILL DEPEND ON COSTS AND PERCEIVED COMMERCIAL BENEFITS AND EXTENT TO WHICH OTHER POLICY PARAMETERS PROVIDE APPROPRIATE INCENTIVES. FOR THESE REASONS, PRC RECOMMENDS THAT THE PP DESIGN TEAM IDENTIFY INTERMEDIATE, MEASURABLE TARGETS FOR ASSESSING PERFORMANCE OF INDIVIDUAL MODULES AND PROJECT AS A WHOLE, AND FOR CONTRACTORS TO ESTABLISH SPECIFIC WORKPLANS IN ACCORDANCE WITH WELL-DEFINED TARGETS.

4. POLICY CLIMATE: IN RESPONSE TO CONCERN WHETHER THE POLICY PARAMETERS AND YARG INCENTIVES WOULD PERMIT THE PRIVATE SECTOR TO RESPOND TO NEW TECHNOLOGIES, MISSION DIRECTOR CITED ENCOURAGING RECENT POLICY DEVELOPMENTS, INCLUDING INCREASINGLY RECEPTIVE HOST GOVERNMENT WILLINGNESS TO PROMOTE PRIVATE ENTERPRISE AND THE EXPRESSED INTENTION OF NEW MINISTER OF AGRICULTURE AND

FISHERIES {MAF} TO RESTRICT MINISTRY INVOLVEMENT TO POLICY, REGULATION, RESEARCH, AND EXTENSION. ANNOUNCEMENT OF SUBSTANTIAL MAF DIVESTITURE OF NURSERIES WAS ONE PRODUCT OF LONGSTANDING USAID DEVELOPMENT DIALOGUE. ANOTHER ENCOURAGING RESULT HAD BEEN ABANDONMENT OF UNREALISTICALLY LOW SUBSIDIZED PRICES FOR FRUIT TREES, WHICH HAD ACTED AS DISINCENTIVE TO PRIVATE ENTERPRISE. EXTENSIVE USAID AGRICULTURAL SECTOR DIALOGUE AND PROJECT EXPERIENCE HAD DEMONSTRATED THAT WHILE MAJOR POLICY CONSTRAINTS {E.G. FOREIGN EXCHANGE AND CONVERTIBILITY} WERE UNLIKELY TO BE INFLUENCED DIRECTLY, USAID CONCENTRATION ON SECTORAL LEVEL POLICY ISSUES {E.G. IMPORT LICENCING, EXPORT AND IMPORT MARKETING} HAD PROVEN INCREASINGLY EFFECTIVE. FURTHER PUBLIC AND AS WELL AS EXTENSIVE PRIVATE SECTOR FORMAL TRAINING AND WIDE OUTREACH WOULD BE ACHIEVED BY PROJECT INPUTS OVER THE LONG LOP ENVISAGED.

5. MORTGAGE: PRC DISCUSSED AGENCY'S INCREASING CONCERNS REGARDING HIGH COUNTRY MORTGAGES WHICH MAY

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RESTRICT FUTURE PROGRAM OPTIONS. PROPOSED LOP FUNDING FOR THIS PROJECT REPRESENTS A SUBSTANTIAL MORTGAGE, BUT MISSION DIRECTOR INDICATED THAT THE PLANNED TERMINATION OF ONGOING PROGRAM COMPONENTS AND STAGING OF FPP OBLIGATIONS OVER SEVEN YEARS WILL MEAN THAT AGRICULTURE WILL CONSTITUTE NO GREATER SHARE OF FUTURE BUDGETS THAN IT DOES CURRENTLY. PRC RECOMMENDED THAT EACH PROJECT MODULE HAVE SPECIFIC MEASUREABLE OUTPUTS, WHICH CAN BE JUDGED INDIVIDUALLY, AND THAT THE MODULES BE PRIORITIZED ON THE BASIS OF SUSTAINABILITY IN THE EVENT OF ANY FUTURE YEAR BUDGET CUTS.

6. LEVEL OF TA: NOTING THE HIGH PERCENTAGE OF PROJECT COSTS DIRECTED TO TA, IT WAS AGREED THAT PP WOULD ANALYZE AND JUSTIFY IN DETAIL THE PROPOSED APPROACHES, IN COMPARISON, FOR EXAMPLE, WITH GREATER RELIANCE ON TRAINING. MISSION DIRECTOR INDICATED THAT EACH MODULE WOULD HAVE A SEPARATE LOGFRAME WITH MEASUREABLE SHORT AND LONG-TERM OUTPUTS AND TARGETS FOR JUDGING PERFORMANCE. HAVING SUCH INDIVIDUAL TARGETS SHOULD ASSIST MISSION IN DETERMINING APPROPRIATE LEVEL OF TA.

7. BENEFICIARIES: IN RESPONSE TO QUERIES RE LIKELIHOOD OF SMALL FARMERS BENEFITTING MORE FROM PROJECT THAN LARGE LANDHOLDERS, MISSION DIRECTOR DISTINGUISHED BETWEEN SMALL-SCALE HOLDINGS IN MOUNTAINOUS REGIONS WHICH OFFERED OPTIMUM CONDITIONS FOR IRRIGATED CULTIVATION OF HIGH VALUE FRUITS AND VEGETABLES AND

LARGE PLANTATIONS IN THE FLATLANDS WHICH ARE UNLIKELY TO BENEFIT SIGNIFICANTLY FROM PROJECT'S TECHNOLOGY INNOVATIONS. IT WAS NOTED THAT LARGE AMOUNTS OF CASH WERE AVAILABLE IN THE COUNTRYSIDE (PRIMARILY FROM FOREIGN REMITTANCES), AND NO DIFFICULTIES WERE ENVISAGED IN SMALL FARMER ABILITIES TO PURCHASE BUBBLERS AND OTHER TECHNOLOGY ONCE UTILITY AND HIGH RETURN WERE DEMONSTRATED. USAID DIRECTOR NOTED THAT HIGH VALUE HORTICULTURAL CROPS WOULD PROVIDE VIABLE ALTERNATIVE TO QAT PRODUCTION, THEREBY COMPLEMENTING GOVERNMENT EFFORTS TO DISCOURAGE THIS DEBILITATING FACET OF PRIVATE ENTREPRENEURSHIP.

8. WID: MR. SHERPER RECOUNTED LONGSTANDING USAID EFFORTS TO PROMOTE FEMALE PARTICIPATION IN AGRICULTURAL PRODUCTION, CITING INROADS ALREADY ACHIEVED THROUGH INCREASED ADMISSIONS TO AGRICULTURAL SCHOOLS AND THE UNIVERSITY. IT WAS AGREED THAT PP WOULD DEVOTE APPROPRIATE ATTENTION TO HOW WID COULD BE PROMOTED THROUGH SUBJECT PROJECT. SUGGEST THAT MISSION DISCUSS WITH PPC/WID (TULIN PULLEY) POSSIBLE APPLICATION OF GENDER INFORMATION MATRIX TO EACH TECHNICAL MODULE PROPOSED FOR DISSEMINATION IN EARLY IMPLEMENTATION.

9. CONTRACTING: IT WAS AGREED THAT THE PP WOULD DEVOTE APPROPRIATE ATTENTION TO THE SCOPE FOR POSSIBLE TITLE XII AND GRAY AMENDMENT PARTICIPATION IN CONTRACTING FOR THE MODULES.

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10. ENVIRONMENT: GIVEN DISSIMILARITIES BETWEEN FORMER FFP PROPOSAL AND CURRENT FPP, ANE ENVIRONMENTAL COORDINATOR CONCLUDES THAT THE 1985 ENVIRONMENTAL ANALYSIS IS NO LONGER APPLICABLE AND THAT A NEGATIVE DETERMINATION IS NOT APPROPRIATE. THE FOLLOWING CONCERNS SHOULD BE ADDRESSED IN PP DESIGN AND IMPLEMENTATION: {A} AID DOES NOT HAVE QUOTE APPROVED LIST UNQUOTE OF PESTICIDES, AND SPECIFIC PESTICIDES MUST BE CLEARED FOR USE ON BASIS OF SCREENING ANALYSIS PURSUANT AID ENVIRONMENTAL PROCEDURES IN 22 CFR 2.6.3 (B-1-17). THIS SHOULD BE DONE EARLY IN PROJECT PROCESS DURING DESIGN OR EARLY IMPLEMENTATION STAGES. MISSION SHOULD ADVISE ANE/PD/ENV APPROPRIATE TIMING AND SCOPE OF WORK FOR PESTICIDES ANALYSIS. IF PART CAN BE DONE DURING DESIGN PHASE BASED ON KNOWLEDGE OF SPECIFIC HORTICULTURAL CROPS TO BE TESTED INITIALLY, THEN PROVISION SHOULD BE MADE FOR INCLUSION OF CROP PROTECTION EXPERTISE ON DESIGN TEAM. OTHERWISE, PESTICIDES AND PEST MANAGEMENT ANALYSIS SHOULD BE

INCLUDED IN SCOPE OF WORK FOR A PLANT PROTECTION SPECIALIST TO BE BROUGHT ON BOARD AT THE OUTSET OF PROJECT IMPLEMENTATION. {B} PROPOSED FIELD TRIALS USING PESTICIDES SHOULD BE PERFORMED UNDER CONTINUOUS SUPERVISION OF FPP PROJECT PERSONNEL TO SAFEGUARD HEALTH AND SAFETY OF USERS/APPLICATORS. {C} RECOGNIZING THAT FPP WILL INFLUENCE QUANTITY AND KINDS OF PESTICIDES USED ON WIDER GEOGRAPHICAL SCALE, ANALYSIS OF PROPOSED USAGE AND THE COUNTRY'S INSTITUTIONAL CAPABILITY TO REGULATE PROPER SELECTION AND MANAGEMENT WILL BE NECESSARY.

11. WATER CONSERVATION AND WATER POLICY: THERE IS NOTHING IN THE PID ON THE ISSUE OF WATER RESOURCE CONSERVATION AND WATER POLICY. HOW CAN OR SHOULD THIS PROJECT ADDRESS THE BROADER CONCERN OF "MINING" FOSSIL GROUNDWATER FOR SHORT-TERM PRODUCTION OBJECTIVES? HOW DOES THE PROJECT RELATE TO OTHER ACTIVITIES IN THIS AREA?

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2. HOST COUNTRY CONTRIBUTION: PRC WELCOMED MISSION DIRECTOR'S REPORT OF INCREASING MAF INTEREST AND COLLABORATION, BUT NOTED THAT PP SHOULD CAREFULLY SPELL OUT THE YARG COUNTERPART COMPONENTS, CASH AND IN-KIND CONTRIBUTIONS, AND PROCEDURES FOR MOBILIZING THEM. FURTHERMORE, NORMAL AID REQUIREMENT OF 25 PERCENT HOST COUNTRY COUNTERPART CONTRIBUTION WAS NOT MET IN PID. WE UNDERSTAND FROM SUBSEQUENT PHONE CONVERSATION THAT YARG CONTRIBUTION WILL BE INCREASED TO 25 PERCENT OF COMBINED PID/YARG PROJECT FINANCING IN THE PP. IN THE EVENT THAT THIS SHOULD PROVE INFEASIBLE, IT WOULD BE NECESSARY TO REQUEST A WAIVER FROM A/AID WITH APPROPRIATE JUSTIFICATION INCLUDING HOST COUNTRY STATUS AS LEAST-DEVELOPED COUNTRY WITHIN UN NOMENCLATURE. AA/ANE DECISION TO DELEGATE PROJECT AUTHORIZATION CANNOT PREJUDGE ADMINISTRATOR'S DECISION ON WAIVER, SHOULD MISSION CHOOSE TO REQUEST IT. PLEASE CONFIRM BY CABLE THAT MISSION DOES INTEND TO NEGOTIATE FULL 25 PERCENT YARG CONTRIBUTION.

3. TECHNICAL ISSUES: {A} ONE ISSUE CONCERNS THE INSTITUTIONAL BASE OF RESEARCH, AND THE ON-GOING PROCESS OF IDENTIFYING TECHNOLOGIES FOR APPLIED RESEARCH AND EXTENSION. PP SHOULD ADDRESS HOW THE CONTINUING SOUNDNESS OF THE RESEARCH INSTITUTIONAL BASE IS TO BE ASSURED SO THAT THE PROCESS IS SELF-SUSTAINING. PP SHOULD ALSO COVER HOW FARMER INPUT IS TO BE OBTAINED, AND HOW TO ASSURE PROJECT CONCENTRATION ON TECHNOLOGIES OF HIGHEST PRIORITY TO FARMERS. WHAT DETERMINES THE ELECTION OF ADDITIONAL TECHNOLOGIES AFTER PROMOTION OF BUBBLER IRRIGATION AND FERTILIZER USE? IS THE OVERALL

RESEARCH SYSTEM UP TO THE CHALLENGE OF DEMAND DRIVEN RESEARCH? {B} THE PID SUGGESTS THAT THE BUBBLER MODULE SHOULD PRECEDE THE IRRIGATION TECHNOLOGIES MODULE. THIS DELAY SEEMS UNNECESSARY, AND THE TIME PROPOSED {ONE YEAR} IS INCONSISTENT WITH THE RHETORIC {"SUBSTANTIAL SUCCESS"}. INDEED, THE RATIONALE FOR SEPARATING THE TWO IS NOT CLEAR. A CASE NEEDS TO BE MADE FOR TREATING THEM SEPARATELY, IF THIS IS REALLY DEEMED DESIRABLE. IN VIEW OF THE CONCERN OVER TA LEVELS, IS IT POSSIBLE THAT SOME ECONOMIES COULD BE ACHIEVED BY COMBINING THE TWO?

4. DESIGN TEAM COMPOSITION: IN ADDITION TO THOSE NOTED IN THE PID PLUS RECOMMENDATIONS IN PARA. 10, THE DESIGN TEAM SHOULD INCLUDE, AT MINIMUM, A SPECIALIST IN IRRIGATION TECHNOLOGIES AND A PRIVATE SECTOR INSTITUTION/EXTENSION SPECIALIST WITH EXPERIENCE IN AGRICULTURAL PRODUCTION. THE SOW FOR THE FORMER SHOULD INCLUDE DRAFTING A PROGRAM FOR IDENTIFYING AND MOBILIZING RELEVANT INFORMATION FOR THE IRRIGATION TECHNOLOGIES MODULE, INCLUDING REVIEWING AND UPDATING THE INFORMATION CONTAINED IN THE ORIGINAL IRRIGATED FARMING PRACTICES PP. THE LATTER WOULD RESEARCH AND PLAN FOR THE OUTREACH EFFORT, WHICH IS CENTRAL TO ACHIEVEMENT OF OBJECTIVES -- WHAT IS NOW KNOWN ABOUT THE FORMAL AND INFORMAL OUTREACH CAPABILITIES, HOW CAN OR SHOULD THE PROJECT RELATE TO THE EXISTING SYSTEM, AND

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WHAT CHANGES NEED TO BE MADE, IF ANY, TO COORDINATE
PRIVATE SECTOR, MAF AND REGIONAL AUTHORITIES IN AN
EFFECTIVE OUTREACH PROGRAM? THE INCLUSION OF BOTH WOULD
NOT ONLY FACILITATE FINALIZATION OF THE PP, BUT COULD
ALSO HELP IN GETTING THE PROJECT OFF THE GROUND AFTER
APPROVAL. SHULTZ

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ANNEX B:

USAID/YEMEN DESIGN AND REVIEW COMMITTEE

- | | |
|-------------------------|---|
| 1. Kenneth H. Sherper | Mission Director |
| 2. Michael F. Lukomski | Deputy Director |
| 3. John Swanson | Chief, Office of Agricultural Development |
| 4. Frederick Vigil | Agricultural Development Officer |
| 5. John Schamper | Agricultural Development Officer |
| 6. Abdel M. Moustafa | Agricultural Development Officer |
| 7. John Rifembark | Agricultural Development Officer |
| 8. Abdulla T. Ben Yehia | Agricultural Specialist |
| 9. Nasr A. Al-Ghoorairy | Agricultural Specialist |
| 10. Leonard Kata | Area Contracting Officer |
| 11. Drew Luton | Area Legal Advisor |
| 12. Mark Krackiewicz | Regional Economist |
| 13. Ben Hawley | Program Officer |
| 14. Jonathan Addleton | Deputy Program Officer |

ANNEX C:

FARMING PRACTICED FOR PRODUCTIVITY (FPP)
LOGICAL FRAMEWORK MATRIX

| NARRATIVE | ASSUMPTIONS |
|---|---|
| <hr/> <u>1. Project Level</u> <hr/> | |
| <p>GOAL: To increase production of cash crops, primarily horticultural, on small and medium-scale farms by raising the productivity of land, labor, and water resources</p> | <ol style="list-style-type: none">1. Farmers are able to apply technologies given technical information and availability of inputs in private sector2. Private distributors respond to opportunities by increasing supply of inputs3. Financial incentives for horticultural production (prices) and availability of foreign exchange do not deteriorate markedly |
| <p>PURPOSE: To provide farmers with technology needed to raise horticultural production and income</p> | <ol style="list-style-type: none">1. Demonstration and other activities of extension are sufficient to provide farmers with enough information to apply technology, given parallel training of private input suppliers |
| <hr/> <u>2. On-Farm Horticultural Applications (OHA) Module</u> <hr/> | |
| <p>PURPOSE: To transfer knowledge of technical packages for horticultural production to farmers, extension agents, and input distributors in the project area</p> | <ol style="list-style-type: none">1. Extension agents apply training in contact with farmers2. Demonstrations are successful in demonstrating technologies that raise production and income for target farmers3. Input distributors participate in training programs |

OUTPUTS:

1. 20 demonstrations on "baladi" orchards established
2. 20 demonstrations of improved varieties established
3. 24 irrigation demonstrations established
4. At least 100 in-country training courses for agents and input distributors

1. Farmers agree to serve as cooperators and cooperate effectively in applying technology
2. TA team is able to develop initial recommendation packages for "baladi" trees without research
3. ARAs, RDAs, and MAF collaborate effectively to organize training
4. Private sector distributors participate

INPUTS:

1. Two LT expatriate advisors
2. Equipment for extension agents
3. Extension training supplies
4. Training course operations
5. Demonstration supplies
6. Short term TA
7. YARG personnel
8. Operating budget

1. TA team fielded in timely manner
2. Extension agents available
3. Farmers agree to pay for half of additional cost of demonstrations

3. Horticultural Technology Development (HTD) Module

PURPOSE: To adapt, develop and extend technical packages that are appropriate for small and medium scale farmers and to strengthen Yemeni capacity to adapt, develop and extend such packages in the future

1. ARA staff are willing and able to participate in on-farm research
2. Extension and ARA staff are able to conduct on-farm research collaboratively
3. Research is successful in identifying packages that raise production and net income and are applicable by large numbers of farmers

OUTPUTS:

1. At least 12 technical packages for horticulture production adapted and/or developed

Project staff able to translate research findings and available information into extension/training packages

2. At least two irrigations packages (bubbler and improved furrow or other low-investment package) developed

2. Training successful in transferring knowledge of packages to agents and distributors

INPUTS:

1. Long- and short-term training
2. Long- and short-term technical assistance
3. Research supplies and equipment
4. Research and study grants
5. Research operating expenses

1. Suitable candidates for training and training courses identified
2. ARA and other facilities made available

4. Support Systems for Agriculture (SSA) Module

PURPOSE: To establish a policy, regulatory and analytical environment that will promote the sound development of the horticulture subsector, including the distributor networks that support it

1. Analysis and dialogue results in adoption of laws, regulations, and procedures conducive to expansion of distributor network and input suppliers
2. Distributors and investors utilize analysis and other support services

OUTPUTS:

1. Horticultural Investment profiles
2. Market systems analyses
3. Regulatory studies and analyses
4. Horticultural production systems and analyses
5. Workshops and publications related to FPP activities, particularly in policy area

1. MAF and TA personnel able to produce useful analyses of issues related to agriculture
2. Analyses are made made available and acted upon by decision-makers

INPUTS:

1. Technical assistance
2. YARG personnel
3. Operating expenses
4. Publication expenses
5. Survey expenses
6. Training

1. Trained personnel made available for analysis and report preparation
 2. Extension personnel cooperate in collection of information on current commodity systems
- Personnel available for training

ANNEX D:
YARG LETTER OF REQUEST

Yemen Arab Republic
Prime Minister's Office
Central Planning Organization
Directorate of Projects and Bilateral Assistance

9/21/1989

subject: Farming Practices for Productivity Project (FPP)

The Director of USAID
After Compliments;

Esq

We have the pleasure to convey to you the interest of YAR Government in requesting the implementation and funding of the agricultural project (Farming Practices for Productivity) which you earlier discussed its documents with the Ministry of Agriculture and Fisheries.

On this occasion we would also like to express our appreciation and gratitude for the efforts rendered by the United States Agency for International Development in offering continued assistance and support to our development progress .

With our best regards.

Dr.. Mutahar Abdulla AL-Saeedi
Vice Minister of Development
Vice Chairman of the CPO

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الجمهورية العربية الفلسطينية
رئاسة مجلس الوزراء
المحكمة المركزية للتخطيط

الرقم : ٥٢٢٥
التاريخ : ١١/١٠/٨٤
المرفقات

الموضوع : طلب المشروع تطوير الاساليب الزراعية لزيادة

الانتاجية

الإدارة العامة للمشروعات والتعاون الفني

١٩٨٦/٩/٢١م



المهـد / مدير الوكالة الأمريكية للتنمية الدولية
بمعد اللحية :-

بمقتضى أن خلال إلتكم رغبة حكومة الجمهورية العربية السورية في طلب
تنفيذ وتنفيذ المشروع الزراعي ، تطوير الاساليب الزراعية لزيادة الانتاجية
والذي تم لكم مباحثة وثاقته مع وزارة الزراعة والثروة السمكية .

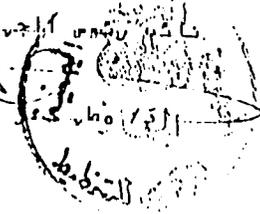
كما خود التعبير بهذه المناسبة عن اهتمامنا بالجهود المبذولة من قبل
الوكالة الأمريكية للتنمية الدولية في تقديم العون والدعم المستمرين لعمارتنا
التنموية .

وتتبعاً واتجاهاتنا ، ، ، ، ،

شافي وزير التنمية

شافي رئيس الجهاز المركزي للتخطيط

عبد الله المحيد



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ANNEX E:

STATUTORY CHECK LISTS

5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A includes criteria applicable to all projects. Part B applies to projects funded from specific sources only: B(1) applies to all projects funded with Development Assistance; B(2) applies to projects funded with Development Assistance loans; and B(3) applies to projects funded from ESF.

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

A. GENERAL CRITERIA FOR PROJECT

1. FY 1989 Appropriations Act Sec. 523; FAA Sec. 634A. If money is sought to obligated for an activity not previously justified to Congress, or for an amount in excess of amount previously justified to Congress, has Congress been properly notified?
Yes (As per State 258005 dated 12 August 1989, FPP CN for dols 2.1 million obligation in FY1989 expired without objection)
2. FAA Sec. 611(a)(1). Prior to an obligation in excess of \$500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance, and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?
(a) yes
(b) yes
3. FAA Sec. 611(a)(2). If legislative action is required within recipient country, what is the basis for a reasonable expectation that such action will be completed in time to permit orderly accomplishment of the purpose of the assistance?
No

4. FAA Sec. 611(b); FY 1989 Appropriations Act Sec. 501. If project is for water or water-related land resource construction, have benefits and costs been computed to the extent practicable in accordance with the principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See A.I.D. Handbook 3 for guidelines.) N/A
5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and total U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability to maintain and utilize the project effectively? N/A
6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. No
7. FAA Sec. 601(a). Information and conclusions on whether projects will encourage efforts of the country to:
 (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.
 (a) project aims at increasing export of Yemen's horticultural crops
 (b) project specifically seeks to promote private sector
 (c) n/a
 (d) project focuses on small and medium scale farmers and private sector
 (e) projects aims to increase technical efficiency in agriculture
 (f) n/a
8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).
 These goals are supported through training and technical assistance

9. FAA Secs. 612(b), 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars. N/A
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release? No
11. FY 1989 Appropriations Act Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity? No
12. FY 1989 Appropriations Act Sec. 549. Will the assistance (except for programs in Caribbean Basin Initiative countries under U.S. Tariff Schedule "Section 807," which allows reduced tariffs on articles assembled abroad from U.S.-made components) be used directly to procure feasibility studies, prefeasibility studies, or project profiles of potential investment in, or to assist the establishment of facilities specifically designed for, the manufacture for export to the United States or to third country markets in direct competition with U.S. exports, of textiles, apparel, footwear, handbags, flat goods (such as wallets or coin purses worn on the person), work gloves or leather wearing apparel? No
13. FAA Sec. 119(g)(4)-(6) & (10). Will the assistance (a) support training and education efforts which improve the capacity of recipient countries to prevent loss of biological diversity; (b) be provided under a long-term agreement in which the recipient country agrees to protect ecosystems or other No

- wildlife habitats; (c) support efforts to identify and survey ecosystems in recipient countries worthy of protection; or (d) by any direct or indirect means significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas? No
14. FAA Sec. 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (either dollars or local currency generated therefrom)? No
15. FY 1989 Appropriations Act. If assistance is to be made to a United States PVO (other than a cooperative development organization), does it obtain at least 20 percent of its total annual funding for international activities from sources other than the United States Government? Probably N/A
Will comply if applicable
16. FY 1989 Appropriations Act Sec. 538. If assistance is being made available to a PVO, has that organization provided upon timely request any document, file, or record necessary to the auditing requirements of A.I.D., and is the PVO registered with A.I.D.? Probably N/A
Will comply if applicable
17. FY 1989 Appropriations Act Sec. 514. If funds are being obligated under an appropriation account to which they were not appropriated, has prior approval of the Appropriations Committees of Congress been obtained? N/A
18. State Authorization Sec. 139 (as interpreted by conference report). Has confirmation of the date of signing of the project agreement, including the amount involved, been cabled to State I/T and A.I.D. LEG within 60 days of the agreement's entry into force with respect to the United States, and has the full text of the agreement been pouched to those same offices? (See Handbook 3, Appendix 6G for agreements covered by this provision). Details will be cabled and original copy plus conformed copies pouched after signing

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

- a. FY 1989 Appropriations Act Sec. 548
 (as interpreted by conference report for original enactment). If assistance is for agricultural development activities (specifically, any testing or breeding feasibility study, variety improvement or introduction, consultancy, publication, conference, or training), are such activities (a) specifically and principally designed to increase agricultural exports by the host country to a country other than the United States, where the export would lead to direct competition in that third country with exports of a similar commodity grown or produced in the United States, and can the activities reasonably be expected to cause substantial injury to U.S. exporters of a similar agricultural commodity; or (b) in support of research that is intended primarily to benefit U.S. producers?
- (a) no
 (b) no
- b. FAA Secs. 102(b), 111, 113, 281(a). Describe extent to which activity will (a) effectively involve the poor in development by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, dispersing investment from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward a better life, and otherwise encourage democratic private and local governmental
- (a) project focuses on small and medium scale farmers in rural Yemen, mainly through training, technical assistance, and introduction of new technologies
 (b) although the project does not aim to develop cooperatives, indirectly it will promote self-help measures and local groups already active in rural Yemen

- (c) see (b) above
- (d) elements of the project, particularly training and extension, focus on women
- (e) some of the training will take place elsewhere in the region
- institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries.
- c. FAA Secs. 103, 103A, 104, 105, 106, 120-21; FY 1989 Appropriations Act (Development Fund for Africa). Does the project fit the criteria for the source of funds (functional account) being used? Yes
- d. FAA Sec. 107. Is emphasis placed on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)? Yes
- e. FAA Secs. 110, 124(d). Will the recipient country provide at least 25 percent of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)? Yes
- f. FAA Sec. 128(b). If the activity attempts to increase the institutional capabilities of private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority? Project focuses on introducing new technology packages in horticulture relevant to small and medium scale farmers in rural Yemen

9. AA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government. Project implementation is based on full utilization of relevant Yemeni institutions and personnel related to horticultural development.
- h. FY 1989 Appropriations Act Sec. 536. Are any of the funds to be used for the performance of abortions as a method of family planning or to motivate or coerce any person to practice abortions? No
- Are any of the funds to be used to pay for the performance of involuntary sterilization as a method of family planning or to coerce or provide any financial incentive to any person to undergo sterilizations? No
- Are any of the funds to be used to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilization as a means of family planning? No
- i. FY 1989 Appropriations Act. Is the assistance being made available to any organization or program which has been determined to support or participate in the management of a program of coercive abortion or involuntary sterilization? No
- If assistance is from the population functional account, are any of the funds to be made available to voluntary family planning projects which do not offer, either directly or through referral to or information about access to, a broad range of family planning methods and services? N/A

- j. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise? Yes
- k. FY 1989 Appropriations Act. What portion of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, colleges and universities having a student body in which more than 40 percent of the students are Hispanic Americans, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans or who are economically or socially disadvantaged (including women)? Institutions to provide training and technical assistance will be selected during the course of project implementation. Where appropriate, this concern will be addressed at that time.
- l. FAA Sec. 118(c). Does the assistance comply with the environmental procedures set forth in A.I.D. Regulation 16? Does the assistance place a high priority on conservation and sustainable management of tropical forests? Specifically, does the assistance, to the fullest extent feasible: (a) stress the importance of conserving and sustainably managing forest resources; (b) support activities which offer employment and income alternatives to those who otherwise would cause destruction and loss of forests, and help countries identify and implement alternatives to colonizing forested areas; (c) support training programs, educational efforts, and the establishment or strengthening of institutions to improve forest management; (d) help end destructive slash-and-burn agriculture by supporting stable and productive farming practices; (e) help conserve forests which have not yet been degraded by helping to increase
- Yes
- N/A

production on lands already cleared or degraded; (f) conserve forested watersheds and rehabilitate those which have been deforested; (g) support training, research, and other actions which lead to sustainable and more environmentally sound practices for timber harvesting, removal, and processing; (h) support research to expand knowledge of tropical forests and identify alternatives which will prevent forest destruction, loss, or degradation; (i) conserve biological diversity in forest areas by supporting efforts to identify, establish, and maintain a representative network of protected tropical forest ecosystems on a worldwide basis, by making the establishment of protected areas a condition of support for activities involving forest clearance or degradation, and by helping to identify tropical forest ecosystems and species in need of protection and establish and maintain appropriate protected areas; (j) seek to increase the awareness of U.S. government agencies and other donors of the immediate and long-term value of tropical forests; and (k) utilize the resources and abilities of all relevant U.S. government agencies?

N/A

N/A

N/A

N/A

N/A

FAA Sec. 118(c)(13). If the assistance will support a program or project significantly affecting tropical forests (including projects involving the planting of exotic plant species), will the program or project (a) be based upon careful analysis of the alternatives available to achieve the best sustainable use of the land, and (b) take full account of the environmental impacts of the proposed activities on biological diversity?

N/A

- n. FAA Sec. 118(c)(14). Will assistance be used for (a) the procurement or use of logging equipment, unless an environmental assessment indicates that all timber harvesting operations involved will be conducted in an environmentally sound manner and that the proposed activity will produce positive economic benefits and sustainable forest management systems; or (b) actions which will significantly degrade national parks or similar protected areas which contain tropical forests, or introduce exotic plants or animals into such areas? No
- o. FAA Sec. 118(c)(15). Will assistance be used for (a) activities which would result in the conversion of forest lands to the rearing of livestock; (b) the construction, upgrading, or maintenance of roads (including temporary haul roads for logging or other extractive industries) which pass through relatively undegraded forest lands; (c) the colonization of forest lands; or (d) the construction of dams or other water control structures which flood relatively undegraded forest lands, unless with respect to each such activity an environmental assessment indicates that the activity will contribute significantly and directly to improving the livelihood of the rural poor and will be conducted in an environmentally sound manner which supports sustainable development? No
- p. FY 1989 Appropriations Act. If assistance will come from the Sub-Saharan Africa DA account, is it (a) to be used to help the poor majority in Sub-Saharan Africa through a process of long-term development and economic growth that is equitable, participatory, environmentally sustainable, and self-reliant; (b) being provided in accordance with the policies contained in section 102 of the FAA; N/A

(c) being provided, when consistent with the objectives of such assistance, through African, United States and other PVOs that have demonstrated effectiveness in the promotion of local grassroots activities on behalf of long-term development in Sub-Saharan Africa;

(d) being used to help overcome shorter-term constraints to long-term development, to promote reform of sectoral economic policies, to support the critical sector priorities of agricultural production and natural resources, health, voluntary family planning services, education, and income generating opportunities, to bring about appropriate sectoral restructuring of the Sub-Saharan African economies, to support reform in public administration and finances and to establish a favorable environment for individual enterprise and self-sustaining development, and to take into account, in assisted policy reforms, the need to protect vulnerable groups;

(e) being used to increase agricultural production in ways that protect and restore the natural resource base, especially food production, to maintain and improve basic transportation and communication networks, to maintain and restore the renewable natural resource base in ways that increase agricultural production, to improve health conditions with special emphasis on meeting the health needs of mothers and children, including the establishment of self-sustaining primary health care systems that give priority to preventive care, to provide increased access to voluntary family planning services, to improve basic literacy and mathematics especially to those outside the formal educational system and to improve primary education, and to develop income-generating opportunities for the unemployed and underemployed in urban and rural areas?

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- q. FY 1989 Appropriations Act Sec. 515. N/A
If deob/reob authority is sought to be exercised in the provision of DA assistance, are the funds being obligated for the same general purpose, and for countries within the same general region as originally obligated, and have the Appropriations Committees of both Houses of Congress been properly notified?

2. Development Assistance Project Criteria
(Loans Only)

- a. FAA Sec. 122(b). Information and N/A
conclusion on capacity of the country to repay the loan at a reasonable rate of interest.
- b. FAA Sec. 620(d). If assistance is N/A
for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20 percent of the enterprise's annual production during the life of the loan, or has the requirement to enter into such an agreement been waived by the President because of a national security interest?
- c. FAA Sec. 122(b). Does the activity N/A
give reasonable promise of assisting long-range plans and programs designed to develop economic resources and increase productive capacities?

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3. Economic Support Fund Project Criteria

- a. FAA Sec. 531(a). Will this assistance promote economic and political stability? To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of Part I of the FAA? N/A
- b. FAA Sec. 531(e). Will this assistance be used for military or paramilitary purposes? N/A
- c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made? N/A

5C(3) - STANDARD ITEM CHECKLIST

Listed below are the statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. PROCUREMENT

1. FAA Sec. 602(a). Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed? Yes
2. FAA Sec. 604(a). Will all procurement be from the U.S. except as otherwise determined by the President or determined under delegation from him? Yes (Project authorized Code 941 procurement in general and includes waivers for specific code 935 transactions)
3. FAA Sec. 604(d). If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company? Yes
4. FAA Sec. 604(e); ISDCA of 1980 Sec. 705(a). If non-U.S. procurement of agricultural commodity or product thereof is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? (Exception where commodity financed could not reasonably be procured in U.S.) N/A

5. FAA Sec. 604(g). Will construction or engineering services be procured from firms of advanced developing countries which are otherwise eligible under Code 941 and which have attained a competitive capability in international markets in one of these areas? (Exception for those countries which receive direct economic assistance under the FAA and permit United States firms to compete for construction or engineering services financed from assistance programs of these countries.) No
6. FAA Sec. 603. Is the shipping excluded from compliance with the requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 percent of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S. flag commercial vessels to the extent such vessels are available at fair and reasonable rates? No
7. FAA Sec. 621(a). If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? Will the facilities and resources of other Federal agencies be utilized, when they are particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs? Yes
8. International Air Transportation Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available? Yes
9. FY 1989 Appropriations Act Sec. 504. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States? Yes

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10. FY 1989 Appropriations Act Sec. 524. If assistance is for consulting service through procurement contract pursuant to 5 U.S.C. 3109, are contract expenditures a matter of public record and available for public inspection (unless otherwise provided by law or Executive order)? Yes

B. CONSTRUCTION

1. FAA Sec. 601(d). If capital (e.g., construction) project, will U.S. engineering and professional services be used? N/A
2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? Yes if applicable
3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million (except for productive enterprises in Egypt that were described in the CP), or does assistance have the express approval of Congress? N/A

C. OTHER RESTRICTIONS

1. FAA Sec. 122(b). If development loan repayable in dollars, is interest rate at least 2 percent per annum during a grace period which is not to exceed ten years, and at least 3 percent per annum thereafter? N/A
2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? N/A

3. FAA Sec. 620(h). Do arrangements exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries? Yes
4. Will arrangements preclude use of financing:
- a. FAA Sec. 104(f); FY 1989 Appropriations Act Secs. 525, 536. (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which relates, in whole or part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; or (4) to lobby for abortion? Yes
- b. FAA Sec. 483. To make reimbursements, in the form of cash payments, to persons whose illicit drug crops are eradicated? Yes
- c. FAA Sec. 620(g). To compensate owners for expropriated or nationalized property, except to compensate foreign nationals in accordance with a land reform program certified by the President? Yes
- d. FAA Sec. 660. To provide training, advice, or any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? Yes
- e. FAA Sec. 662. For CIA activities? Yes

- f. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained? Yes (waiver will be obtained)
- g. FY 1989 Appropriations Act Sec. 503. To pay pensions, annuities, retirement pay, or adjusted service compensation for prior or current military personnel? Yes
- h. FY 1989 Appropriations Act Sec. 505. To pay U.N. assessments, arrearages or dues? Yes
- i. FY 1989 Appropriations Act Sec. 506. To carry out provisions of FAA section 209(d) (transfer of FAA funds to multilateral organizations for lending)? Yes
- j. FY 1989 Appropriations Act Sec. 510. To finance the export of nuclear equipment, fuel, or technology? Yes
- k. FY 1989 Appropriations Act Sec. 511. For the purpose of aiding the efforts of the government of such country to repress the legitimate rights of the population of such country contrary to the Universal Declaration of Human Rights? Yes
- l. FY 1989 Appropriations Act Sec. 516; State Authorization Sec. 109. To be used for publicity or propaganda purposes designed to support or defeat legislation pending before Congress, to influence in any way the outcome of a political election in the United States, or for any publicity or propaganda purposes not authorized by Congress? Yes
5. FY 1989 Appropriations Act Sec. 584. Will any A.I.D. contract and solicitation, and subcontract entered into under such contract, include a clause requiring that U.S. marine insurance companies have a fair opportunity to bid for marine insurance when such insurance is necessary or appropriate? Yes

Listed below are statutory criteria applicable to: (A) FAA funds generally; (B)(1) Development Assistance funds only; or (B)(2) the Economic Support Fund only.

A. GENERAL CRITERIA FOR COUNTRY ELIGIBILITY

1. FY 1989 Appropriations Act Sec. 578(b). No
Has the President certified to the Congress that the government of the recipient country is failing to take adequate measures to prevent narcotic drugs or other controlled substances which are cultivated, produced or processed illicitly, in whole or in part, in such country or transported through such country, from being sold illegally within the jurisdiction of such country to United States Government personnel or their dependents or from entering the United States unlawfully?

2. FAA Sec. 481(h); FY 1989 Appropriations Act Sec. 578; 1988 Drug Act Secs. 4405-07. N/A
(These provisions apply to assistance of any kind provided by grant, sale, loan, lease, credit, guaranty, or insurance, except assistance from the Child Survival Fund or relating to international narcotics control, disaster and refugee relief, narcotics education and awareness, or the provision of food or medicine.) If the recipient is a "major illicit drug producing country" (defined as a country producing during a fiscal year at least five metric tons of opium or 500 metric tons of coca or marijuana) or a "major drug-transit country" (defined as a country that is a significant direct source of illicit drugs significantly affecting the United States, through which such drugs are transported, or through which significant sums of drug-related profits are

laundered with the knowledge or complicity of the government): (a) Does the country have in place a bilateral narcotics agreement with the United States, or a multilateral narcotics agreement? and (b) Has the President in the March 1 International Narcotics Control Strategy Report (INSCR) determined and certified to the Congress (without Congressional enactment, within 45 days of continuous session, of a resolution disapproving such a certification), or has the President determined and certified to the Congress on any other date (with enactment by Congress of a resolution approving such certification), that (1) during the previous year the country has cooperated fully with the United States or taken adequate steps on its own to satisfy the goals agreed to in a bilateral narcotics agreement with the United States or in a multilateral agreement, to prevent illicit drugs produced or processed in or transported through such country from being transported into the United States, to prevent and punish drug profit laundering in the country, and to prevent and punish bribery and other forms of public corruption which facilitate production or shipment of illicit drugs or discourage prosecution of such acts, or that (2) the vital national interests of the United States require the provision of such assistance?

3. 1986 Drug Act Sec. 2013; 1988 Drug Act Sec. 4404. (This section applies to the same categories of assistance subject to the restrictions in FAA Sec. 481(h), above.) If recipient country is a "major illicit drug producing country" or "major drug-transit country" (as defined for the purpose of FAA Sec 481(h)), has the President submitted a report to Congress listing such country as one (a) which, as a matter of government policy, encourages or facilitates the production or distribution of illicit drugs; (b) in which any senior official of the

N/A

government engages in, encourages, or facilitates the production or distribution of illegal drugs; (c) in which any member of a U.S. Government agency has suffered or been threatened with violence inflicted by or with the complicity of any government officer; or (d) which fails to provide reasonable cooperation to lawful activities of U.S. drug enforcement agents, unless the President has provided the required certification to Congress pertaining to U.S. national interests and the drug control and criminal prosecution efforts of that country?

4. FAA Sec. 620(c). If assistance is to a government, is the government indebted to any U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies, (b) the debt is not denied or contested by such government, or (c) the indebtedness arises under an unconditional guaranty of payment given by such government or controlled entity? No
5. FAA Sec. 620(e)(1). If assistance is to a government, has it (including any government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities? No
6. FAA Secs. 620(a), 620(f), 620D; FY 1989 Appropriations Act Secs. 512, 550, 592. Is recipient country a Communist country? If so, has the President determined that assistance to the country is vital to the security of the United States, that the recipient country is not controlled by the international Communist conspiracy, and that such assistance will further promote the independence of the recipient country from international communism? Will assistance be provided No

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either directly or indirectly to Angola, Cambodia, Cuba, Iraq, Libya, Vietnam, South Yemen, Iran or Syria? Will assistance be provided to Afghanistan without a certification, or will assistance be provided inside Afghanistan through the Soviet-controlled government of Afghanistan?

7. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, damage or destruction by mob action of U.S. property? No
8. FAA Sec. 620(l). Has the country failed to enter into an investment guaranty agreement with OPIC? No
9. FAA Sec. 620(o); Fishermen's Protective Act of 1967 (as amended) Sec. 5. (a) Has the country seized, or imposed any penalty or sanction against, any U.S. fishing vessel because of fishing activities in international waters? No
(b) If so, has any deduction required by the Fishermen's Protective Act been made?
10. FAA Sec. 620(q); FY 1989 Appropriations Act Sec. 518. (a) Has the government of the recipient country been in default for more than six months on interest or principal of any loan to the country under the FAA? (b) Has the country been in default for more than one year on interest or principal on any U.S. loan under a program for which the FY 1989 Appropriations Act appropriates funds? No
11. FAA Sec. 620(s). If contemplated assistance is development loan or to come from Economic Support Fund, has the Administrator taken into account the percentage of the country's budget and amount of the country's foreign exchange or other resources spent on military equipment? (Reference may be made to the annual "Taking Into Consideration" memo: "Yes, taken into account by the Administrator at time of approval of N/A

Agency OYB." This approval by the Administrator of the Operational Year Budget can be the basis for an affirmative answer during the fiscal year unless significant changes in circumstances occur.)

12. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have relations been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption? Diplomatic relations were severed between 1967 and 1973. In April 1974, U.S. economic assistance was resumed with signing of a new economic agreement
13. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the A.I.D. Administrator in determining the current A.I.D. Operational Year Budget? (Reference may be made to the "Taking into Consideration" memo.) No (see taking into consideration memo)
14. FAA Sec. 620A. Has the President determined that the recipient country grants sanctuary from prosecution to any individual or group which has committed an act of international terrorism or otherwise supports international terrorism? No
15. FY 1989 Appropriations Act Sec. 568. Has the country been placed on the list provided for in Section 6(j) of the Export Administration Act of 1979 (currently Libya, Iran, South Yemen, Syria, Cuba, or North Korea)? No
16. ISDCA of 1985 Sec. 552(b). Has the Secretary of State determined that the country is a high terrorist threat country after the Secretary of Transportation has determined, pursuant to section 1115(e)(2) of the Federal Aviation Act of 1958, that an airport in the country does not maintain and administer effective security measures? No

17. FAA Sec. 666(b). Does the country object, on the basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. who is present in such country to carry out economic development programs under the FAA? No
18. FAA Secs. 669, 670. Has the country, after August 3, 1977, delivered to any other country or received nuclear enrichment or reprocessing equipment, materials, or technology, without specified arrangements or safeguards, and without special certification by the President? Has it transferred a nuclear explosive device to a non-nuclear weapon state, or if such a state, either received or detonated a nuclear explosive device? (FAA Sec. 620E permits a special waiver of Sec. 669 for Pakistan.) No
19. FAA Sec. 670. If the country is a non-nuclear weapon state, has it, on or after August 8, 1985, exported (or attempted to export) illegally from the United States any material, equipment, or technology which would contribute significantly to the ability of a country to manufacture a nuclear explosive device? No
20. ISDCA of 1981 Sec. 720. Was the country represented at the Meeting of Ministers of Foreign Affairs and Heads of Delegations of the Non-Aligned Countries to the 36th General Assembly of the U.N. on Sept. 25 and 28, 1981, and did it fail to disassociate itself from the communique issued? If so, has the President taken it into account? (Reference may be made to the "Taking into Consideration" memo.) See Taking Into Consideration Memo
21. FY 1989 Appropriations Act Sec. 527. Has the recipient country been determined by the President to have engaged in a consistent pattern of opposition to the foreign policy of the United States? No

22. FY 1989 Appropriations Act Sec. 513. Has the duly elected Head of Government of the country been deposed by military coup or decree? If assistance has been terminated, has the President notified Congress that a democratically elected government has taken office prior to the resumption of assistance? No
23. FY 1989 Appropriations Act Sec. 540. Does the recipient country fully cooperate with the international refugee assistance organizations, the United States, and other governments in facilitating lasting solutions to refugee situations, including resettlement without respect to race, sex, religion, or national origin? Yes

B. FUNDING SOURCE CRITERIA FOR COUNTRY ELIGIBILITY

1. Development Assistance Country Criteria

FAA Sec. 116. Has the Department of State determined that this government has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, can it be demonstrated that contemplated assistance will directly benefit the needy?

No

FY 1989 Appropriations Act Sec. 536. Has the President certified that use of DA funds by this country would violate any of the prohibitions against use of funds to pay for the performance of abortions as a method of family planning, to motivate or coerce any person to practice abortions, to pay for the performance of involuntary sterilization as a method of family planning, to coerce or provide any financial incentive to any person to undergo sterilizations, to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilization as a means of family planning?

No

2. Economic Support Fund Country Criteria

FAA Sec. 502B. Has it been determined that the country has engaged in a consistent pattern of gross violations of internationally recognized human rights? If so, has the President found that the country made such significant improvement in its human rights record that furnishing such assistance is in the U.S. national interest?

N/A

FY 1989 Appropriations Act Sec. 578(d). Has this country met its drug eradication targets or otherwise taken significant steps to halt illicit drug production or trafficking?

N/A

Annex F:

EXECUTIVE SUMMARY,
DRAFT YEMEN FARM
PRICE AND INCENTIVES
STUDY (JUNE 1989)

The substantial economic progress made by the Yemen Arab Republic (YAR) since its founding in 1962 has been driven in no small part by grants and by worker remittances from abroad. These sources of revenue to YAR are tied to petroleum revenues in Saudi Arabia and the Gulf States. The decline in grants and remittances promises to be offset by revenues from domestic oil production. However, known and anticipated YAR oil reserves are expected to last only 15 years at the current rate of extraction.

Given its high ratio of population to natural resources, Yemen faces a formidable challenge to sustain economic progress after oil reserves are depleted. Agriculture (including qat), which accounts for 60 percent of employment and 40 percent of national income, is the major basic industry and must perform well if the national economy is to perform well after oil revenues fall. Policy and development efforts need to focus especially on agriculture during a 15-year transition period positioning the economy for sustained growth in the post-oil era.

Agriculture faces formidable constraints, however, in becoming the vehicle for growth:

- Limited water supplies. Groundwater use exceeds natural recharge, and reserves are declining especially in the Sana's Basin. The Tihama Region is troubled by brackishwater from intrusion of seawater into the underground aquifer. Irrigation water is currently being used with low efficiency.
- Fragmented landholdings. Fields are often too small and terrain too irregular for efficient field operations, including mechanized tillage.
- Inadequate supporting infrastructure (roads, bridges, etc.) and public services (general and vocational education, agricultural extension and research, technology transfer, and information services).
- Macroeconomic (monetary and fiscal) and trade policies inhibiting agricultural and national economic growth.

The era of domestic oil production buys time and provides capital for the Government of Yemen to make changes in policy to revitalize agriculture. Failure to make these policy changes likely will lead to declining national income.

Yemen's agricultural prices and incentives are distorted and growth inhibited by two principal macroeconomic characteristics not unique to YAR:

- So called "Dutch disease" whereby the strong comparative advantage in oil supplies foreign exchange to meet demand for such exchange at a high value of the Yemen rial (YR). This undermines the ability of Yemen's agricultural products to be price-competitive in international markets.
- The so called "internal immiserization process" characteristic of numerous developing countries (and some developed countries). Under the process, excess public spending relative to receipts leads to excessive external debt and debt service burden, to excessive creation of money supply and thereby to inflation, to an overvalued currency in foreign exchange when the inflated domestic currency (YR) is pegged to a more stable currency (US \$), and to shortage and rationing of foreign exchange.

Under "Dutch disease" the YR exchange rate is high but not overvalued. As compensation for this export disincentive and to position a disadvantaged agriculture for post-oil growth, the appropriate policy is to use oil export earnings to provide public goods with a high economic payoff and to provide import tax relief. Examples of public goods beneficial to agriculture include:

- Supporting infrastructure, especially feeder roads and irrigation facilities;
- Public services including especially general and technical-vocational education, and agricultural research and extension;
- In addition, agricultural productivity and growth can be enhanced by phasing out of import taxes and other import restraints on highly productive agricultural inputs such as improved seeds, fertilizers, and pesticides.

The internal immiserization process causes inflation, negative real interest rates, overvalued currency, and exchange rate controls damaging to agricultural and national economic growth. Compensation to agriculture is not feasible; the best solution is to avoid actions that energize the immiserization process: government deficits, internal and external borrowing for unproductive spending, excessive creation of money supplies, fixed exchange rates, and exchange and price controls. Exchange controls invite mismanagement and cause inefficiency, especially when they restrict such vital imports as fertilizers and pesticides.

A moving-peg exchange rate is suggested whereby the YR exchange rate is adjusted periodically (say every 6 months if inflation is high) for the inflation rate in Yemen versus that of currency of a weighted average of trading partners. Where inevitable errors are made, it is better to err on the side of too low rather than too high a value of the YR.

The Government of Yemen has been, since the early 1980s, heavily involved in managing the flow of agricultural imports. In addition to the ban on the imports of fruits and vegetables that has been in effect since 1983, the Ministry of Economy, Supply and Trade has had responsibility for rationing the imports of three "strategic" agricultural commodities: wheat, flour and rice. To explore the effects of these import restrictions on the pricing structure in the agricultural sector, nominal and effective protection coefficients for individual commodities and groups of commodities were estimated.

The nominal protection coefficients (NPCs), which measure the divergence between the domestic price and its border price equivalent, indicate that domestic prices were well above import parity for all commodities. The gap was so large in certain cases that the domestic price was 7 to 8 times its international price equivalent. The conclusion that the domestic price structure has offered unusually high incentives to producers holds whether the official exchange rate (OER) or the shadow exchange rate (SER) is used to derive the coefficients. Incentives were highest for cereals and fruits, and lowest for vegetables, coffee and poultry.

The effective protection coefficients (EPCs), which measure the net effects of domestic economic policy in both the input and output markets, were in general higher than the NPCs. The differential is due to the fact that a number of distortions exist both in favor of producers (e.g., fertilizer and pesticides) and against producers (e.g., fuel), with a net effect reflecting a subsidy on the input side. However, the EPCs did not differ significantly from the NPCs, an expected result when tradable inputs represent, as in Yemen, a small fraction of production costs.

A major objective of the report is to investigate comparative advantage in YAR agriculture. Following most studies in this research area, the domestic resource cost (DRC) approach was used to determine Yemen's comparative advantage in the production of cereals, fruits, vegetables, coffee and poultry. The DRC coefficient can be interpreted as a social cost/benefit ratio that measures the rate at which a country is substituting domestic resources to produce one unit of a given commodity for each unit of foreign exchange saved by not importing that commodity. The DRC concept is essentially an indicator of the efficiency of domestic production relative to the international market. It shows whether there are social costs or social benefits in producing the commodity rather than importing it. If domestic resource costs are, for instance, higher than foreign exchange saved, then it is less costly to import the commodity than to produce it. The DRC coefficients are constructed such that a coefficient less (greater) than 1 indicates comparative advantage (disadvantage).

The overall picture which emerges from the DRC analysis is that Yemen has comparative advantage in fruits, vegetables and poultry, is unlikely to have comparative advantage in coffee, and has a clear comparative disadvantage in cereals. It is debatable whether the wage rate in the YAR reflects the opportunity cost of labor. However, the foregoing conclusion remains valid even when labor is valued at 25 percent of market wage. Nor is the classification fundamentally altered when the official rather than the shadow exchange rate is utilized, except for broilers where exchange rate policies seem to determine whether comparative advantage exists in that industry. It should, nevertheless, be noted that horticultural crops are more solidly on the side of comparative advantage when the SER is used and when labor is valued at below actual market wage levels.

Coefficients for individual fruits and vegetables are not sufficiently different so as to allow confident inferences on which of the crops considered has more comparative advantage, except for banana production where farming practices that include chemical control display an unambiguous comparative disadvantage.

It is extremely important to stress that the DRC coefficients are highly sensitive to yield increases and domestic price levels relative to import parity. Reducing the present disparity between domestic and international prices would greatly enhance Yemen's comparative advantage in horticultural crops. Yield increases are in large part a function of fertilizer and other modern inputs. The substantial benefits from chemical use are illustrated in banana production. It has also been shown that fertilizer application can generate unusually high returns in the YAR. This evidence strengthens the rationale for liberalizing imports of fertilizer and agricultural chemicals, including removal of foreign exchange restrictions.

Most of the results in the foodgrain sector indicate comparative disadvantage, suggesting that cereal production is the least competitive economic activity. As indicated by the DRC coefficients, 3 to 4 units of domestic resources are substituted for each unit of foreign exchange saved by not importing foodgrains. This finding runs counter to a widespread belief in Yemen that an extensive program should be designed to reduce cereal imports so as to contain the massive drain on scarce foreign exchange resources. The high DRC coefficient for foodgrains indicates that, if not generated by further intensification and improved farming practices, a production increase would result in economic inefficiency and reduced national income. The lower DRC coefficients for fruits and vegetables also suggest that, as agricultural production expands, efforts should be concentrated to encourage that expansion in the horticultural sector. Such an implication should, however, consider the fact that fruits and vegetables are heavy users of irrigation water, a most limiting resource in Yemeni agriculture. Further research to determine the opportunity cost of irrigation water would place social efficiency in the horticultural sector relative to other sectors in a better perspective.

It is important to note that some of the conclusions suggested by the DRC analysis should be tempered by the severe data limitations encountered during the study. Further analysis based on a more reliable and more complete set of farm budgets prepared for major modes of production, crop rotations and agro-climatic zones would ensure better understanding of Yemen's comparative advantage in the agricultural sector.

This study shows that import restrictions on fruits and vegetables reduce real income of consumers more than they raise income of producers, and that such restrictions markedly retard real national income. Based on data for 1987, additions to full national income from fruit and vegetable trade liberalization are estimated at approximately YR 3 billion, with more than YR 2 billion for fruits and less than YR 1 billion for vegetables. National income is reduced by the import restrictions because income gains to producers are more than offset by real income losses to consumers whose buying power declines with higher prices for fruits and vegetables.

The loss in full national income per YR transferred to producers through market interventions is estimated at YR 1.63 for fruits and YR 1.45 for vegetables. If the Government of Yemen deems that transfers to producers are warranted, more efficient transfer mechanisms than trade restrictions are available. Such mechanisms range from direct payments unrelated to production to public investment in irrigation facilities, roads, education and health services. Adjustment to a more open market would be least difficult while oil revenues can be used to cushion adjustments of producers.

In short, economic progress will be made by expanding government outlays for infrastructure and social services that expand national income while phasing out interventions that reduce national income.

As such, recommendations in the study include:

- Phase out price controls and public involvement in activities that can be performed by the private sector. Markets were found to function well in Yemen. Merchants and traders are innovative and competition is keen. Release of the public sector from activities which the private sector can perform more efficiently frees public employees and funds to concentrate on provision of public goods which the private sector does not provide but are essential for an efficient private sector and growing economy.
- Concentrate export promotion on crops in which Yemen has a competitive advantage. Yemen is now only marginally competitive in international agricultural markets, mainly in fruits and vegetables filling seasonal niches in Saudi Arabia and the Gulf States. In the post-oil era, however, agricultural commodities of Yemen will enjoy a much stronger competitive position as the YR falls in value.
- Encourage consolidation of fragmented holdings through use of fertilizer price, credit cost, and property tax incentives or other means.
- Stimulate formation of cooperative community banks and credit unions and of branch commercial banking for savings mobilization at positive real interest rates. Savings could, in turn, be invested in high payoff activities such as bubble irrigation. We suggest that the private market rather than the government determine most credit allocations.
- Irrigation efficiency incentives. The market alone will not provide proper incentives for irrigation efficiency because water prices (costs) do not reflect scarcity value of water -- the most limiting agricultural resource. Public involvement to raise irrigation efficiency from currently low levels, to develop additional water where appropriate, and to ration available supplies should include:
 1. Irrigation technical assistance and education to farmers.

2. Prohibitions against excessive drilling where groundwater supplies are being depleted (In some instances, this may mean diversion of water from low value farm irrigation to high value urban and industrial use.).
3. Public development of irrigation infrastructure where the economic payoff is favorable but where the scale is too large and risk too great for development by private firms. An example is spate irrigation.
4. Impose user charges to cover at least operating and maintenance costs of public irrigation projects.
5. Appropriate incentives for crops to irrigate. With appropriate pricing and absence of market intervention, the market will make efficient decisions regarding what crops to irrigate and export.

Yemen is commended for following policies in early years after the revolution that have proven most successful for growth in developing countries. Such policies emphasized the public sector providing public goods such as infrastructure and social services, reliance on the private sector for other goods and services with minimal interventions (e.g., subsidies, price controls, excessive taxes, etc.), an open economy in terms of access to world markets, and an atmosphere of national stability where long-term plans and private contracts can be made and carried out. Signs of departure from the successful policy formula are apparent in import duties, exchange and price controls, and a growing bureaucracy administering these interventions. This report shows that these interventions reduce national income. The government of Yemen will need to determine whether it can afford to maintain these interventions which detract from high-priority public sector needs in the transition period preparing for the post-oil era. Because provision of public goods of the type noted in this report is so vital to increase national income, market interventions that reduce national income must be scrutinized carefully at a time when many nations are trying vainly to rid themselves of such interventions.

ANNEX G
INITIAL ENVIRONMENTAL EXAMINATION
FARMING PRACTICES FOR PRODUCTIVITY PROJECT

279-0084

Annex G

Initial Environmental Examination

Project Location: Yemen Arab Republic

Project Title: Farming Practices For Productivity
(279-084)

Funding (Fiscal Year and Amount): FY90 \$2.1M, FY91-FY97 \$37.9M

Life of Project: \$40M, 8 years

IEE Prepared by: Dr. Harvey Reissig, Cornell University,
Dr. Bill Ellis, Irrigation Specialist,
F. Rudolph Vigil F. Rudolph Vigil, ADO/Yemen
September 16, 1989

Environment Actions Recommended:

It is recommended that a negative determination be given this project. The bases for this recommendation are found in pages 15, 16 and 20 of this Initial Environmental Examination (IEE).

USAID Project Committee

John B. Swanson, S/ADO
Ben Hawley, PRM
Jonathan Addleton, PRM
Leonard Kata, ACO
Abdel A. Moustafa, ADO

Concurrence:

Date:

John B. Swanson 9/18/89
Ben Hawley 9/18/89
Jonathan Addleton 9/18/89
Leonard Kata 9/18/89
Abdel A. Moustafa 9/18/89

Director's Decision:

Kenneth H. Sherper
Approved Environmental
Action Recommendation
Date: 9/18/89

Disapproved Environmental
Action Recommendation
Date: _____

IEE Executive Summary

The Farming Practices for Productivity Project (FPP) has as its goal to increase the production of cash crops, primarily horticultural, on small and medium scale farms by raising the productivity of land, labor and water resources. In order to achieve this goal the FPP project intends to develop new horticulture technologies and to provide the farmers with the technology needed to raise horticulture production and income.

The FPP project's impact on the environment will be twofold; one, through the use of chemical pesticides and two, through the mining of the ground water aquifer to irrigate the crop.

A. Pesticides Concerns

All of the pesticides proposed for use in the FPP project are labeled for use by the EPA in the United States on the same crops selected for emphasis in the project. None of the pesticides selected is classified by the EPA as a "restricted use" material, and, therefore should be appropriate for widespread usage by Yemeni farmers. None of the materials is currently on the EPA's list of intent to cancel or suspend. All of the pesticides proposed for use in the FPP project have been widely used for various lengths of time in orchards in the United States and other fruit production areas throughout the world. Therefore, the proposed pesticides should be compatible with the orchard ecosystems in Yemen if they are properly applied.

Although there are a relatively large number of potential insect, mite, and disease pests in Yemen, only a few key pests can currently be considered serious problems in fruit tree production. However, Yemeni farmers are currently relying on protective applications of pesticides applied throughout the season to control these pests. As the amount of fruit acreage increases and crop production inputs intensify, it is likely that the pest pressure will become increasingly severe. Unless farmers adapt a more rational Integrated Pest Management (IPM) approach for controlling pests in their orchards, all of the problems associated with pesticide misuse may develop in fruit production in Yemen. Therefore, the FPP project should attempt to prevent these potential problems arising from pesticide misuse by hiring a Pest Management Specialist (PMS) to design and test practical IPM programs that are appropriate for Yemeni farmers to use in the production of horticultural crops.

Summary of Specific Recommendations for IPM Activities

1. The following areas of pest management research on

fruit crops should be conducted within the project: relative pest severity and crop losses; plant resistance; biological control; sampling, monitoring and economic threshold levels; control and management of nursery pests; and training and outreach.

2. Using current available information and technology, the PMS within the project should immediately work with the Extension Training Specialists (ETS) to develop appropriate crop protection and IPM recommendations and training programs for extension specialists and farmers.
3. As new practical IPM research results are generated within the project, the PMS should work with ETS in the project to evaluate and test the new technology at the farm level, and incorporate this new information into updated IPM recommendations and training programs.
4. The PMS should work with extension training specialists to ensure that pesticides within the project are properly labeled, used pesticide containers are properly disposed of, and farmers and technicians are provided with appropriate protective clothing and trained in proper pesticide handling and use.
5. Pest management activities within the project could be provided by either of the two following types of staffing patterns: (1) A full time expatriate PMS could work in the project for 2-3 years with a Yemeni counterpart. Then the counterpart would direct activities with support from a short-term expatriate consultant for the next several years. (2) A Yemeni PMS would be hired full time for the length of the project. This counterpart would be supported by periodic visits from a short-term expatriate consultant to help plan pest management research and evaluate progress twice a year.

B. Irrigation Concerns

Successful implementation of the project will result in changes in water resources management, irrigation techniques, and the use of agricultural inputs (fertilizers, pesticides, etc.) in the project area. These changes will occur through adoption by Yemeni farmers of improved irrigated agriculture practices promoted by project-financed demonstration and training centers and on-farm demonstrations. The dissemination of these practices will be accomplished through: (a) farmers visiting project-funded demonstration and training center; (b) farmer;

participating in and observing on-farm demonstrations; (c) promotion of new types of irrigation and inputs by private sector importers and distributors and government extension agents. The potential environmental impacts from these programs are small and easily controlled. They should not be anticipated to result in significant environmental impacts provided that construction is properly supervised and pesticides and fertilizers used in the project are properly selected, stored and applied.

Adoption of new irrigation technologies should have a major beneficial environmental impact resulting from more effective use of limited water resources. Through the use of new application techniques, better field preparation, and improved timing of water and inputs, it is anticipated that irrigation efficiencies can be improved from present values of 25 to 35% to 60 to 80%. More efficient water application will reduce water demand, reduce the labor needed to irrigate, increase yields through better nutrient use, and reduce the incidence of plant diseases.

The proposed project focuses entirely on the improvement of irrigated farming practices on land that is already irrigated. The project will not promote or be involved in the drilling of additional wells. While well drilling will continue in the project area, this activity is outside and beyond the control of this project.

Summary of Specific Recommendation for Irrigation

1. Establishment and maintenance of a well monitoring program at the project funded demonstration and training centers and collection of well data in association with on-farm demonstrations of irrigation techniques.
2. Project-sponsored training programs for private sector importers and distributors of irrigation equipment concerning irrigation techniques, equipment and field installation methods being promoted by the demonstration and training centers and on farm demonstrations.
3. Project sponsored training programs for private sector importers and distributors of pesticides, and for extension agents and farmers, concerning the cause, control and treatment of Schistosomiasis. These sessions should focus on water management and weed control practices which can be used to environmentally control vector habitat. If determined appropriate by the Government of Yemen, these sessions could include demonstrations concerning the use and safe application of molluscicides.

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C. Monitoring and Evaluation

Environmental concerns will be included as an element of the monitoring and evaluation plans for the project. Special emphasis will be placed on monitoring implementation of the specific pesticide and irrigation recommendations stated herein and the evaluation of training programs for government staff, private sector personnel and farmers.

D. Recommendation

The USAID Project Committee recommends that a Negative Environmental Determination be given the FPP project as the committee feels that the proposed project activities will not have a significant effect on the environment.

Initial Environmental Examination FPP Project

The general purpose of the FPP project is to increase farm productivity through the identification, testing, demonstration, dissemination, and adoption of improved farm technology packages and through the identification and promotion of associated and required market structures and policy reforms. The project is currently divided into 3 modules: On-Farm Horticultural Applications, Horticulture Technology Development, and Support Systems for Agriculture.

The FPP project's impact on the environment will be twofold; one, through the use of chemical pesticides and two, through the mining of the ground water aquifer to irrigate the crop.

1. Initial Environmental Examination of Pesticide Use in the Farming Practices for Productivity Project (FPP) in Yemen

As outlined in the section on Environmental Procedures according to AID's regulation 22 CFR Part 216, an Initial Environmental Examination (IEE) is the first review of the reasonably foreseeable effects of a proposed action on the environment. The limited amount of pesticides purchased and used in this project should generally be exempt from these prescribed procedures outlined in 216.2 (c) (iii) "Research activities which may have an effect on the physical and natural environment but will not have a significant effect as a result of limited scope, carefully controlled nature and effective monitoring. "However, since the results obtained from the demonstration and adaptive research trials carried out in this project may eventually be used on a larger scale by Yemeni farmers, the following IEE will examine the projected environmental effects of the pesticides according to the procedures outlined in section 216.3 (b) for projects including the procurement or use of pesticides.

A. The EPA Registration Status of the Requested Pesticide

In the United States, pesticides are registered by the Environmental Protection Agency (EPA) into one of two categories: (1) Restricted Use -- A restricted use pesticide can only be purchased and applied by a certified applicator who has been properly trained in pesticide use and hazards. Pesticides are classified for "restricted use" because they are highly toxic or persistent and accumulative in the environment. (2) General Use -- General use pesticides can be purchased and used by the general public. All of the pesticides proposed for use in the FPP project in fruit crops are labeled for use by the EPA in the United States on the same fruit crops selected for emphasis in this project (Table 1). None of the pesticides selected is classified by the EPA as a "restricted use" material, and, therefore, the pesticides

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selected for use in this project should be quite appropriate for widespread usage by Yemeni farmers if they are given the types of training and instruction in the proper use of pesticides outlined in this document.

None of the materials is currently on the EPA's list of intent to cancel or suspend, although several of the compounds have completed the special review process, which is utilized by the EPA to evaluate pesticides that may post a specific risk or risks to human health and/or the environment. Benomyl was reviewed to determine its effect on wildlife and nontarget species and oncogenic properties and neurotoxicity. Diazinon was reviewed to determine its effects on wildlife and nontarget species. The registration of Dicofol was cancelled in 1987 because of contamination by DDT-like residues. Currently, a new formulation of this material that has an acceptable level of these residues is being marketed. Dimethoate has also been reviewed for its oncogenic and mutagenic properties and possible reproductive effects.

B. Basis for Selection of the Requested Pesticides

Although many pests have been reported to occur on fruit crops in Yemen, discussion with personnel experienced in crop protection indicated that the most common and damaging species are those listed in Table 1. In general, the pesticides selected for the project were chosen because they are labeled in the United States for these key fruit production pests in Yemen and they have relatively low mammalian toxicity (Table 1,2).

Several of the pesticides proposed for use in experimental efficiency trials at the al-Irra station although widely used on fruit crops in the United States and elsewhere, are not on the permitted list of pesticides (Appendix II) for Yemen: Phosmet, Dicofol, Propargite, Chlorothalonil, Copper Oxychloride Sulfate, Glyphosphate, and Norflurazon, (Table 2). Phosmet was chosen for testing because it is a broad spectrum organophosphate material providing good residual activity against a wide range of fruit pests. It is no more toxic than Dimethoate or Diazinon, which are currently widely used in Yemen, and is usually considered to be more compatible for use in the United States in Integrate Pest Management (IPM) programs on fruit than these materials because it is relatively nontoxic to beneficials. Propargite and Dicofol were proposed for testing because they are selective miticides that have been used successfully in integrated mite control programs on deciduous fruit in the United States and elsewhere. These miticides along with Morestan will provide an array of materials with different chemical structures that can be used alternately in rotation schemes to prevent the buildup

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of resistance of mites in IPM programs. Chlorothalonin and Copper Oxychloride Sulfate were chosen for evaluation because they are the only fungicides registered on peaches that will control both shot-hole disease and peach leaf curl. Glyphosphate was selected as an herbicide because it is a broad spectrum material, which is considered much safer for applicators than the most likely alternate material, Paraquat, which is currently banned in Yemen and classified as a restricted use pesticide in the United States. Norflurazon was chosen as a more selective herbicide that can be used as a tank mix with Glyphosphate to control certain grasses and broad leafed weeds on sandy soils. The remaining materials were all chosen for use in this project as standard materials for comparative purposes in the research trials because they are all currently widely used in tree fruit crops in Yemen.

The importation and use of small quantities of these pesticides for research trials at the al-Irra station was discussed with Dr. Mohamed al-Gashem, the Director General of Plant Protection. He considered that these trials were appropriate for the project and that the pesticides could be imported for research purposes as long as he is provided with information about the registration status and toxicological data from the United States.

C. Extent to Which the Proposed Pesticide Use is Part of an Integrated Pest Management Program

Very little previous work has been done to develop IPM programs for fruit crops in Yemen. This project will support a long-term Pest Management Specialist (PMS) who will work with Yemeni counterparts to conduct adaptive IPM research programs for fruit and to develop practical extension programs for farmer training. The proposed scope of work for the PMS in this project is presented in Appendix 1. The primary IPM components for fruit outlined in the scope of work are: biological control, varietal susceptibility, and sampling and monitoring techniques.

D. Application Methods and Safety Equipment

Most of the pesticides would be applied in the project in research orchards at the al-Irra station. This station has a relatively modern truck-mounted high pressure sprayer, which is similar to the equipment used for experimental pesticide research in the United States. Pesticides will only be applied at the station by technicians who have been trained by the PMS in proper safety precautions and correct application techniques. The applicators will wear full appropriate safety equipment when applying any of the pesticides recommended in the project: hats, rubber gloves, rubber boots, disposable coveralls and an approved respirator.

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The project will also train farmers in the demonstration plots and surrounding farmers in the safe handling and use of pesticides and provide them with the previously mentioned safety equipment.

Pesticides will be stored in a building structurally separated from office, residential and laboratory spaces. The building will be locked and posted with a sign stating Danger, Pesticides. The floor of the storage building is a sealed, impervious surface. Pesticides will be segregated by function and hazard. Whenever possible, pesticides should be stored on impermeable shelves, racks or pallets. Personal safety equipment appropriate for the pesticides stored and handled should be convenient to but not within the pesticide storage area.

Used pesticide containers should be disposed of properly and never reused. Never abandon empty pesticide containers or allow them to accumulate where they may be encountered by children, pets, livestock and wildlife. To prepare metal and plastic containers for disposal, they should be triple rinsed. This procedure will remove more than 99% of product residue remaining in the empty containers. These containers should then be crushed or punctured to prevent reuse. Properly rinsed containers are not considered hazardous waste and can be disposed of in sanitary landfills. Paper, plastic and combustible pesticide containers can be burned. Burning must be done downwind from workers, occupied buildings or public roads.

E. Acute, Long-Term Toxicological Hazards of Products to Humans and the Environment and Project Mitigation Measures

All pesticides, if misused, can be harmful to humans, nontarget organisms, and the environment. The best way to mitigate these potential harmful effects from pesticides is to handle all materials safely according to the following general precautions. When dealing with chemical products, one should remember that Risk = Toxicity (hazard) x Exposure. The operator cannot change the toxicity of the product, but can reduce exposure and thereby minimize subsequent risks.

Exposure occurs via four routes (1) Oral (mouth), (2) dermal (skin), (3) eyes, and (4) inhalation. Each route of exposure can occur from accidents, spills, broken or faulty equipment or poor personal hygiene. Each route of exposure can be reduced by following basic principles for protection. For example, the most common type of applicator exposure -- dermal exposure of the hands and forearms can be prevented by wearing chemical resistant gloves with long cuffs. Inhalation exposure can be reduced by wearing respirators. Pesticide applicators should

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never eat, drink or smoke while applying pesticides and always wash hands, body and clothing following application operations.

Always read the pesticide label before applying the material and follow the directions for application and observe the precautions outlined on the label.

All of the pesticides selected for this project have a relatively low mammalian toxicity and should not be hazardous to applicators and field workers if they are used according to labeled directions and applicators follow the previously described procedures to minimize exposure. However, some of the materials are, potentially, hazardous to bees: Dimethoate, Diazinon, Phosmet, Malathion and Carbaryl. Severe losses may be expected if bees are present at treatment time or within a day thereafter. Therefore, the following precautions should be followed when using these materials: Notify any beekeepers in the area before spraying; do not spray crops in bloom; when weeds are in bloom, mow them prior to treatment, or spray only when blossoms are closed. Avoid application during the day when field bees are most numerous. Apply very early in the morning or in the evening. Read the pesticide label.

Most of the pesticides selected for use in this project are relatively nonpersistent with a half-life of less than 30 days. Therefore, if applied according to labeled directions, they should not be expected to cause excessive residues in the fruit at harvest, or to contaminate soil or groundwater. Glyphosphate is classified as a moderately persistent chemical with a half-life of 30 to 99 days. The primary potential environmental danger from this material is contamination of soil groundwater. However, one of the most useful indices for quantifying pesticide absorption on soil is the "solubility partition coefficient" (PC). The PC value is defined as the ratio of pesticide concentration in the absorbed state and the solution phase. Thus, pesticides with a high PC value are tightly absorbed to soil and unlikely to leak into groundwater. Glyphosphate has a relatively high PC value and has no biological activity when absorbed to clay particles or organic matter. When bound to soil particles, it is very persistent, but biologically unavailable. Therefore, the potential environmental risk from this compound should be acceptable if it is used according to labeled directions.

F. Effectiveness of the Requested Pesticide for the Proposed Use

Very few tests of the relative effectiveness of different pesticides against disease, insect, and weed pests of fruit trees have been conducted in Yemen. However, all of the pesticides recommended for use in this project have been extensively tested in the United States on the key pests listed

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in Table 1 and have provided effective control. Therefore, the pesticides should also be effective against these pests in Yemen, although the rates and timing may have to be adjusted to be appropriate for local conditions. Also, since most of the pesticides have somewhat broad spectrum activity, they should control some of the minor, more sporadic pests of fruit in Yemen not listed in Table 1.

Several of the key arthropod pests in Yemen, aphids and mites, have become resistant to pesticides in most commercial deciduous fruit trees orchards in the United States and elsewhere. Currently mites can still be controlled on fruit trees in Yemen by insecticides. In the future, it is likely that mites will become resistant to these insecticides and will only be susceptible to the miticides recommended in the project, Dicofol, Propargite and Oxythioquinox. In order to prevent or delay the anticipated buildup of pesticide resistance in fruit orchards in Yemen, different pesticides should be used alternately in the control schedule whenever possible, and pests should also be sampled and monitored so that pesticide applications are minimized.

D. Compatibility of the Proposed Pesticides with Target and Nontarget Ecosystems

All of the pesticides proposed for use in the project in Yemen have been widely used for various lengths of time in deciduous orchards in the United States and other fruit production areas throughout the world. Therefore, the proposed pesticides should be generally compatible with the orchard ecosystems in Yemen if they are properly applied.

The general orchard ecosystems at the al-Irra station and surrounding areas are semi-arid so foliar pesticide residues may not be as subject to degradation by rainfall as in some more rainy and humid fruit ecosystems. Vegetation within the orchards is sparse and most trees are grown under clean cultivation on a bare soil surface. This production system limits biological diversity within and around the orchards, and thereby reduces the chances of pesticides adversely affecting nontarget species of arthropods, wildlife, and livestock. The immediate area next to the al-Irra station and most other fruit orchards is sparsely populated so inadvertent exposure of humans and livestock from pesticide drift would be minimal.

The primary potential adverse effects of the proposed pesticides on the orchard ecosystems would be contamination of the ground and surface water. However, since rainfall is relatively low and no streams, canals or lakes are situated near the al-Irra station or the demonstration sites, it is unlikely that the pesticides could be transported into

surface water supplies from runoff resulting from natural precipitation. Trees at the al-Irra station and demonstration sites will be irrigated with improved water saving irrigation techniques. These irrigation technologies uses closed pipe and tubing systems to distribute small amounts of water around the base of each tree. Therefore, contamination of irrigation water and transport of pesticides away from the target site by the flow of surface water should be minimal under such irrigation systems. Also, because of the general lack of persistence of the pesticides proposed for use in the system and their relatively low Solubility Partition Coefficients (see Section E), the potential for groundwater contamination from pesticides used in this project should be minimal.

A secondary potential adverse effect of insecticide use in some of the demonstration farmers' orchards would be bee poisoning since sometimes small patches of alfalfa, harboring natural populations of bees, may be grown near deciduous fruit orchards. In addition to following the general precautions to protect bees outlines in section E, farmers should not apply any of the materials listed in section E as toxic to bees whenever nearby alfalfa plantings are in bloom.

H. Conditions Under Which the Pesticides Will be Used, Including Climate, Flora, Fauna, Geography, Hydrology, and Soils

The target area for the FPP project is comprised of the ecological zones of the Central Highlands, the Southern Uplands and the Tihama Coastal area. Physical conditions can change rapidly over very short distances. The Central Highlands ranges in elevation from 1,000 meters to 3,700 meters. The geology is predominantly volcanic, overlaid in part by alluvium and intruded by volcanic outcrops and rock. Soils are generally sandy loam and well drained. These soils are fairly deep in the basins and valleys. Affected primarily by altitude, climate varies considerably from temperate on the high plains to subtropical in the lower lands and wadis. Annual rainfall varies from about 230 mm around Sana'a to about 450 mm around Dhamar. Day temperatures are well above 15 degrees C throughout the year, but night temperatures can fall below 0 degrees C in the winter months. Winds are steady most of the year. While rainfed cultivation of field crops predominates, on irrigated land, vegetables are the major crops. The Central Highlands are also an important and growing region for the cultivation of deciduous fruit trees and qat.

Elevations for the Southern Uplands range from 500 meters to 3,000 meters above sea level. While the geology is similar to the Central Highlands, the landscape is cut by deep wadis and valleys where tropical to sub-tropical conditions exist. Soils are generally more fertile and have better water retention

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characteristics. Annual rainfall is as little as 250 mm in the south and southeast and approximately 1,000 mm around Ibb. In addition to field crops; sorghum, oat, coffee, vegetables and subtropical fruits such as citrus, guava, mangoes and papaya are the major crops. Although the total planted area is relatively small, recently there have been rapid increases in the cultivation of deciduous fruit trees.

Elevations in the Tihama range from sea level to 300 meters. The irrigated agriculture is along the wadis where tropical to subtropical conditions exist. Soils range from sandy to sandy loam and are well drained. In addition to cereal crops, sorghum and millet, vegetables, dates and subtropical fruits such as papaya, mango and guava are the major crops.

I. The Availability and Effectiveness of Other Pesticides or Non-Chemical Control Methods

A wide range of synthetic pyrethroid insecticides are available in Yemen: Permethrin, Fenvalerate, Dekamethrin, Cypermethrin, and Fenpropathrin. Some of these materials are currently registered for use on deciduous fruits in the United States (Fenvalerate and Permethrin), and are very effective against a wide range of insects. However, these materials are toxic to beneficials and may cause outbreaks of secondary pests such as mites and woolly apple aphids in deciduous fruit trees. Because of these undesirable effects, Synthetic Pyrethroids are primarily used in the United States to control orchard pests that have become resistant to organophosphate and carbamate insecticides. These pyrethroid insecticides were not recommended for use in this project because of their potential adverse effects on natural biological control programs of mites and other insects, and also because insect pests in orchards in Yemen are still susceptible to other classes of insecticides.

Very few studies have been conducted in Yemen on nonpesticidal control techniques. Currently, the GTZ crop protection program is conducting surveys of parasites and predators of vegetable insect pests, focusing primarily on potatoes and tomatoes. They are also developing a program for tuberworm. The HITS project has conducted studies of parasites of the California red scale. They found that a primary parasite Aphytis melinus, was well established throughout most areas where citrus is grown in Yemen. They also found that a predator of armored scale on citrus (a Coccinellid species in the genus Scymnus) was present in some locations.

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J. The Requesting Country's Ability to Regulate or Control the Distribution, Storage, and Disposal of the Requested Pesticides

The responsibility for pesticide licensing, registration, importation and regulation in Yemen resides in the General Directorate of Plant Protection. The Directorate has developed a list of permitted and a list of banned materials in Yemen (Appendix II). The banned list of pesticides includes most materials which are prohibited in the United States because of harmful environmental effects and toxicological problems. In addition, many pesticides classified for restricted use in the USA are also banned from Yemen. The list of permitted pesticides includes many materials widely used in the USA and some materials classified for "restricted use" for reasons other than acute toxicity, such as the synthetic pyrethroids.

The government, therefore, relies on these two lists to determine which materials can be legally imported. However, the government actually has very little legal control over the sale, storage, distribution and use of pesticides within the country. The importation and marketing of pesticides is largely within the hands of the private sector although the government and donor agencies also directly import pesticides. There is currently no formal legislation regulating pesticide use on crops within the country. Yemen also currently has no pesticide analysis laboratories to check pesticide formulations for adulteration or to monitor produce for excessive residues. The crop protection program of GTZ plans to work with the Government of Yemen in drafting legislation to regulate the importation, storage, formulation, manufacture, labeling, packaging, distribution, transportation, sale, application and disposal of pesticides and to set up a pesticide analytical laboratory to monitor pesticide formulations.

The Director General of Plant Protection, Dr. Mohamed al-Ghashm, mentioned that unauthorized pesticides are often smuggled into the country, and there are problems with pesticide adulteration by some pesticide distributors. He also mentioned that more training in proper pesticide use and safety is needed within the country for pesticide distributors, extension personnel and farmers.

Despite these reported problems with pesticides, the pesticide shops that were visited in Sana'a and Dhamar were generally clean and orderly. All of the pesticides displayed on the shelves were on the permitted list, pesticides appeared to be in their original containers, and most packages had at least some Arabic labeling and appropriate toxicity signal words. The pesticide dealers mentioned that they purchased some pesticides directly from the government, particularly materials distributed by Sumitomo. Obviously, the government was

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providing some subsidies for these Sumitomo products and certain other materials since the dealer prices were well below normal world market levels. Dealers also mentioned that certain permitted pesticides were often unavailable because of problems with government regulations of supply through import controls.

However, in subsequent discussions, Dr. Rolf Link, the director of the GTZ plant protection program, indicated that most of the problems with pesticide distribution and sales throughout Yemen occurred in about 1000 small shops which were part-time unauthorized pesticide dealers. He mentioned that these small dealers often sold banned materials or adulterated improper pesticides to farmers and were quite ignorant about making pesticide recommendations.

In summary, the Government of Yemen has a very rudimentary system of regulating pesticide imports and only a limited ability to regulate pesticide usage within the country. However, most persistent and highly toxic materials are not sold generally within the country by authorized pesticide dealers. Future cooperative efforts between GTZ and the Government of Yemen should help to strengthen the government's ability to regulate pesticides within the country and to prevent illegal sales by unauthorized, small, part-time sales outlets. There is an obvious need to provide more training in pesticide use and safety for both users and distributors throughout the country.

K. The Provisions Made for Training of Users and Applicators

The Extension and Training Specialist (ETS) of the FPP project will work cooperatively with the Pest Management Specialist (PMS) within the project to develop a practical training course in pesticide use and safety for project technicians, pesticide distributors, and farmers. Since the HITS program has already developed a pesticide training videotape and other materials, these can be used to develop future appropriate training courses.

This training course will first be given to technicians and other laborers working within the FPP project and then to cooperating farmers on the demonstration plots. Then, this pesticide training course can be extended to extension workers within the project area and also to as many farmers and pesticide distributors as possible within the region, particularly those near demonstration trial areas.

L. The Provisions Made for Monitoring Pesticide Use and Effectiveness

The PMS will collect data in the chemical efficiency trials

conducted at al-Irra on both the effectiveness of the materials against the target pests and, for insecticides and miticides, monitor the toxicity of the materials against predators and parasites. Also, the PMS and extension personnel within the project will frequently monitor demonstration plots in farmers' fields whenever pesticides are applied and record data to evaluate the effectiveness of pesticide applications made by cooperating farmers.

M. Recommendation for Pesticide Management in the FPP Project

1. Pesticide labeling - Pesticide used in the project should be labeled in Arabic, and labels should be written in accordance with the guidelines on good labeling practices for pesticides published by FAO.
2. Pesticide containers used in the project should be disposed of in accordance with the guidelines for the disposal of waste pesticide and pesticide containers on the farm published by FAO.
3. Division of time for the Pest Management Specialist. It is anticipated that the PMS will spend approximately 75% of his/her time conducting research and 25% of the time working with the Extension Training Specialist to formulate crop protection and IPM extension recommendations and to develop training programs in these areas for extension personnel, pesticide distributors, and farmers.
4. Protocol for providing pest management activities within the project. It is clear that expatriate assistance will be needed in order to facilitate the development of adequate pest management technology in the project. In order to assure continuity of pest management activities and develop a self sustaining capability to develop and implement pest management technology in the future, a Yemeni PMS counterpart should be employed and trained within the project in one of two ways: (1) An expatriate PMS could be hired to work in Yemen at the al-Irra station full time for 2-3 years. During that time, the expatriate would coordinate and direct pest management activities in cooperation with the Yemeni counterpart. After the expatriate PMS leaves, the pest management activities within the project would then be directed by the Yemeni counterpart. For the next several years of the project, a short term expatriate PMS consultant would visit the project annually for 2-3 weeks to review the progress made in the previous year's pest management research and extension activities, and work with project personnel in planning the future year's

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activities. (2) An Yemeni scientist could be recruited to work as a PMS within the project and, if necessary, sent abroad for 1-2 years at the beginning of the project for additional education training in crop protection and IPM. After that, the Yemeni scientist would work full time as the PMS within the project. During the remainder of the project, an expatriate IPM specialist would visit the project twice a year for a 2 week periods, once before the growing season to plan pest mangement research and extension activities within the project for the future season and at the end of the year to evaluate annual progress.

Specific Recommendation for IPM.

1. The following specific areas of pest management research on deciduous fruit should be conducted within the project: relative pest severity and crop loss; plant resistance; biological control; sampling, monitoring and economic threshold levels; controls and management of nursery pests; and training and outreach.
2. Using currently available information and technology, Pest Mangement Specialists (PMS) within the project should immediately work with the Extension Training Specialists (ETS) t develop appropriate crop protection and IPM recommendations and training programs for extension specialists, pesticide distributors and farmers.
3. As new practical IPM research results are generated within the project, the PMS should work with the ETS in the project to evaluate and test the new technology at the farm level, and incorporate this new information into updated IPM recommendations and training programs.
4. The PMS should work with the extension training specialist to insure that pesticides within the project are properly labeled , used pesticide containers are properly disposed of, and farmers and technicians are provided with appropriate protective clothing and trained in proper pesticide handling and sale use.

2. Initial Environmental Examination for the Irrigation Practices Proposed for the FPP Project

A. Introduction

Successful implementation of the project will result in changes in water resources management, irrigation techniques, field

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preparation, planting techniques, and the use of agricultural inputs (fertilizers, pesticides, etc.) in the project area. These changes will occur through adoption by Yemeni farmers of improved irrigated agriculture practices promoted by project-financed demonstration and training centers and on-farm demonstrations. The dissemination of these practices will be accomplished through: (a) farmers visiting project-funded demonstration and training center; (b) farmers participating in demonstration plots; and (c) training for private sector agriculture input importers and distributors and government extension agents. The findings and recommendations of this analysis have been directly incorporated into the design of the project, including mitigation activities to reduce potential negative environmental impacts.

The development of Government of Yemen organizations with responsibilities for environment and natural resources issues is in its initial stage. Major organizations with responsibilities for environmental issues of concern to the proposed project include: Ministry of Agriculture and Fisheries (Plant Protection); Ministry of Health (Schistosomiasis Control); Ministry of Public Works (Water Resources).

Yemen does not presently have national environmental legislation, and the very limited number of existing laws and regulations concerning natural resources have only been recently enacted. It is especially important to note that there are presently no laws which regulate the use of either groundwater or pesticides.

D. Potential Environmental Impacts

The proposed project will continue the use of the existing HITS demonstration and training center (al-Irra center) for irrigated agriculture. The activities of the center will be extended to surrounding areas through on-farm demonstrations and the adoption of improved irrigated farming practices by Yemeni farmers. The impacts of the project will be initially limited to the service areas for the al-Irra center and project demonstration plots. It may be anticipated, however, that the potential impacts of the project may be more widespread due to the interest of the Government of Yemen and the private sector in the promotion of new agricultural techniques.

The most significant potential environmental impacts associated with implementation of the project are related to the adoption of recommended practices by the Yemeni farmer and their application in areas beyond the supervision of project personnel. This analysis is structured to address only those impacts which can be anticipated to occur in the project area

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during the course of project implementation. It is possible that higher incomes available to farmers as the result of increased agricultural production may allow for local investments to improve water supply and environmental health for the villagers.

1. Primary impacts

Primary environmental impacts are those which are directly related to the proposed project. They are limited to:

- a. The direct physical changes associated with the conduct of demonstration activities at the center.
- b. The direct physical changes associated with implementation of planned on-farm demonstration activities.

The potential environmental impacts from these programs are small and easily controlled. They should not be anticipated to result in significant impacts provided that construction is properly supervised and pesticides and fertilizers used in the project are properly selected, stored and applied. No pesticides may be used that are not approved by the Pesticides Management Advisor, Bureau for Science and Technology, AID/W.

2. Secondary Impacts

Secondary environmental impacts are those which are indirectly related to the proposed project. Areas of secondary impact associated with the proposed project include:

a. Adoption of New Irrigation Technologies

Adoption of new irrigation technologies should have a major beneficial environmental impact resulting from a more effective use of limited water resources. Through the use of new application techniques, better field preparation, and improved timing of water and inputs, it is anticipated that irrigation efficiencies can be improved from present values of 25 to 35% to 60 to 80%. More efficient water application will reduce water demand, reduce the labor needed to irrigate, increase yields through better nutrient use, and reduce the incidence of plant diseases. It may increase the area that is irrigated.

b. Probable Effect on the Area Under Irrigation

The proposed project focuses entirely on the improvement of irrigated farming practices on land that is already

irrigated. The project will not promote or be involved in the drilling of additional wells. While well drilling will continue in the project area, this activity is outside and beyond the control of this project.

c. Changes in Field Size

The irrigation practices to be extended in this project are specifically intended for the existing small fields in use by Yemeni farmers. The techniques are not applicable to large fields. There will, therefore, be no incentives to increase field size.

d. Effect on Habitat for Vectors of Schistosomiasis

There are two forms of human Schistosomiasis in Yemen. They are Schistosoma haematobium, which causes a disease of the urinary system, and Schistosoma mansoni, which is responsible for a chronic disabling disease affecting the liver and intestines. Both forms depend on certain small snail species as intermediate hosts in their life cycle. The World Health Organization (WHO) has estimated national prevalence rates of 74/1000 for Schistosoma haematobium, and 23/1000 for Schistosoma mansoni.

The project will promote the piping of all irrigation water from well discharge to the plant and the controlled application of the irrigation water to the plant itself. Thus the project will reduce or eliminate the habitat for Schistosoma hosts where it is applied.

e. Archeological and Historical Sites

The limited surveys conducted in Yemen indicate that the concentration of archeological and historical sites are located adjacent to areas subject to spate and spring irrigation, at the edges of the cultivable land, and on adjacent upland areas. Since the project will be applied to presently irrigated areas that are removed from these potential sites, it is not expected to impact archeological or historic areas.

f. Rare and Endangered Species

It is not anticipated that implementation of the proposed project will result in the destruction of rare and endangered plant and animal species or their critical habitat. The IUCN Red Book lists the following three species in Yemen as being threatened:

| | |
|--------------------------------|-----------------------|
| <u>Panthera Pardus Nimr</u> | South Arabian Leopard |
| <u>Dugong dugong</u> | Dugong |
| <u>Gazella gazella arabica</u> | Arabic gazelle |

Review of available information concerning their habitats does not indicate they will be affected by the proposed project or the adoption of improved irrigation technology by Yemeni farmers.

The potential for damage to nontarget wildlife populations by pesticide applications should be reduced by project promotion of integrated pest management, selection and proper use of pesticides which are more specific in their application, promotion of pesticides which have limited residual effects, and support for implementation of Government of Yemen crop protection services.

C. Mitigation Activities

Mitigations are activities which are designed to eliminate or reduce identified negative impacts in advance or in conjunction with project implementation. Proposed mitigation activities included in this section focus on areas of secondary impact which will result from project implementation. Only mitigation activities which could be realistically implemented given the political, institutional and social conditions existing in the Yemen Arab Republic are considered in this section. Mitigation activities which have been adopted in project design include:

1. Establishment and maintenance of a well monitoring program at the project-funded demonstration and training centers and collection of well data in association with on-farm demonstrations of irrigation techniques.
2. Project-sponsored training programs for private sector importers and distributors of irrigation equipment concerning irrigation techniques, equipment and field installation methods being promoted by the demonstration and training centers and on-farm demonstrations.
3. Project sponsored training programs for private sector importers and distributors of pesticides, and for extension agents and farmers, concerning the causes, control and treatment of Schistosomiasis. These sessions should focus on water management and weed control practices which can be used to environmentally control vector habitat. If determined appropriate by the Government of Yemen, these sessions could include demonstrations concerning the use and safe application of molluscicides.

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D. Monitoring and Evaluation

Environmental concerns will be included as an element of the monitoring and evaluation plans for the project. Special emphasis will be placed on monitoring implementation of mitigation activities and evaluation of training programs for government staff, private sector personnel and farmers.

TABLE 1. REGISTRATION STATUS AND ACTIVITY SPECTRUM OF PESTICIDES PROPOSED FOR USE IN THE FPP PROJECT

| Pesticides Common Name and Brand Name | EPA Registration Status | | | | Insects | | | | Diseases | | | Weeds | | | |
|---|-------------------------|---------|-------|-------|---------|--------|-------------------|-----------------|-------------------|-----------------------|-------------------------|------------------------|-------------------|--------------------|---------|
| | Apples | Peaches | Pears | Plums | Mites | Aphids | Cater- pillars | Woolly aphid | Powdery mildew | Peach Leaf curl | Shot hole disease | Pre- emer- gence | Post emergence | Broadleaf Weeds | Grasses |
| <u>Insecticides</u> | | | | | | | | | | | | | | | |
| Carbaryl (Sevin) | x | x | x | x | | x | x | x | | | | | | | |
| Diazinon | x | x | x | x | x | x | | | | | | | | | |
| Dimethoate (Cygon, Perfekthion) | x | | x | | | x | x | x | | | | | | | |
| Malathion (Cythion) | x | x | x | x | x | x | x | x | | | | | | | |
| Phosmet (Imidan) | x | x | x | x | x | x | x | x | | | | | | | |
| <u>Miticides</u> | | | | | | | | | | | | | | | |
| Dicofol (Kelthane) | x | | x | | x | | | | | | | | | | |
| Oxythioquinox (Morestan) | x | | x | | x | | | | x | | | | | | |
| Propargite (Omite) | x | x | x | x | x | | | | | | | | | | |
| Petroleum Oil | x | x | x | x | x | | | | | | | | | | |
| <u>Fungicides</u> | | | | | | | | | | | | | | | |
| Benomyl (Benlate) | x | x | x | x | x | | | | x | | | | | | |
| Copper Oxychloride Sulfate (COCS) | | x | | | | | | | | x | x | | | | |
| Fenarimol (Rubigan) | x | | x | | | | | | x | | | | | | |
| Sulfur | x | x | x | x | | | | | x | | | | | | |
| Chlorothalonil (Bravo) | | x | | x | | | | | | x | x | | | | |
| Triadimefon (Bayleton) | x | | x | | | | | | x | | | | | | |
| <u>Herbicides</u> | | | | | | | | | | | | | | | |
| Glyphosate (Roundup) | x | x | x | x | | | | | | | | | x | x | x |
| Norflurazon (Solicam) | x | x | | x | | | | | | | | x | | x | x |

TABLE 2. TOXICITY AND LABEL WARNINGS FOR THE PESTICIDES PROPOSED FOR USE IN THE FPP PROJECT

| Pesticides Common Name and (Brand Name) | Toxicity LD50 Mg/kg | | Toxicity Category ₁ / | EPA Signal Word ₁ / |
|---|-------------------------------|-----------|-------------------------------------|-----------------------------------|
| | Oral | Dermal | | |
| <u>Insecticides</u> | | | | |
| Carbaryl (Sevin) | 500-850 | 400 | III | Caution |
| Diazinon | 300-400 | 455-900 | II, III | Caution or warning |
| Dimethoate (Cygon or Perfekthion) | 215 | 400-610 | II | Warning |
| Malathion (Cythion) | 1000-1375 | 4,444 | III | Caution |
| Phosmet (Imidan) | 147-316 | 2,000 | II | Warning |
| <u>Miticides</u> | | | | |
| Dicofol (Kelthane) | 820-960 | 1000-1230 | II, III | Caution or warning |
| Oxythioquinox (Morestan) | 1520-2070 | 2,000 | II | Caution |
| Propargite (Omite) | 2,200 | 900 | I | Danger |
| Petroleum Oil | Exempt from residue tolerance | | | |
| <u>Fungicides</u> | | | | |
| Benomyl (Benlate) | 10,000 | 10,000 | III | Caution |
| Copper Oxychloride Sulfate (COCS) | Exempt from residue tolerance | | | |
| Fenarimol (Rubigan) | 2,500 | - | III, II | Caution or warning |
| Sulfur | Nontoxic, May irritate skin | | | |
| Chlorothalonil (Bravo) | 710,000 | 710,000 | III | Caution |
| Triadimefon (Bayleton) | 1020-1855 | 5,000 | II, III | Warning |
| <u>Herbicides</u> | | | | |
| Glyphosate (Roundup) | 4,300 | 7,940 | II | Warning |
| Norflurazon (Solicam) | 8,000 | 20,000 | III | Caution |

₁/The explanation of the toxicity of proposed pesticides by category and signal word warning is presented in Table 3.

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TABLE 3. TOXICITY CATEGORIES AND SIGNAL WORD WARNINGS FOR EPA REGISTERED PESTICIDES.

| | Label Word required | LD50 (Mg/Kg) | | |
|--------------|------------------------|----------------|------------|--------------|
| | | Oral | Dermal | |
| Category I | Highly toxic | Danger-Poison* | 0-50 | 0-200 |
| Category II | Moderately toxic | Warning | 50-5,000 | 200-2,000 |
| Category III | Slightly toxic | Caution | 500-5,000 | 2,000-20,000 |
| Category IV | Relatively nontoxic | Caution | over 5,000 | over 20,000 |

*Labels of compounds in category I must also be marked with a skull and crossbones.

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Scope of Work for a Long Term Pest Management Specialist in the FPP Project

BACKGROUND AND JUSTIFICATION

One of the primary objectives of the Farming Practices for Productivity project (FPP) is to develop new technology to increase the production of deciduous fruit crops in Yemen. As a result of the government's decision in 1983 to ban importation of fruit from foreign countries to conserve scarce currency reserves, Yemeni farmers have become very interested in planting fruit trees in order to capitalize on the increased demand for consumption of locally produced fruit.

Currently, only a relatively low percentage of Yemen's arable land is planted to fruit crops. Yields are very low because of a lack of suitable varieties, lack of technical knowledge and adoption of modern horticultural techniques, and low agricultural inputs. The USAID financed Horticulture Improvement and Training Subproject (HITS) has tested different tree fruit varieties and rootstocks and has developed outreach programs designed to assist farmers in increasing fruit production. However, only a limited amount of work has been done in this project to develop effective pest management programs for controlling arthropods, diseases and weed pests of tree fruit. The FPP project will continue to conduct adaptive research trials in variety and rootstock testing and attempt to develop a more integrate fruit production package, utilizing new irrigation techniques, fertilizer inputs, cultural techniques, and improved pest management strategies that can be utilized by Yemeni farmers.

There are a relatively large number of potential insect, mite and disease pests of fruit crops in Yemen. Yemeni farmers are currently relying on several protective applications of pesticides applied throughout the season to control these pests. As the amount of fruit acreage increases and crop production inputs intensify, it is likely that the pest pressure will become increasingly severe. If farmers react to these intensified pest problems by increasing their use of pesticides, pests will become resistant to chemicals and all of the problems associated with pesticide misuse will develop: environmental contamination, destruction of natural enemies of insect and mite pests, increased hazards to farmers and farm workers and excess pesticide levels in fruit at harvest. Therefore, the FPP project should attempt to prevent these potential problems arising from pesticide misuse by hiring a Pest Management Specialist (PMS) to design and test practical IPM programs that are appropriate for Yemeni farmers to use in the production of deciduous fruit crops.

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SPECIFIC AREAS OF RESEARCH FOR THE PEST MANAGEMENT SPECIALIST

1. Relative Pest Severity and Crop Loss

Although a large number of insect and disease pests have been identified on various deciduous fruit crops grown in Yemen, very little information is available about the relative severity and potential crop loss caused by each species on the various crops. Detailed observations of fruit and foliar damage are needed throughout the season on blocks of the various kinds of fruit which are given optimum horticultural inputs or left untreated with pesticides. Yields and fruit quality in these untreated plots should be compared with those from comparable trees in which pests are eliminated or maintained at low levels with protective pesticide applications. This type of information will be particularly valuable in prioritizing the future pest management research among the various commodities and also determining which pests might require detailed studies to define economic injury levels.

2. Pesticide Evaluation

Initially the effectiveness of seasonal programs of insecticides should be compared in the various commodities. In addition, the relative toxicity of the different materials against beneficials should be compared and any undesirable effects on secondary pest i.e. resurgence of mites, should be recorded. Similar efficacy studies should be done with fungicides, except that these studies should probably focus primarily an activity against powdery mildew.

After the activity of seasonal programs has been compared, reduced schedules of the most effective materials can be evaluated based on the seasonal activity and monitoring of key pests.

3. Plant Resistance

Integrated research should be initiated in conjunction with horticultural studies to compare the susceptibility of different rootstocks and cultivars of each type of fruit to insects and diseases. These studies should probably focus primarily on indirect pests such as mites, aphids and powdery mildew.

4. Biological Control

Initially, the species of beneficials (parasites and predators) attacking insect pests on the different types of fruit should be surveyed. The information obtained from the survey can be intergraded with the results of the study comparing the toxicity

of different insecticides against the beneficials and used to develop insecticide management programs on each commodity that will facilitate the conservation of indigenous natural enemies and be compatible with natural biological control programs.

5. Sampling and Monitoring

Although sampling and monitoring programs are crucial to maximizing pesticide usage in IPM programs, it may not be practical for the PMS to devote a large portion of time on research to develop unique sampling programs for most of the key pests observed in the various commodities. Therefore, the initial work should concentrate on evaluating of sampling and monitoring programs developed elsewhere for the same or closely related pests in Yemen orchards and modifying them to be applicable to local conditions if necessary.

6. Control and Management of Nursery Pests

Normally the insect and disease damage should be reduced to minimum levels in nursery plants to insure maximum tree growth and prevent the spread of pests throughout the country when the trees are planted. The PMS should work in cooperation with the horticulture specialists to ensure that the current nursery control recommendations for insect and disease control are adequate.

7. Training and Outreach

The PMS should work with extension personnel and the project's extension training specialist to develop practical IPM training programs that can be delivered to farmers, nurserymen, and pesticide distributors.

8. Qualifications

The PMS should have a Ph.D in Entomology with training in integrated pest management and applied entomology from an agricultural university in the United States, another developed nation or some other third world country. The following criteria would be helpful but not essential: experience in crop protection, experience in international agriculture, knowledge of Arabic, minor in plant pathology.

9. Duration of Assignment

The PMS would work full time with the FPP in Yemen for 2-3 years. After that, either the PMS or another crop protection specialist should visit the project annually for two weeks during the next three years to work with the Yemeni counterpart PMS to review annual progress and develop a plan of work for the coming year.

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Appendix IIYEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--------------------------|-------------------|--------------|-------------------------|---|
| Acrolein | Acrylaldehyde | Herbicide | N | |
| Aldicarb | Aqualin | Herbicide | N | |
| | Brand | Insecticide | N | |
| | OMS 771 | Insecticide | N | |
| | Temik | Insecticide | N | |
| Aldrin | UC 21149 | Insecticide | N | |
| | Aldrex | Insecticide | N | |
| | Aldrex 30 | Insecticide | N | |
| | Aldrine | Insecticide | N | |
| | Aldrite | Insecticide | N | |
| | Aldrosol | Insecticide | N | |
| | Alttox | Insecticide | N | |
| | Bangald | Insecticide | N | |
| | Drinox | Insecticide | N | |
| | HHDN | Insecticide | N | |
| | Octalene | Insecticide | N | |
| | Rasayaldrin | Insecticide | N | |
| | Seedrin Liquide | Insecticide | N | |
| | Allyl Alcohol | | Herbicide | N |
| Aminocarb | A 363 | Insecticide | N | |
| | Aminocarbe | Insecticide | N | |
| | Bay 44646 | Insecticide | N | |
| Aramite | 88-R | Acaricide | N | |
| | Aracide | Acaricide | N | |
| | Niagaramite | Acaricide | N | |
| Arsenious Oxide | Arsenic Trioxide | Rodenticides | N | |
| Azinpblos - Ethyl | Azinos | Insecticide | N | |
| | Bay 16259 | Insecticide | N | |
| | Bionex | Insecticide | N | |
| | Cotnion-Ethyl | Insecticide | N | |
| | Gusathion M. | Insecticide | N | |
| | Triazotion | Insecticide | N | |
| | Azinphos-Methyl | Bay 17147 | Insecticide | N |
| | | Carfene | Insecticide | N |
| Cotnion-Methyl | | Insecticide | N | |
| Gusathion M. | | Insecticide | N | |
| Guthion | | Insecticide | N | |
| Metiltriazotion | | Insecticide | N | |
| R 1582 | | Insecticide | N | |
| Azocyclotin (Peropal) | | Bay Bue 1452 | Acaricide | N |
| Benomyl 50% W.P. | Benlate* | Fungicide | Y | |
| | Tersan 1991 | Fungicide | Y | |

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YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--------------------------|-------------------|-----------------------------|-------------------------|---|
| Blasticidin-5 | Blasticidin S-3 | Fungicides & Seed Dressings | N | |
| | CLA-S | Fungicides & Seed Dressings | N | |
| Bromophos-Ethyl | Cela S-2225 | Insecticide | N | |
| | ENT 27258 | Insecticide | N | |
| | formerly Filariol | Insecticide | N | |
| | Nexagan | Insecticide | N | |
| Bromophos-Ethyl | OMS 659 | Insecticide | N | |
| Bupirimate 20% E.C. | Nimrod* | Fungicide | Y | |
| | PP 588 | Fungicide | Y | |
| Butocarboxim | Afilene | Insecticide | N | |
| | Drawin 755 | Insecticide | N | |
| Butoxycarboxim | Plant pin | Insecticide | N | |
| Cadmium Compounds | | Fungicide | N | |
| Cadmium-Calcium | Crag Turf | Fungicide | N | |
| Copper | | | | |
| | Fungicide 531 | Fungicide | N | |
| Zinc Chromate Complex | Miller 531 | Fungicide | N | |
| Calcium Arsenate | Chip-Cal | Insecticide | N | |
| | Pencal | Insecticide | N | |
| | Spra-Cal | Insecticide | N | |
| | Turf-Cal | Insecticide | N | |
| | | | Soil Fumigant | N |
| Calcium Cyanide | | | | |
| Carbaryl 85% W.P | Brand | Insecticide | Y | |
| | Carbamine | Insecticide | Y | |
| | Carbocid* | Insecticide | Y | |
| | Cekubary | Insecticide | Y | |
| | Denapon | Insecticide | Y | |
| | Dicarbam* | Insecticide | Y | |
| | Hexavin | Insecticide | Y | |
| | Karbaspray | Insecticide | Y | |
| | NAC | Insecticide | Y | |
| | Ravyon | Insecticide | Y | |
| | Septene | Insecticide | Y | |
| | Sevin | Insecticide | Y | |
| | Tercyl | Insecticide | Y | |
| | Tricarnam | Insecticide | Y | |
| | UC 7744 | Insecticide | Y | |
| | Carbofos | Cythion | Insecticide | Y |
| | Carbofuran | Detmol MA | Insecticide | Y |
| | | Bay 70143 | Insecticide | N |
| | | Brifur | Insecticide | N |
| | | Crisfuran | Insecticide | N |
| Curater | | Insecticide | N | |
| D 1221 | | Insecticide | N | |

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YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|-------------------------------|----------------------|-----------------|-------------------------|---|
| Carbofuran 50% GR. | ENT 27164 | Insecticide | N | |
| | FMC 10242 | Insecticide | N | |
| | NIA 10242 | Insecticide | N | |
| | Yaltax | Insecticide | N | |
| | Bay 70143 | Insecticide | Y,R | |
| | Brifur | Insecticide | Y,R | |
| | Ctisfuran | Insecticide | Y,R | |
| | Curaterr | Insecticide | Y,R | |
| | D 1221 | Insecticide | Y,R | |
| | ENT 27164 | Insecticide | Y,R | |
| | FMC 10242 | Insecticide | Y,R | |
| | Furadan * | Insecticide | Y,R | |
| | NIA 10242 | Insecticide | Y,R | |
| | Yaltax | Insecticide | Y,R | |
| Carbophenothion (Trithion) | Carrathion | Insecticide | N | |
| | Dagadip | Insecticide | N | |
| | Endyl | Insecticide | N | |
| | Lethox | Insecticide | N | |
| Carboxin (Seed Dressing) | R 1303 | Insecticide | N | |
| | Dcmo | Fungicide | Y | |
| Chlordane | Vitavax | Fungicide | Y | |
| | Aspon Chlordane | Insecticide | N | |
| | Belt | Insecticide | N | |
| | Chlor | Insecticide | N | |
| | Chlordan | Insecticide | N | |
| | Chlordono | Insecticide | N | |
| | Chlortox | Insecticide | N | |
| | Corodane | Insecticide | N | |
| | Gold Grest C-100 | Insecticide | N | |
| | Kil | Insecticide | N | |
| | Kilex Lindane | Insecticide | N | |
| | Kypchlor | Insecticide | N | |
| | Niran | Insecticide | N | |
| | Octa-Klor | Insecticide | N | |
| | Octachlor | Insecticide | N | |
| | Ortho-Klor | Insecticide | N | |
| | Synklor | Insecticide | N | |
| | Termided | Insecticide | N | |
| | Topiclor 20 | Insecticide | N | |
| | Velsicol 1068 | Insecticide | N | |
| | Chlordecone (Kepone) | GC 1189 | Insecticide | N |
| | | Chlorfenvinphos | Insecticide | N |
| | Chlorfenvinphos | Apachlor | Insecticide | N |
| Birlane | | Insecticide | N | |
| Birlane 24 | | Insecticide | N | |
| | C 8949 | Insecticide | N | |

Annex G

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YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> |
|--------------------------------|-------------------|--------------------------------|-------------------------|
| | CGA 26351 | Insecticide | N |
| | Compound 4072 | Insecticide | N |
| | Sapcron | Insecticide | N |
| | SD 7859 | Insecticide | N |
| | Steladone | Insecticide | N |
| | Supona | Insecticide | N |
| | Vinylphate | Insecticide | N |
| Chlormephos | Dotan | Insecticide | N |
| | MC 2188 | Insecticide | N |
| Chlorthiophos | Celathion | Insecticide | N |
| | CM-S 2957 | Insecticide | N |
| | ENT 27635 | Insecticide | N |
| | OMS 1342 | Insecticide | N |
| | S 2957 | Insecticide | N |
| Clorofos | Leivasom | Insecticide | Y |
| | Neguvon | Insecticide | Y |
| | Proxol | Insecticide | Y |
| | Trinex | Insecticide | Y |
| | Tugon | Insecticide | Y |
| Cooper Oxychloride 50% W.P. | Biltox | Fungicide | Y |
| | Brascop | Fungicide | Y |
| | Cobox * | Fungicide | Y |
| | Cobox Blue | Fungicide | Y |
| | Coppersan | Fungicide | Y |
| | Coprantol | Fungicide | Y |
| | Coptox | Fungicide | Y |
| | Coxyson | Fungicide | Y |
| | Cupravit * | Fungicide | Y |
| | Cuprin | Fungicide | Y |
| | Cuproffaffaro | Fungicide | Y |
| | Cuprol | Fungicide | Y |
| | Fytolan | Fungicide | Y |
| | Kauritil | Fungicide | Y |
| Crimidine | Castnix | Rodenticides | N |
| | Cyimidine | Rodenticides | N |
| Crotoxyphos | Ciodrin | Insecticide | N |
| | Cypona | Insecticide | N |
| | Decrotox | Insecticide | N |
| | Duo-kill | Insecticide | N |
| | E.C. | Insecticide | N |
| Cyanthoate | Taran | Acaricide | N |
| | Tartan | Insecticide | N |
| Cyclohexamide | Acti-Aid | Fungicides & Seed Dressings | N |
| | Acti-dione | Fungicides & Seed Dressings | N |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> |
|--------------------------|-------------------|-----------------------------|-------------------------|
| | Actispray | Fungicides & Seed Dressings | N |
| | Hizarocin | Fungicides & Seed Dressings | N |
| | Naramycin | Fungicides & Seed Dressing | N |
| Cypermethrin 10% E.C. | Ammo | Insecticide | Y |
| | Barricade | Insecticide | Y |
| | CCN 52 | Insecticide | Y |
| | Cymbush * | Insecticide | Y |
| | Cyperator | Insecticide | Y |
| | Cyperkill | Insecticide | Y |
| | Cyrux | Insecticide | Y |
| | Flectron | Insecticide | Y |
| | Folcord | Insecticide | Y |
| | Kafil Super | Insecticide | Y |
| | NRDC 149 | Insecticide | Y |
| | Plytrin | Insecticide | Y |
| | Ripcord | Insecticide | Y |
| | Siperin | Insecticide | Y |
| | Vstaad | Insecticide | Y |
| D.D.T. | Anofex | Insecticide | N |
| | Arkotine | Insecticide | N |
| | DDT 75% WDP | Insecticide | N |
| | Dedelo | Insecticide | N |
| | Diamekta 50% | Insecticide | N |
| | Didimac | Insecticide | N |
| | Genitox | Insecticide | N |
| | Gesapon | Insecticide | N |
| | Gesarol | Insecticide | N |
| | Gexarex | Insecticide | N |
| | Gyron | Insecticide | N |
| | Hildit | Insecticide | N |
| | Ixodex | Insecticide | N |
| | Kopsol | Insecticide | N |
| | Micro DDT 75 | Insecticide | N |
| | Neocid | Insecticide | N |
| | Pentachlorin | Insecticide | N |
| | PP Zeidane | Insecticide | N |
| | R 50 | Insecticide | N |
| | Rukseam | Insecticide | N |
| | Zeidane | Insecticide | N |
| | Zerdane | Insecticide | N |
| DDVP | Apavap | Insecticide | N |
| | Benfos | Insecticide | N |
| | Cekusan | Insecticide | N |
| | Cypona | Insecticide | N |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> |
|--------------------------|-------------------|-------------|-------------------------|
| | DDVP Solutions | Insecticide | N |
| | Dedevap | Insecticide | N |
| | Derriban | Insecticide | N |
| | Derribante | Insecticide | N |
| | Devikol | Insecticide | N |
| | Dichlorvos | Insecticide | N |
| | Divipan | Insecticide | N |
| | Duravos | Insecticide | N |
| | Fly Fighter | Insecticide | N |
| | Fly-die | Insecticide | N |
| | Herkol | Insecticide | N |
| | Mafu | Insecticide | N |
| | Marvex | insecticide | N |
| | Mus-De-Kil | Insecticide | N |
| | No-Pest | Insecticide | N |
| | Nogos | Insecticide | N |
| | Nuvan | Insecticide | N |
| | OKO | Insecticide | N |
| | Phosphit | Insecticide | N |
| | Prentox | Insecticide | N |
| | UDVF | Insecticide | N |
| | Vapona | Insecticide | N |
| | Vaponite | Insecticide | N |
| | Vapora II | Insecticide | N |
| | Verdican | Insecticide | N |
| | Verdipor | Insecticide | N |
| | Verdisol | Insecticide | N |
| DDVP | NRDC 161 | Insecticide | Y |
| DECA (Decamethrin) | Butoflin | Insecticide | Y |
| Dekamethrin 2.5% E.C. | Butox | Insecticide | Y |
| | Decis* | Insecticide | Y |
| | K-Othrin | Insecticide | Y |
| | RU 22974 | Insecticide | Y |
| Demephion-O | Demephion-O. | Insecticide | N |
| Demephion-S | Demephion-S. | Insecticide | N |
| Diamidafos | Nellite | Insecticide | N |
| Diamidfos | Nellite | Nematicide | N |
| Diazinon 60% E.C. | Basudin* | Insecticide | Y |
| | D - 264 | Insecticide | Y |
| | D.Z.N. | Insecticide | Y |
| | Dazzel | Insecticide | Y |
| | Diagran | Insecticide | Y |
| | Dianon' | Insecticide | Y |
| | Diaterrfos | Insecticide | Y |
| | Diazajet | Insecticide | Y |
| | Diazatol | Insecticide | Y |
| | Diazide | Insecticide | Y |
| | Diazol | Insecticide | Y |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> |
|--------------------------|-------------------|-----------------------------|-------------------------|
| | Dyzol | Insecticide | Y |
| | Fezadin | Insecticide | Y |
| | G - 24480 | Insecticide | Y |
| | Gardentox | Insecticide | Y |
| | Kayazinon | Insecticide | Y |
| | Kayazol | Insecticide | Y |
| | Neocidol | Insecticide | Y |
| | Nipsan | Insecticide | Y |
| | Sarolex | Insecticide | Y |
| | Spectracide | Insecticide | Y |
| Dibromochloropropane | BDC 12 | Soil Fumigant | N |
| | DBCP Fumazone | Soil Fumigant | N |
| | Nemafume | Soil Fumigant | N |
| | Nemagon | Soil Fumigant | N |
| | Nemanax | Soil Fumigant | N |
| | Nemaset | Soil Fumigant | N |
| | Nematocide | Soil Fumigant | N |
| Dibromochloropropane | Oxy DBCP | Soil Fumigant | N |
| | BBC 12 | Fungicides & Seed Dressings | N |
| | DBCP Fumazone | Fungicides & Seeds | N |
| | Nemagon | Dressings | N |
| | NemaFume | Fungicides & Seed Dressings | N |
| | Nemanax | Fungicide & Seed Dressings | N |
| Dibromochloropropane | Nemaset | Fungicide & Seed | N |
| | Nematocide | Fungicides & Seed Dressings | N |
| | Oxy DBCP | Fungicides & Seed | N |
| Dicrotophos | Nematocide | Dressings | N |
| | Bidrin | Insecticide | N |
| | C 709 | Insecticide | N |
| | Carbicron | Insecticide | N |
| | Diapadrin | Insecticide | N |
| | Ektafos | Insecticide | N |
| Dieldrin | SD 3562 | Insecticide | N |
| | Alvit | Insecticide | N |
| | Dieldrex | Insecticide | N |
| | Dieldrite | Insecticide | N |
| | Octalox | Insecticide | N |
| Dimefox | Panoram D-31 | Insecticide | N |
| | Hanane | Acaricide | N |
| | Pestox XIV | Acaricide | N |
| | Terra-Sytam | Acaricide | N |
| | Wacker S 14/10 | Acaricide | N |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--------------------------|---------------------------------|-------------|-------------------------|---|
| Dimethoate 40% E.C. | AC - 12880 | Insecticide | Y | |
| | BI 58 | Insecticide | Y | |
| | Cekuthoate | Insecticide | Y | |
| | Chemathoate | Insecticide | Y | |
| | Cygon | Insecticide | Y | |
| | Daphene | Insecticide | Y | |
| | De-Fend | Insecticide | Y | |
| | Dimethoate* | Insecticide | Y | |
| | Dimetilan | Fly Bands | Insecticide | N |
| | | G-22870 | Insecticide | N |
| Dinocap 25% W.P. | Caprane | Fungicide | Y | |
| | Cekucap | Fungicide | Y | |
| | Crotothane | Fungicide | Y | |
| | Ezenosan | Fungicide | Y | |
| | Karathane * | Fungicide | Y | |
| Dinoseb | Basanite | Herbicide | N | |
| | Caldon | Herbicide | N | |
| | Chemox PE | Herbicide | N | |
| | Chemox-General | Herbicide | N | |
| | Chemsect | Herbicide | N | |
| | Dinitro | Herbicide | N | |
| | Dinitro General | Herbicide | N | |
| | Dinitro-3 | Herbicide | N | |
| | DN-289 | Herbicide | N | |
| | Elgetol 318 | Herbicide | N | |
| | Gebutox | Herbicide | N | |
| | Hel-fire | Herbicide | N | |
| | Kiloseb | Herbicide | N | |
| | Nitropone C | Herbicide | N | |
| | Premerge 3 | Herbicide | N | |
| | Sinox General | Herbicide | N | |
| | Subitex | Herbicide | N | |
| | Unicrop-DNBP | Herbicide | N | |
| | Vertac Dinitro | | | |
| | Weed Killer 5 | Herbicide | N | |
| | Vertac selective weed killer | Herbicide | N | |
| | Wertac General weed killer | Herbicide | N | |
| | Dinoseb Acetate | Aretit | Herbicide | N |
| | | Hoe 002904 | Herbicide | N |
| | | Ivosit | Herbicide | N |
| | Dinoterb Acetate | Phenotan | Herbicide | N |
| | | MC 1108 | Herbicide | N |
| | Dinoterb Salts | Dinoterb | Herbicide | N |
| | | DNTBP | Herbicide | N |
| | | Herbogil | Herbicide | N |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--------------------------|--------------------|-----------------------------|-------------------------|---|
| Dioxathion | Delnav | Insecticide | N | |
| | Deltic | Insecticide | N | |
| | Hercules AC 528 | Insecticide | N | |
| | Navadel | Insecticide | N | |
| Disulfoton | Ruphos | Insecticide | N | |
| | Bay 19639 | Insecticide | N | |
| | Bay S 276 | Insecticide | N | |
| | Di-Syston | Insecticide | N | |
| | Disyston | Insecticide | N | |
| | Dithiodometon | Insecticide | N | |
| | Dithiosystoxn | Insecticide | N | |
| | Ethylthiodemetion | Insecticide | N | |
| | Frumin Al | Insecticide | N | |
| | M-74 | Insecticide | N | |
| | Solvirex | Insecticide | N | |
| | Thiodemeton | Insecticide | N | |
| | DNOC | Chemsect | Insecticide | N |
| | | DNC | Herbicide | N |
| | | Insecticide | N | |
| Elgetol 30 | | Herbicide | N | |
| | | Insecticide | N | |
| Nitrador | | Herbicide | N | |
| | | Insecticide | N | |
| Selion | | Herbicide | N | |
| | | Insecticide | N | |
| Trifocide | | Herbicide | N | |
| Trifrina | Herbicide | N | | |
| Edifenphos | | Insecticide | N | |
| | Bay 78418 | Fungicides & Seed Dressings | N | |
| | Hinosan | Fungicides & Seed Dressings | N | |
| | SRA 7847 | Fungicides & Seed Dressings | N | |
| Endothion | | Insecticide | N | |
| | AC-18737 | Insecticide | N | |
| | Exothion | Insecticide | N | |
| | NIA 5767 | Insecticide | N | |
| Endrin | Phosphopyron | Insecticide | N | |
| | Endrex | Insecticide | N | |
| | Hexadrin | Insecticide | N | |
| | Nendrin | Insecticide | N | |
| EPN | EPN | Acaricide | N | |
| | Fenarimol 14% E.C. | Bloc | Fungicide | Y |
| | EL-222 Rimidin | Fungicide | Y | |
| | Rubigan* | Fungicide | Y | |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--------------------------------------|----------------------|-------------|-------------------------|---|
| Fenitrothin 25% E.C. | Sumicidin* | Insecticide | Y | |
| | Sumicombi* | Insecticide | Y | |
| | Sumithion* | Insecticide | Y | |
| Fenitrothion 50% to 100% E.C. | Accothion | Insecticide | Y | |
| | Agrothion | Insecticide | Y | |
| | Bay 41831 | Insecticide | Y | |
| | Bay S 5660 | Insecticide | Y | |
| | Cekutrthion | Insecticide | Y | |
| | Cytel | Insecticide | Y | |
| | Fenitox | Insecticide | Y | |
| | Folithion | Insecticide | Y | |
| | Novathion | Insecticide | Y | |
| | Nuvanol | Insecticide | Y | |
| | S 5660 | Insecticide | Y | |
| | Sumithion* | Insecticide | Y | |
| | Fensulfothion | Bay 25141 | Nematicide | N |
| | | Dasanit | Nematicide | N |
| | | Terracur P | Nematicide | N |
| Fenthion | Bay 29493 | Insecticide | N | |
| | Baycid | Insecticide | N | |
| | Baytex | Insecticide | N | |
| | Entex | Insecticide | N | |
| | Lebaycid | Insecticide | N | |
| | Mercaptophos | Insecticide | N | |
| | S 1752 | Insecticide | N | |
| | Tiguvon | Insecticide | N | |
| | Pydrin | Insecticide | N | |
| | S-5602 | Insecticide | N | |
| | Fenvalerate 20% E.C. | Sanmarton | Insecticide | Y |
| Sumi powder | | Insecticide | Y | |
| Sumicidin* | | Insecticide | Y | |
| Sumiflay | | Insecticide | Y | |
| Fenvalerate 5% E.C. Flucythrinate | 024 | Insecticide | N | |
| | 705 | Insecticide | N | |
| | AAstar | Insecticide | N | |
| | AC 222 | Insecticide | N | |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> |
|--------------------------|------------------------------|--------------|-------------------------|
| | AC 35 | Insecticide | N |
| | Cybolt | Insecticide | N |
| | Pay off | Insecticide | N |
| | Phorate | Insecticide | N |
| Fluoracetamide | 1081 | Rodenticides | N |
| | Baran | Rodenticides | N |
| | Fluorakil 100 | Rodenticides | N |
| Fluoroacetamide | Fussol | Rodenticides | N |
| | Navron | Rodenticides | N |
| | Rodex | Rodenticides | N |
| | Yanock | Rodenticides | N |
| Fonofos | Cyfonate | Insecticides | N |
| | N-2790 | Insecticides | N |
| Formetanate | Carzol | Acaricide | N |
| | Dicarzol | Acaricide | N |
| | ENT 27566 | Acaricide | N |
| | EP-332 | Acaricide | N |
| | Formetanate Hydrochloride | Acaricide | N |
| | SN 36056 | Acaricide | N |
| Fosfamid | Dimethoate* | Insecticide | Y |
| | Dimethogen | Insecticide | Y |
| | Perfekthion* | Insecticide | Y |
| | Rogodial | Insecticide | Y |
| | Rogor | Insecticide | Y |
| | Roxion* | Insecticide | Y |
| | Trimetion | Insecticide | Y |
| Fosthietan | 475 | Nematicide | N |
| | AC 64 | Nematicide | N |
| | Acconam | Nematicide | N |
| | CL 64 | Nematicide | N |
| | Geofos | Nematicide | N |
| | Nem-A-Tak | Nematicide | N |
| Gammexane (BHC) | 666 | Insecticide | N |
| | Benzahex | Insecticide | N |
| | Benzex | Insecticide | N |
| | Dol | Insecticide | N |
| | Dolmix | Insecticide | N |
| | HCCH | Insecticide | N |
| | HCH | Insecticide | N |
| | Hexablanc | Insecticide | N |
| | Hexachlor | Insecticide | N |
| | Hexachloran | Insecticide | N |
| | Hexafor | Insecticide | N |
| | Hexamul | Insecticide | N |
| | Hexapoudre | Insecticide | N |
| | Hexyclan | Insecticide | N |

YEMEN-GERMAN PLANT PROJECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> |
|--------------------------|-------------------------|--------------------------------|-------------------------|
| | Hilbeech | Insecticide | N |
| | Kotol | Insecticide | N |
| | Lindacol | Insecticide | N |
| | Soprocide | Insecticide | N |
| | Submar | Insecticide | N |
| Gaphacide | Phorazetim Gay 38819 | Rodenticides | N |
| Hepta-Chlor | Drinox | Insecticide | N |
| | Gold Crest H-60 | Insecticide | N |
| | H-34 | Insecticide | N |
| | H-60 | Insecticide | N |
| | Heptachlore | Insecticide | N |
| | Heptamul | Insecticide | N |
| | Heptox | Insecticide | N |
| Heptenophos | Hoe 002982 | Insecticide | N |
| | Hostaquick | Insecticide | N |
| | Ragadan | Insecticide | N |
| Hexachlorobenzene | Anticarie | Fungicides & Seed Dressings | N |
| | Ceku-C.B. | Fungicides & Seed Dressings | N |
| | HCB | Fungicides & Seed Dressings | N |
| | No | Fungicides & Seed Dressings | N |
| IPSP | Aphidan | Insecticide | N |
| Isazophos | CGA 12223 | Nematicide | N |
| | Miral | Nematicide | N |
| | Triumph | Nematicide | N |
| Isobenzan (Telodrin) | SD 4002 | Insecticide | N |
| Isodrin | Isomer of Aldrin | Insecticide | N |
| Isotenphos | Bay 92114 | Insecticide | N |
| | Bay SRA 12869 | Insecticide | N |
| | Oftanol | Insecticide | N |
| Isothioate | Hosdon | Insecticide | N |
| Isoxathion | E-48 | Insecticide | N |
| | Karphos | Insecticide | N |
| | SI-6711 | Insecticide | N |
| Kepone | Chlordecone | Insecticide | N |
| | GC 1180 | Insecticide | N |
| | Talbot | Insecticide | N |
| Leptophos (Phosrel) | MBCP | Insecticide | N |
| Lindane | Agronexit | Insecticide | N |
| | Exagama | Insecticide | N |
| | Forlin | Insecticide | N |
| | Gallogama | Insecticide | N |
| | Gamaphex | Insecticide | N |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--------------------------|---------------------------|-----------------------------|-------------------------|---|
| Lindane | Gammex | Insecticide | N | |
| | Inexit | Insecticide | N | |
| | Isotox | insecticide | N | |
| | Lacco Hi Lin | Insecticide | N | |
| | Lacco Lin-O-Mulsion | Insecticide | N | |
| | Lin-O-Sol | Insecticide | N | |
| | Lindafor | Insecticide | N | |
| | Lindagam | Insecticide | N | |
| | Lindagrain | Insecticide | N | |
| | Lindaterra | Insecticide | N | |
| | Nexit | Insecticide | N | |
| | Novigan | Insecticide | N | |
| | Silvanol | Insecticide | N | |
| | Malathion 50% E.C. | Calmathion | Insecticide | Y |
| | | Celthion | Insecticide | Y |
| Cythion | | Insecticide | Y | |
| Maneb 80% W.P. | Dithane M-22 | Fungicide | Y | |
| | Kypman | Fungicide | Y | |
| | Lonocol M | Fungicide | Y | |
| | Maneba | Fungicide | Y | |
| | Manebgan | Fungicide | Y | |
| | Manessan | Fungicide | Y | |
| | Manex | Fungicide | Y | |
| | Manzati | Fungicide | Y | |
| | Meb | Fungicide | Y | |
| | Nespor | Fungicide | Y | |
| | Polyram M* | Fungicide | Y | |
| | Remasan | Fungicide | Y | |
| | Tersan - LSR | Fungicide | Y | |
| | Trimangol | Fungicide | Y | |
| | Tubothane | Fungicide | Y | |
| | Mecarban | Afos | Insecticide | N |
| | | MC 474 | Insecticide | N |
| Murfotox | | Insecticide | N | |
| Pestan | | Insecticide | N | |
| Medinoterb Acetate | MC 1488 (Murphy Chemical) | Herbicide | N | |
| Mephosfolan | Cytroiane-Cytro-Lane | Insecticide | N | |
| Mercuric Chloride | Bichloride of Morsodren | Fungicides & Seed Dressings | N | |
| | Corrosive Sublimate | Fungicides & Seed Dressings | N | |
| | | | | |
| Metalaxy 5% G.R. | Acylon | Fungicide | Y | |
| | Apron | Fungicide | Y | |
| | GRA-48988 | Fungicide | Y | |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICID-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> |
|------------------------------|-------------------------|-------------------|-------------------------|
| Metalaxy 5% G.R. | Ridomil* | Fungicide | Y |
| | Subdue | Fungicide | Y |
| Metasystox-(I) | Demeton-S-Methyl | Insecticide | N |
| | Duratox | Insecticide | N |
| | Methyl-Mercaptosfos | Insecticide | N |
| | Teolery | Insecticide | N |
| Metasystox-R | Bay 21097 | Insecticide | N |
| | Demeton-Methyl-Sulfoxid | Insecticide | N |
| | Metasystemox | Insecticide | N |
| | Oxydemeton-Methyl | Insecticide | N |
| | Metilmercaptosfosoks | Insecticide | N |
| Metasystox-S | R 2170 | Insecticide | N |
| | Bay 23635 | Insecticide | N |
| | Estox | Insecticide | N |
| | Oxydeprofos | Insecticide | N |
| Methamidphos | S 410 | Insecticide | N |
| | Acephate-Met | Insecticide | N |
| | Bay 71628 | Insecticide | N |
| | Estrella | Insecticide | N |
| | Filitux | Insecticide | N |
| | Metamidofos | Insecticide | N |
| | Monitor | Insecticide | N |
| | MTD | Insecticide | N |
| | MTD-608 | Insecticide | N |
| | Patrole | Insecticide | N |
| | SRA 5172 | Insecticide | N |
| | Tahmabon | Insecticide | N |
| | Tamanox | Insecticide | N |
| | Tamaron | Insecticide | N |
| | Methidathion | GS 13005 | Insecticide |
| Somonil | | Insecticide | N |
| Supracide | | Insecticide | N |
| Suprathion | | Insecticide | N |
| Vltracide | | Insecticide | N |
| Methomly | Lannate | Insecticide | N |
| | Lanox 216 | Insecticide | N |
| | Lanox 90 | Insecticide | N |
| | Nu-Bait 11 | Insecticide | N |
| | Nudrin | Insecticide | N |
| Methyl Mercury Dicyandiamide | Cyano | Fungicides & Seed | N |
| | (Methylmercuri) | Dressings | N |
| | Guanidine | Fungicides & Seed | N |
| | | Dressing | |
| | Morsodran | Fungicides & Seed | N |
| Panogen Turf Fungicide | | Dressing | |
| | | Fungicides & Seed | N |
| | | Dressings | |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--------------------------|-------------------|--------------|-------------------------|---|
| Metiram 80% W.P. | Carbatene | Fungicides | Y | |
| | Metiram* | Fungicides | Y | |
| | Petd | Fungicides | Y | |
| | Polyram* | Fungicide | Y | |
| | Polyram Combi* | Fungicide | Y | |
| Mevinphos | Apavinphos | Insecticide | N | |
| | Duraphos | Insecticide | N | |
| | Gesfid | Insecticide | N | |
| | Menite | Insecticide | N | |
| | Mevinox | Insecticide | N | |
| | OS 2046 | Insecticide | N | |
| | Phosdrin | Insecticide | N | |
| | Phosfene | Insecticide | N | |
| | Mirex | Dechlorane | Insecticide | N |
| GC-1283 | | Insecticide | N | |
| MOCSP | Ethoprop | Nematicide | N | |
| | Ethoprofos | Nematicide | N | |
| | Jolt | Nematicide | N | |
| Monocrotophos | Propfos | Nematicide | N | |
| | Apadrin | Insecticide | N | |
| | Azodrin | Insecticide | N | |
| | Bilobran | Insecticide | N | |
| | C 1414 | Insecticide | N | |
| | Crisodrin | Insecticide | N | |
| | Glore Phos 36 | Insecticide | N | |
| | Hazodrin | Insecticide | N | |
| | Monocil | Insecticide | N | |
| | Monocron | Insecticide | N | |
| | Nuvacron | Insecticide | N | |
| | Plantdrin | Insecticide | N | |
| | SD 9129 | Insecticide | N | |
| | Susvin | Insecticide | N | |
| | Ulrair | Insecticide | N | |
| | Monuron | Chlorfenidim | Herbicide | N |
| | | Monurex | Herbicide | N |
| | | Telvar | Herbicide | N |
| | Naphthyl-Thiourea | Antu | Rodenticides | N |
| Krysid | | Rodenticides | N | |
| Nemacur | Bay 68138 | Nematicide | N | |
| | Bay SRA 3886 | Nematicide | N | |
| | Fenamiphos | Nematicide | N | |
| Nicotine | Ulrair | Insecticide | N | |
| Nitrofen | Nip | Herbicide | N | |
| | Nitrofone | Herbicide | N | |
| | Nitrophen | Herbicide | N | |
| | TOK WP-50 | Herbicide | N | |
| | Trizilin 25 | Herbicide | N | |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--|-------------------|--------------------------------|-------------------------|---|
| Omethoate | Bay 45432 | Insecticide | N | |
| | Dimethoate-met | Insecticide | N | |
| | Folimat | Insecticide | N | |
| | S 6876 | Insecticide | N | |
| Organic and Inorganic Mercury compounds | | Fungicides & Seed Dressings | N | |
| Oxamyl | DPX 1410 | Insecticide | N | |
| | Vydate | Insecticide | N | |
| Oxydemeton-Methyl (Metasystox) | Bay 15203 | Insecticide | N | |
| | Demeton Methyl | Insecticide | N | |
| Oxythioquinox 25% W.P. | Methyl demeton | Insecticide | N | |
| | Chinomethionate | Fungicide | Y | |
| | Morestan* | Fungicide | Y | |
| | Quinomethionate | Fungicide | Y | |
| Parathion | AC 3422 | Insecticide | N | |
| | Alkron | Insecticide | N | |
| | Alleron | Insecticide | N | |
| | Aphamite | Insecticide | N | |
| | Bladan | Insecticide | N | |
| | Corothion | Insecticide | N | |
| | E-605 | Insecticide | N | |
| | ENT 15108 | Insecticide | N | |
| | Ethyl Parathion | Insecticide | N | |
| | Etilon | Insecticide | N | |
| | Folidol E-605 | Insecticide | N | |
| | Fosforno 50 | Insecticide | N | |
| | Niran | Insecticide | N | |
| | Orthaphos | Insecticide | N | |
| | Panthion | Insecticide | N | |
| | Paramar | Insecticide | N | |
| | Paraphos | Insecticide | N | |
| | Parathene | Insecticide | N | |
| | Parawet | Insecticide | N | |
| | Phoskil | Insecticide | N | |
| | Rhodiatox | Insecticide | N | |
| | Soprathion | Insecticide | N | |
| | Stathion | Insecticide | N | |
| | Thiophos | Insecticide | N | |
| | Parathion-Methyl | Cekumethion | Insecticide | N |
| | | Derithion | Insecticide | N |
| | | Dimethyl Parathion | Insecticide | N |
| | | Drexel Mehtyl | Insecticide | N |
| | | Parathion 4-E | | |
| | | E 601 | Insecticide | N |
| | | Gearphos | Insecticide | N |
| | | Mefacide | Insecticide | N |

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YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--------------------------|-------------------|-------------------|-------------------------|---|
| Parathion-Methyl | Metafos | Insecticide | N | |
| | Methaphos | Insecticide | N | |
| | Methyl-Parathion | Insecticide | N | |
| | Metron | Insecticide | N | |
| | Nitrox 80 | Insecticide | N | |
| | Parataf | Insecticide | N | |
| | Paratox | Insecticide | N | |
| | Partron M | Insecticide | N | |
| | Penncap-M | Insecticide | N | |
| | Tekwaisa | Insecticide | N | |
| Paris Green | Wofatox | Insecticide | N | |
| | Copper | Insecticide | N | |
| | Acetoarsenite | | | |
| | Emerald Green | Insecticide | N | |
| | French Green | Insecticide | N | |
| | Mitis Green | Insecticide | N | |
| | Schweinfurt Green | Insecticide | N | |
| Penproprathrin 10% E.C. | Danitol* | Insecticide | Y | |
| | Herald | Insecticide | Y | |
| | Meothrin | Insecticide | Y | |
| | Ortho Danitol | Insecticide | Y | |
| | Rody | Insecticide | Y | |
| | S-2206 | Insecticide | Y | |
| | S 2206 | Insecticide | Y | |
| | SD-41706 | Insecticide | Y | |
| | WL-41706 | Insecticide | Y | |
| | XE-938 | Insecticide | Y | |
| | Pentachlorophenol | Antimicrobial | Herbicide | N |
| | | DOW | Herbicide | N |
| | | Pentachlorophenol | | |
| | | DP-2 | | |
| Dowicide | | Herbicide | N | |
| EC-7 | | Herbicide | N | |
| PCP | | Herbicide | N | |
| Penchlorol | | Herbicide | N | |
| Pentacon | | Herbicide | N | |
| Penwar | | Herbicide | N | |
| Priltox | | Herbicide | N | |
| Santobrite | | Herbicide | N | |
| Santophen | | Herbicide | N | |
| Sinituho | | Herbicide | N | |
| Weedone | | Herbicide | N | |
| Permethrin 25% E.C. | | Ambush | Insecticide | Y |
| | | BW-21-Z | Insecticide | Y |
| | Ectiban | Insecticide | Y | |
| | Eksmin | Insecticide | Y | |
| | FMC 33297 | Insecticide | Y | |
| | Indothrin | Insecticide | Y | |
| | Permasect | Insecticide | Y | |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--------------------------------|-------------------|-----------------------------|-------------------------|---|
| Permethrin 25% E.C. | Perthrine | Insecticide | Y | |
| | Pounce | Insecticide | Y | |
| | PP 557 | Insecticide | Y | |
| | Pramex | Insecticide | Y | |
| | Talacord | Insecticide | Y | |
| | Ethylan | Insecticide | N | |
| Perthane | | | | |
| Petroleum Oils | 90-Par | Insecticide | Y | |
| | Oils | Insecticide | Y | |
| | Volck* | Insecticide | Y | |
| | White Oils | Insecticide | Y | |
| Phenylmercury Acetate | Gallotox | Fungicides & Seed Dressings | N | |
| | PMAA | Fungicides & Seed Dressings | N | |
| | Setrete | Fungicides & Seed Dressings | N | |
| | | | | |
| Phorate | Aastar | Insecticide | N | |
| | AC 8911 | Insecticide | N | |
| | Agrimet | Insecticide | N | |
| | Geomet | Insecticide | N | |
| | Granutox | Insecticide | N | |
| | Phorate | Insecticide | N | |
| | Phorate-108 | Insecticide | N | |
| | Ramport | Insecticide | N | |
| | Thimenox | Insecticide | N | |
| | Thimet | Insecticide | N | |
| | Timet | Insecticide | N | |
| | Vegfru | Insecticide | N | |
| | Vegfru Foratox | Insecticide | N | |
| | Phosfolan | Cylan | Insecticide | N |
| | | Cyolane | Insecticide | N |
| | Phosphamidon | Apamidon | Insecticide | N |
| C 570 | | Insecticide | N | |
| Dimecron | | Insecticide | N | |
| Dixon | | Insecticide | N | |
| | | | | |
| Pirimicarb | Abol | Insecticide | Y | |
| | Aficida | Insecticide | Y | |
| | Aphox | Insecticide | Y | |
| | Ferons | Insecticide | Y | |
| | Pirimor* | Insecticide | Y | |
| | Rapid | Insecticide | Y | |
| | Actellic | Insecticide | Y | |
| | | | | |
| Pirimiphos Methyl 50% E. C. | Actellifog | Insecticide | Y | |
| | Blex | Insecticide | Y | |
| Pirimiphos-ethyl | Primicid | Insecticide | N | |
| | Fernex | Insecticide | N | |
| | Primotec | Insecticide | N | |

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YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> |
|---------------------------|--------------------|--------------|-------------------------|
| Propetemphos | Safrotin | Insecticide | N |
| | SAN 52 1391 | Insecticide | N |
| | | Insecticide | N |
| Propineb 70% W.P. | Altone | Fungicide | Y |
| | Antracol* | Fungicide | Y |
| | Mezineb | Fungicide | Y |
| | Taifen | Fungicide | Y |
| | | Fungicide | Y |
| Prothoate | Fac | Insecticide | N |
| Prothoate | Fac-20 | Insecticide | N |
| | Fostion | Insecticide | N |
| Red Squil | | Rodenticides | N |
| Schrada | OMPA | Insecticide | N |
| | Pestox II | Insecticide | N |
| | Schradane | Insecticide | N |
| | System | Insecticide | N |
| | | Insecticide | N |
| Soilloriside | Silmurin | Rodenticides | N |
| Sodium Cyanide | Cymag | Rodenticides | N |
| | Hydrocyanic acid | Rodenticides | N |
| Sodium Fluoro Acetate | Compound 1080 | Rodenticides | N |
| | Fratol | Rodenticides | N |
| | Yasoknock | Rodenticides | N |
| Sodium Pentachloro-phenol | Dowicide G-ST | Herbicide | N |
| | Santobrite | Herbicide | N |
| Sodum Arsenite | Weedbeads | Herbicide | N |
| | Chem pels C | Rodenticides | N |
| | Chem-sen 56 | Rodenticides | N |
| | Kill-All | Rodenticides | N |
| | Penite (pennwalt) | Rodenticides | N |
| | Prodalumnof Double | Rodenticides | N |
| | | Terpene | Insecticide |
| | Polychlorinates | Rodenticides | N |
| Strychnine | | Rodenticides | N |
| Sulfor 80% W.P. | Brimestone | Fungicide | Y |
| | Consul | Fungicide | Y |
| | Casan | Fungicide | Y |
| | Electrosulph | Fungicide | Y |
| | Elosal | Fungicide | Y |
| | Golden | Fungicide | Y |
| | Hexasul | Fungicide | Y |
| | Kolofog | Fungicide | Y |
| | Kolospray | Fungicide | Y |
| | Kumulus* | Fungicide | Y |
| | Losan 80 | Fungicide | Y |
| | Microflotox | Fungicide | Y |
| | Sofril | Fungicide | Y |
| | Sperlox S | Fungicide | Y |

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YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> |
|--------------------------------|-------------------|---------------|-------------------------|
| Sulfor 80% W.P. | Spersul | Fungicide | Y |
| | Sulkul | Fungicide | Y |
| | Sulsol | Fungicide | Y |
| Sulfotep | Supercosan | Fungicide | Y |
| | Bladafum | Insecticide | N |
| | Dithio | Insecticide | N |
| | Dithione | Insecticide | N |
| Tepp | Thiotep | Insecticide | N |
| | Kilmite 40 | Insecticide | N |
| | Tetron | Insecticide | N |
| Terbufos | Vapotone | Insecticide | N |
| | Contraven | Soil Fumigant | N |
| Terbufos | Counter | Soil Fumigant | N |
| Thallium Sulphates | | Rodenticides | N |
| Thiofanex | Benelux | Soil Fumigant | N |
| | Dacamox | Soil Fumigant | N |
| | DS-15647 | Soil Fumigant | N |
| | Thiometon | Dithiomethon | Insecticide |
| Thionazin | Ekatin | Insecticide | N |
| | Ekatin ULV | Insecticide | N |
| | Luxistelm | Insecticide | N |
| | M-81 | Insecticide | N |
| | AC 18133 | Soil Fumigant | N |
| Thiophanate Methyl 70% W.P. | Cynem | Soil Fumigant | N |
| | Nemafos | Soil Fumigant | N |
| | Nemaphos | Soil Fumigant | N |
| | Zinophos | Soil Fumigant | N |
| | Cercobin M | Fungicide | Y |
| Thiophos | Cercobin Methyl | Fungicide | Y |
| | Cycosin | Fungicide | Y |
| | Durosan | Fungicide | Y |
| | Easout | Fungicide | Y |
| | Enovit Super | Fungicide | Y |
| | Frumidor | Fungicide | Y |
| | Fungo | Fungicide | Y |
| | Labilite | Fungicide | Y |
| | Mildothane | Fungicide | Y |
| | Pelt 44 | Fungicide | Y |
| | Sigma | Fungicide | Y |
| | Topsin M* | Fungicide | Y |
| | AC 3422 | Insecticide | N |
| | Alkron | Insecticide | N |
| Alleron | Insecticide | N | |
| Aphamite | Insecticide | N | |
| Bladan | Insecticide | N | |
| Corothion | Insecticide | N | |
| E-605 | Insecticide | N | |

YEMEN-GERMAN PLANT PROTECTION PROJECT
PESTICIDE-LIST

| <u>Active Ingredient</u> | <u>Trade Name</u> | <u>Type</u> | <u>Allowed in Yemen</u> | |
|--------------------------|---------------------|-----------------------------|-------------------------|---|
| Thiophos | ENT 15108 | Insecticide | N | |
| | Folidol E-605 | Insecticide | N | |
| | Hiran | Insecticide | N | |
| | Othophos | Insecticide | N | |
| | Panthion | Insecticide | N | |
| | Paramr | Insecticide | N | |
| | Paraphos | Insecticide | N | |
| | Parathene | Insecticide | N | |
| | Parathion | Insecticide | N | |
| | Parawet | Insecticide | N | |
| | Phoskil | Insecticide | N | |
| | Rhodiatox | Insecticide | N | |
| | Soprathion | Insecticide | N | |
| | Stathion | Insecticide | N | |
| | Thiophos | Insecticide | N | |
| | Triadimefon 5% W.P. | Amiral | Fungicide | Y |
| BAY-MEB-6447 | | Fungicide | Y | |
| Bayleton* | | Fungicide | Y | |
| Triamiphos | Wepsya 155 | Fungicides & Seed Dressings | N | |
| | | | | |
| Trichlorfon 80% S.P. | Bovinox | Insecticide | Y | |
| | Cekufon | Insecticide | Y | |
| | Danex | Insecticide | Y | |
| | Dipterex* | Insecticide | Y | |
| | Dylox | Insecticide | Y | |
| | Equino Aid | Insecticide | Y | |
| | Trichloronate | Agrisil | Insecticide | N |
| | | Agritox | Insecticide | N |
| | | Bay 37289 | Insecticide | N |
| | | Fenophosphon | Insecticide | N |
| Phytosol | | Insecticide | N | |
| S 4400 | | Insecticide | N | |
| Trichloronat | | Insecticide | N | |
| Triforine 20% E.C. | | Cela W524 Denarin | Fungicide | Y |
| | Funginex | Fungicide | Y | |
| | Saprol* | Fungicide | Y | |
| Vacor | DLP-87 | Rodenticides | N | |
| | Pyriminil | Rodenticides | N | |
| Vamidothion | RH-787 | Rodenticides | N | |
| | 10465 RP | Insecticide | N | |
| | Kilval | Insecticide | N | |
| | Trucidor | Insecticide | N | |
| Zinc Phosphide | Vamidoate | Insecticide | N | |
| | Phosvin | Rodenticides | N | |
| | Ratol | Rodenticides | N | |
| | Ridall-Zinc | Rodenticides | N | |
| | Zinc-Tox | Rodenticides | N | |
| | ZP | Rodenticides | N | |

Annex G

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Appendix III

Sources Used in This Report

Dr. Mohammed al-Ghashm, Director General, Plant Protection,
Ministry of Agriculture and Fisheries, Yemen.

Dr. Ahmad Askari, Team Leader, Horticulture Improvement and
Training Subproject.

Dr. Rolf Link, Yemen-German Plant Protection Project.

Mr. John T. Rifembark, USAID, Yemen.

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ANNEX G:

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Concluding Note: AID/W in State Cable 305232 (1989) approved the IEE. However, it recommended that no funds be obligated for Locust Control efforts until an in-country supplemental Environmental Assessment (EA) was conducted. The Sana'a Mission concurs and will follow this recommendation.