PD-ABA-417

64638

TITLE XII AGRICULTURAL DEVELOPMENT SUPPORT PROGRAM

(279-0052)

YEMEN ARAB REPUBLIC

FACULTY OF AGRICULTURE

SUBPROJECT PAPER ANNEXES

(A - R)

Final Revision
11/08/84

PDABA-417

A N N E X A

SPID APPROVAL MESSAGE: SPP CABLE

STATE 106637; STATUTORY

CHECKLIST; 611/a CERTIFICATE

LOGICAL FRAMEWORK

P 280029Z JUL 83
FM SECSTATE WASHDC
TO AMEMBASSY SANAA PRIORITY

UNCLAS STATE 282284

ADMAID DIR,AOO,PRO

E.O.12356: N/A
TAGS:

SUBJECT: YEMEN-FACULTY OF AGRICULTURE - NEAC

REVIEW, AGRICULTURE DEVELOPMENT SUPPORT PROJECT 279-0052

1. NEAC MET JUNE 30, 1983 AND REVIEWED FACULTY OF AGRICULTURE SUB-PROJECT IDENTIFICATION DOCUMENT. IT WAS GENERALLY FELT THAT THE SPID WAS A WELL PREPARED MISSION DOCUMENT. THE NEAC APPROVED THE FOA SPID AND RECOMMENDS THAT CID/MISSION PROCEED WITH DEVELOPING THE SPP.

2. PRE-IMPLEMENTATION: MISSION IS AUTHORIZED TO PROCEED WITH PRE-PROJECT EXPENDITURES FOR THE AID WORK, SURVEYING AND DELINEATING THE FARM GROUNDS, AND THE INSTALLATION OF FEHCBS AS REQUIRED. NOTWITH-STANDING, MISSION SHOULD NOT PROCEED WITH FUNDING OF OTHER PROPOSED PREPROJECT ACTIVITIES UNTIL IT HAS RECEIVED UNQUALIFIED ASSURANCE FROM YARG THAT FUNDS REQUIRED FOR CONSTRUCTION WILL BE AVAILABLE OR THAT THE FACULTY OF AGRICULTURE WILL BE ALLOWED TO COMMENCE INITIAL-OPERATION UTILIZING THE FACILITIES OF THE FACULTY OF SCIENCE OR OTHER CURRENTLY VAILABLE FACILITIES. IN ADDITION MISSION IS ENCOURAGED TO VERIFY YARG'S STATEMENT THAT AN AMPLE SUPPLY OF WATER EXISTS, WHICH CAN BE DEVELOPED FOR SUPPLYING BOTH THE SCHOOL FARM AND THE FACULTY. THIS VERIFICATION SHOULD PROCEED ASAP.

3. DEVELOPMENT OF THE SUBPROJECT PAPER WILL ENTIAL REEMPHASIZING AND STRENGTHENING THE FOLLOWING SEGMENTS OF THE SPID WHERE THE NEAC FELT CLARFICATION IS NEEDED:

A. PAST EXPERIENCE AND LESSONS LEARNED: THE SUBPROJECT DESIGN TEAM IS ENCOURAGED TO LOOK AT ABSTRACTS OF AID'S PAST EXPERIENCES IN DEVELOPING FACULTIES OF AGRICULTURE IN OTHER COUNTRIES SUCH AS AFGHANISTAN, TURKEY, MOROCCO, TUNISIA, THE WEST BANK, ETHIOPIA ETC. THE LESSONS LEARNED FROM THESE ENDEAVORS MAY ENABLE THE TEAM TO BUILD IN SAFEGUARD THAT WILL PERMIT THE PROJECT TO AVOID SOME OF THE PIT-FALLS ENCOUNTERED IN THESE PAST ACTIVITIES. NE/TECH/AD WITH THE ASSISTANCE OF NE/PD/PAE WILL PROVIDE THE DESIGN TEAM WITH DATA ON THE ABOVE.

B. ROLE OF WOMEN: SERIOUS THOUGHT MUST BE GIVEN TO ATTRACTING AND BRINGING WOMEN INTO THE PROJECT AT AN EARLY DATE. THIS IS ESPECIALLY SINCE LARGE NUMBERS OF YEMENI MEN HAVE LEFT AGRICULTURE TO SEEK THEIR FORTUNES IN SAUDI AND THE GULF STATES, AND WOMEN HAVE TAKEN THEIR PLACES ON THE FARM. THE CURRICULUM THAT IS TO BE DESIGNED FOR THE FACULTY SHOULD ENCURRAGE WOMEN TO ENROLL FROM THE ONSET, IN COURSES THAT WILL ACCEERATE THEIR STUDY OF THE AGRICULTURAL SCIENCES. THIS IS PARTICULARLY RELEVANT SINCE WOMEN AT THIS TIME COMPRISE ALMOST A MAJORITY OF THE STUDENTS AT THE SANAA UNIVERSITY. IN ADDITION THERE DOES NOT APPEAR TO BE ANY REASON WHY SPECIFIC COURSES DESIGNED FOR WOMEN IN HOME ECONOMICS AND NUTRITION COULD NOT ALSO BE INCLUDED. THESE ISSUES SHOULD BE CONSIDERED IN THE SOCIAL ANALYSIS SECTION OF THE SPP.

C. BACKWARD AND FORWARD LINKAGES: THE ROLE OF THE FACULTY OF AGRICULTURE IN THE WHOLE AGRICULTURAL SECTOR MUST BE DELINATED IN MORE DETAIL. FOLLOWING ARE TYPICAL QUESTIONS WHICH THE SUBPROJECT PAPER SHOULD ADDRESS.
WHAT IS THE RELATIONSHIP OF THE FACULTY WITH THE MINISTRY OF AGRICULTURE? WHAT IS IT'S RELATIONSHIP WITH THE PRIVATE SECTOR? WHAT LINKAGES EXIST AT THIS TIME BETWEEN OTHER FACULTIES AT THE UNIVERSITY? WHAT ADMINISTRATIVE REGULATIONS PERMIT COORDINATION ON AMONG THESE VARIOUS FACULTIES? WHAT ARE THE LINKAGES THAT EXIST BETWEEN THE FACULTY AND THE SECONDARY SCHOOLS?

D. ADEQUATE SUPPLY OF AGRICULTURE STUDENTS: THIS AREA MUST BE LOOKED AT CLOSELY SINCE THERE ARE ONLY THREE - SECONDARY AGRICULTURAL SCHOOLS WHICH WILL SERVE AS THE PRINCIPAL SOURCE OF SUPPLY OF STUDENTS. OTHER ESTABLISHED AND PROPOSED FACULTIES WITHIN THE UNIVERSITY SYSTEM WILL COMPETE FOR THE LIMITED NUMBER OF STUDENTS GRADUATING FROM THESE AS WELL AS FROM THE OTHER SECONDARY SCHOOLS. THE SPP MIGHT CONSIDER A SUMMER SCHOOL PROGRAM AND/OR THE PROVISION OF A FIFTH YEAR AS METHODS TO BRING IN SECONDARY STUDENTS WHO MIGHT NOT OTHERWISE QUALIFY FOR ADMISSION TO THE FACULTY.

E. PARTICIPANT TRAINING: THE SPID PROVIDES FOR LONG TERM TRAINING FOR FIFTEEN FACULTY MEMBERS. THIS NUMBER APPEARS TO BE INSUFFICIENT WHEN VIEWED FROM ACTUAL SITUATIONS SUCH AS DROP OUTS, NON-FUTURNEES AND THOSE WHO WILL TAKE OTHER JOBS WHEN THEY DO RETURN. THIS NUMBER ALSO APPEARS TO BE RATHER THIN WHEN CONSIDERING THE TEACHING, RESEARCH AND POSSIBLE EXTENSION ROLES WHICH THE FACULTY WILL BE CALLED UPON TO PERFORM. THE SPP DESIGN TEAM SHOULD RE-EXAMINE THE ACTUAL NUMBER OF PARTICIPANTS WHICH THE PROJECT SHOULD TRAIN.

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F. CURRICULUM DEVELOPMENT: THE NEAC WAS CONCERNED THAT MANY OF THE PROPOSED CORE COURSES, FOR THE FACULTY OF AGRICULTURE, IN THE NATURAL AND BIOLOGICAL SCIENCES ARE ALSO TAUGHT IN OTHER FACULTIES OF THE UNIVERSITY. IS THERE NEED FOR DUPLICATION? CONCURRENTLY, IF IT IS DETERMINED THAT THESE OTHER FACULTIES ARE WILLING TO PROVIDE INSTRUCTION IN THESE COURSES, THEN THE SPP MUST ADDRESS THE ISSUE OF WHETHER THEY CAN SUPPORT THE FACULTY OF AGRICULTURE CURRICULUM TO THE LEVEL BEING PROPOSED. IN VIEW OF THE ISSUES OUTLINED IN ITEM D. ABOVE CONCERNING AN ADEQUATE SUPPLY OF STUDENTS, IT IS OF UTMOST IMPORTANCE THAT THE DESIGN OF THE SPP PROVIDES FOR THE ELIMINATION OF AS MUCH DUPLICATION AS POSSIBLE. CONCERN WAS ALSO NOTICED AT THE NEAC AS TO THE TYPE OF TRAINING THAT THE FACULTY WOULD OFFER. FOR EXAMPLE, IS PROVISION BEING CONTEMPLATED FOR OTHER THAN TRADITIONAL BA/BS DEGREE TRAINING IN AGRICULTURE SUCH AS NON-FORMAL SHORT COURSES, IN-SERVICE TRAINING.
EXTENSION/DEMONSTRATION ACTIVITIES ETC?

G. EVALUATION: THE FRAME WORK FOR DATA COLLECTION AS WELL AS A MORE DETAILED EVALUATION BUDGET MUST BE DEVELOPED IN THE SPP. THE DATA COLLECTION STRATEGY SHOULD NOT HOWEVER, AS IS STIPULATED IN THE SPID, BE LEFT TO THE DISCRETION OF TECHNICIANS PROVIDES UNDER THE PROJECT, TO DEFILE. DATA COLLECTION AND EVALUATION SHOULD STAND AS DISTINCT COMPONENTS OF THE PROJECT AND BE CLOSELY INTEGRATED INTO THE IMPLEMENTATION PLAN.

4. ADMINISTRATIVE OPERATIONS: QUESTIONS WERE RAISED DURING THE NEAC AS TO WHO WOULD CARRY OUT ADMINISTRATIVE FUNCTIONS RELATED TO THE FOA. WILL THESE FUNCTIONS BE THE RESPONSIBILITY OF THE FOA OR WILL THEY BE CONDUCTED BY THE CENTRAL UNIVERSITY ADMINISTRATIVE OFFICE? NOW WILL THEY BE FINANCED? ISSUES IN THE ADMINISTRATIVE AREA SHOULD BE ADEQUATELY COVERED IN THE SPP BY A PUBLIC ADMINISTRATION SPECIALIST. PUBLIC ADMINISTRATION SKILLS SHOULD BE INCLUDED ON THE DESIGN TEAM, EVEN IF IT REQUIRES AN ADDITIONAL TEAM MEMBER.

5. YARG'S CONTRIBUTION TO PROJECT ACTIVITIES: THE NEAC REALIZED THAT YARG IS NOW FACING BUDGETARY CONSTRAINTS OF SOME MAGNITUDE. NEVERTHELESS, THE MISSION SHOULD BE SURE THAT YARG UNDERSTANDS FULLY WHAT COSTS IT WILL HAVE TO PROVIDE ON A CONTINUING BASIS WHEN THIS PROJECT BECOMES OPERATIONAL.
SHULTZ.

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P 112313Z APR 84
FM SECSTATE WASHDC
TO AMEMBASSY SANAA PRIORITY
STATE 106637

SUBJECT: YEMEN FACULTY OF AGRICULTURE SUBPROJECT PAPER - AGRICULTURE DEVELOPMENT SUPPORT PROGRAM. PROJECT 279-0052. NEAC REPORTING CABLE.

REF: SANAA 1471

1. THE MISSION IS COMPLIMENTED ON PREPARATION OF AN EXCELLENT SUBPROJECT PAPER FOR THE COMPLEX FACULTY OF AGRICULTURE SUBPROJECT. THE NEAC MET MARCH 9, 1984 AND APPROVED THE SUBPROJECT PAPER SUBJECT TO ADEQUATE RESPONSE TO CHANGES RECOMMENDED IN PARAGRAPHS 3 AND 4 BELOW. THE MISSION SHOULD PROCEED WITH MAKING THE RECOMMENDED MODIFICATIONS AND SEND SPP WITH REVISIONS TO AID/W. UNLESS UNFORESEEN ISSUES ARISE, IT IS EXPECTED THE REVISED DOCUMENT WILL BE REVIEWED BY THE PRC, BUT NOT BY NEAC.

2. THE SPP WILL NOT BE FORWARDED FOR AUTHORIZATION UNTIL FIRM ASSURANCES ARE RECEIVED FROM THE MISSION THAT FUNDING FOR CONSTRUCTION IS AVAILABLE. IT IS ANTICIPATED THE BUDGET AND IMPLEMENTATION PLAN WILL REQUIRE REVISION IF FUNDING FOR CONSTRUCTION IS NOT SECURED AND AUTHORIZATION IS DELAYED MORE THAN APPROXIMATELY ONE YEAR FROM FINAL SPP REVIEW. PLEASE CONTINUE TO KEEP AID/W INFORMED ON STATUS OF EFFORTS TO OBTAIN CONSTRUCTION FUNDS.

3. NEAC ISSUES:

A. ECONOMIC AND FINANCIAL ANALYSIS: NEAC WAS ADVISED THROUGH A MEMO SUBMITTED BY NE/DP THAT THE ECONOMIC ANALYSIS CONTAINED A SIGNIFICANT METHODOLOGICAL ERROR AND OTHER QUESTIONABLE ASSUMPTIONS WHILE THE FINANCIAL ANALYSIS UNDERSTATED COSTS (SEE PARA C BELOW). NE/DP/PL HAS AGREED TO ASSIST CID/MISSION REPRESENTATIVES IN ANALYSES. COPIES OF THE MEMO FROM NE/DP BEING FORWARDED TO MISSION.

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B. RECURRENT COSTS: MISSION SHOULD EMPHASIZE TO YARG THE NECESSITY OF BUDGETING FOR RECURRENT COSTS ON A TIMELY BASIS. MAJOR CONCERN OF THE NEAC WAS THE CONCLUSION REACHED BY THE SPP (PP G-21) THAT EVEN WITHOUT REAL INCREASES IN THE OPERATING ALLOCATION OVER THE NEXT TEN YEARS, THE UNIVERSITY OF SANAA WOULD BE ABLE TO REALLOCATE BUDGETS IN ORDER TO SUPPORT THE FACULTY OF AGRICULTURE. THESE STATEMENTS ILLUSTRATE A NEED FOR BETTER FORWARD BUDGET PLANNING BY THE YARG AND THEIR COMMITMENT TO ASSUME RECURRENT EXPENDITURES.

C. CAPITAL CONSTRUCTION: TWO CAPITAL CONSTRUCTION COMPONENTS ARE CONTAINED IN THE SUBPROJECT PAPER, NEITHER OF WHICH HAS FULLY BUDGETED THE COSTS INVOLVED. NE/PD BELIEVES THAT IN ADDITION, THE CONSTRUCTION AND A&E COSTS ARE PROBABLY UNDERSTATED. NE/PD HAS AGREED TO ASSIST CID/MISSION IN UPDATING THESE ESTIMATES. COPIES OF MEMO DEALING WITH THESE CONCERNS ARE BEING POUCHED TO MISSION AND CABLE RESPONSE TO REF A FOLLOWS.

4. NEAC CONCERNS:

A. ADEQUATE SUPPLY OF AGRICULTURAL STUDENTS: THE ANALYSIS OF STUDENT COMMITMENT TO AGRICULTURE IS NOT CONVINCING. THE INTEREST SURVEY OF STUDENT PERFORMANCE FAILED TO ASK WHETHER RESPONDENTS ACTUALLY INTENDED TO MAKE THEIR CAREERS IN AGRICULTURE. THE FACT THAT AGRICULTURE WAS USUALLY A SECOND OR THIRD PREFERENCE MAY INDICATE THAT THE FIELD WAS SEEN AS AN EASIER ROUTE TO UNIVERSITY ACCEPTANCE RATHER THAN A LONGER-TERM INTEREST. THE SPP SUGGESTS (PP F-25) THAT SPECIAL INCENTIVES MAY BE NECESSARY TO OBTAIN SUFFICIENT STUDENTS FOR THE FACULTY OF AGRICULTURE. THESE CONCERNS MUST NE ADDRESSED IN MORE DETAIL IN THE SPP.

B. PAST EXPERIENCE: NEAC CONCLUDED THAT THERE ARE SEVERAL WELL KNOWN PROJECTS IN WHICH AID HAS ASSISTED IN BUILDING FACULTIES OF AGRICULTURE WHICH SHOULD HAVE BEEN REVIEWED BY THE SPP DESIGN TEAM AND SHOULD BE CONSIDERED IN THE FINAL SUBMISSION. PPC/E/DIU'S REPRESENTATIVE AGREED TO ASSIST CID/MISSION BY MAKING THESE PROJECT PAPERS, EVALUATIONS AND ANY OTHER DOCUMENTS AVAILABLE AS REQUESTED.

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C. CURRICULUM DEVELOPMENT: SOME CONCERN WAS RAISED ABOUT THE PROPOSED TRAINING THAT WAS TO BE OFFERED, ESPECIALLY THE TRAINING OF ALL THE STUDENTS AS GENERALISTS, IN VIEW OF THE FACT THAT MANY WILL BECOME EXTENSION AGENTS, WHO WILL BE ONLY MINIMALLY QUALIFIED TO ASSIST FARMERS. IN ADDITION TO THE TRAINING WHICH THE FACULTY WILL PROVIDE TO THOSE DESTINED TO WORK IN THE MINISTRIES AND SCHOOLS, NEAC CONCLUDED THAT THE CURRICULUM SHOULD ALSO PROVIDE TRAINING TO PREPARE STUDENTS FOR JOBS IN THE PRIVATE SECTOR WHERE POSSIBLE.

D. WOMEN IN DEVELOPMENT: THE NEAC INDICATED THAT THE ISSUE OF WOMEN AND THEIR RELATIONSHIP WITH THE FACULTY OF AGRICULTURE SHOULD RECEIVE MORE ATTENTION IN THE REVISED SPP. CONSIDERATION MIGHT HAVE TO BE GIVEN TO THE CONSTRUCTION OF SPECIALIZED FACILITIES FOR WOMEN ATTENDING THE FACULTY, AS WAS DONE AT KABUL UNIVERSITY. IN ADDITION, SPECIALIZED COURSES MIGHT ALSO HAVE TO BE CONSIDERED.

E. POLES OF POWER/INTERMINISTERIAL FACULTY CONFLICTS: THERE NEEDS TO BE SOME FORMAL AS WELL AS INFORMAL STRUCTURE WHICH WILL MESH THE MINISTRIES WITH THE FACULTIES IN ORDER TO AVOID UNIVERSITY VERSUS MINISTRY CONFLICTS WHICH HAVE OCCURRED IN SIMILAR ACTIVITIES IN OTHER COUNTRIES.

F. PAYMENT SCHEDULE: A NEW REGULATION HAS COME INTO EFFECT WHICH REQUIRES THAT EACH PP/SPP DISCUSSES THE METHOD OF PAYMENT WHICH WILL BE UTILIZED IN THE PROJECT. MISSION REPRESENTATIVES WERE ADVISED TO CONSULT WITH THE REGIONAL CONTROLLER.

G. EVALUATION PLAN: NEAC AGREED THE SPP EVALUATION PLAN SHOULD BE REVISED WITH EVALUATIONS SCHEDULED BASED ON THE INFORMATION NEEDS OF THE SUBPROJECT RATHER THAN AS PART OF A BROADER REVIEW OF THE OVERALL ADS PROGRAM. INTERNAL EVALUATIONS WOULD UTILIZE THE COLLABORATIVE ASSISTANCE APPROACH AND THUS EXPOSE MAF COUNTERPARTS TO THE CONCEPT AND VALUE OF EVALUATION. USAID/YEMEN SHOULD BE DIRECTLY RESPONSIBLE FOR ALL ASPECTS OF EXTERNAL EVALUATIONS. THE PURPOSE FOR EACH EVALUATION SHOULD BE EXPLAINED IN THE EVALUATION PLAN NARRATIVE WITH KEY ISSUES IDENTIFIED. DATA REQUIREMENTS SHOULD BE DISCUSSED AND FUNDS BUDGETED FOR BOTH COLLECTION AND EVALUATION AS NECESSARY. SCHULTZ

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PROJECT CHECKLIST

Agricultural Development Support Program (Project 279-0052)
Faculty of Agriculture Subproject

5C(2) 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 all projects funded from specific sources only: B.1. applies to all projects funded with Development Assistance Funds, B.2. applies to projects funded with Development Assistance loans, and B.3. applies to projects funded from ESF.

A. GENERAL CRITERIA FOR PROJECT

1. FY 1982 Appropriation Act Sec. 523; FAA Sec. 634A; Sec. 653 (b).

(a) Describe how authorizing and appropriations committees of Senate and House have been or will be notified concerning the project;

(b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that amount)?

Ans: (a) Congressional Notification will be transmitted as soon as subproject is approved.

(b) Yes.

2. FAA Sec. 611 (a)(1)

Prior to obligation in excess of $100,000, will there be

(a) engineering, financial or other plans necessary to carry out the assistance?

(b) a reasonably firm estimate of the cost to the U.S. of the assistance?

Ans. (a) Yes.
(b) Yes.

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3. FAA Sec. 611 (a)(2).

If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

Ans: Not applicable

4. FAA Sec. 611 (b); FY 1982 Appropriation Act Sec. 601.

If for water or water-related land resource construction, has project met the standards and criteria set forth in the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973? (See AID Handbook 3 for new guidelines.)

Ans: Not applicable

5. FAA Sec. 611 (e).

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

Ans: Yes

6. FAA Sec. 209.

Is project susceptible to execution as part of regional or multilateral project? If so, why is the project not so executed? Information and conclusion whether assistance will encourage regional development programs.

Ans: Project will be financed in paralled with an Arab donor, probably the Saudi Development Fund.

7. FAA Sec. 601 (a).

Information and conclusion whether project will encourage efforts of the country to:

(a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, and 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.

ANS: Project establishes first indigenous capacity for Agriculture education at the university level. The resulting increase in trained human resources will enhance the YAR's capability to:

(a) increase flow of international trade;

(b) foster private initiative and competition;

(c) expand cooperative movement in area of credit, savings and loan associations;

(d) hinder concentrations of monopolistic power;

(e) expand technical efficiency of industry, agriculture and commerce; and

(f) support the free labor movement.

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 foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

Ans: As students gain knowledge of modern agriculture techniques, U.S. agribusiness firms will have an expanding market in Yemen commercial and investment opportunities.

9. FAA Sec 612(b), 636(h); FY 1982 Appropriation Act, Sec. 507

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.

ANS: The Project Agreement will stipulate the YARG contribution of local currencies to meet at least 25% of the cost of the project. The U.S. owns no foreign currency which can be utilized for this project.

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?

Ans: The Yemen Arab Republic is not an excess currency country.

11. FAA Sec. 601(3)

Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Ans: The selection procedures for collaborative assistance will be followed for the technical assistance. Competitive selection procedures will be used for A and E services.

12. FY 1982 Appropriation 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?

Ans: Not applicable.

13. FAA 118(c) and (d).

Does the project comply with the environmental procedures set forth in AID Regulation 16? Does the project or program take into consideration the problem of destruction of tropoical forests?

ANS: The project is in compliance with AID Regulation 16. Reforestation will be covered in the curriculum and Practicum of the Faculty of Agriculture.

14. FAA 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 (dollars or local currency generated therefrom)?

ANS: Not applicable.

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec 102(b), 111, 113, 281(a).

Extent to which activity will:

(a) effectively involve the poor in development by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions;

(b) help develop cooperatives, especially by technical assistance to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions;

(c) support the self-help efforts of developing countries;

(d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and

(e) utilize and encourage regional cooperation by developing countries?

Ans: (a) The Project will train and demonstrate to Yemeni alternate technologies to be disseminated in rural areas. This in turn will act as a catalyst for rural investment using remittance migrant workers. Rural poor will be encouraged to visit the teaching farm for field inspection training of new agriculture techniques.

(b) The cooperative movement in Yemen is very young and need cadre of trained agriculturalist in order to be responsive to member needs. The Faculty of Agriculture will supply the cadre of trained agriculturalist.

(c) The project will establish the only indigenous agricultural institution for university education.

(d) The Faculty of Agriculture is designed to encourage women to enroll in the school. They expect over 20% of class will be female.

(e) By establishing a Yemen_____ institution with the capability to support and participate in international seminars and conferences on agriculture problems in Yemen.

b. FAA Sec. 103, 103A, 104, 105, 106.

Does the project fit the criteria for the type of funds (functional account) being used?

Ans: The Faculty of Agriculture is providing assistance to Agriculture Sector and is funded under Section 103.

c. FAA Sec. 107

Is emphasis 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)?

Ans: Currently, Yemen has a shortage of labor for agriculture and more capital intensive investments are appropriate. If this situaton should change, the Faculty Teaching Farm and classroom lectures will include a wide range of technological innovations while educating Yemeni to make appropriate investments under current conditions.

d. FAA Sec. 110(a.

Will the recipient country provide at least 25% of the costs of the program, project or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?

Ans: The Yemen Arab Republic will contribute 36.3% of the project costs.

e. FAA Sec. 110(b).

Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"? (M.O. 1232.1 defined a capital project as "the construction, expansion, equipping or alteration of a physical facility or facilities financed by AID dollar assistance of not less than $100,000 including related advisory, managerial, and training services, and not undertaken as part of a project of a predominantly technical assistance character.")

Ans: The AID project is predominantly technical assistance and training. Additional donations will contribute up to $25 million for construction of buildings.

f. FAA Sec. 122(b).

Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth.

Ans: The Faculty of Agriculture Subproject directly addresses the key constraint of YARG's lack of trained human resources. It is only by alleviating this constraint can the YARG efficiently use its economic resources and develop self-sustaining economic growth.

g. FAA Sec. 281(b).

Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.

Ans: The purpose of the Faculty of Agriculture subproject is to support the establishment within Sanaa University of Yemen's Faculty of Agriculture who will be responsive to YAR's agriculture development need, supportive of private and public sector development and has appropriate linkages to the agriculture sector's production and institutional structure.

2. Development assistance project criteria (Loans Only).

Ans: Not applicable.

a. FAA SEc. 122(b).

Information and conclusion on capacity of the country to repay the loan, at a reasonable rate of interest.

b. FAA Sec. 620(d).

If assistance is 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% of the enterprise's annual production during the life of the loan?

c. ISDCA of 1981, Sec 724 (c) and (d).

If for Nicaragua, does the loan agreement require that the funds be used to the maximum extent possible for the private sector? Does the project provide for monitoring under FAA Sec 624(g)?

3. Economic Support Fund Project Criteria

Ans: Not applicable.

(a) FAA Sec 531(a)

Will this assistance promote economic or political stability? To the extent possible, does it reflect the policy directions of FAA Section 102?

(b) FAA Sec. 531(c).

Will assistance under this chapter be used for military, or paramilitary activities?

(c) FAA Sec. 534.

Will ESF funds be used to finance the construction of the operation or maintenance of, or the supplying of fuel for a nuclear facility? If so, has the President certified that such use of funds is indispensable to nonproliferation objectives?

(d) 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?

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ANNEX A

Certification Pursuant to Sections 611(a)(1)

of the Foreign Assistance Act (FAA)

of 1961 as Amended

1. As required by Section 611(a)(1)(a) of the FAA, USAID/Sanaa confirms that the necessary engineering and financial plans have been prepared for carrying out the assistance.

2. The Mission also confirms that it has reviewed the Agricultural Development Support Program (Project 279-0052), Faculty of Agriculture Support Program (Project 279-0052), Faculty of Agriculture Subproject budget, and is the Mission's opinion that the budget meets the standards set in Section 611(a)(1)(b) of the FAA.

Charles F. Weden, Jr.
Director

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A N N E X B

LOGICAL FRAMEWORK

ANNEX B

LOGICAL FRAMEWORK

Project Title: Faculty of Agriculture Subproject
Agricultural Development Support Program

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
	Measures of Achievement	Means of Verification	Assumptions
GOAL	GOAL	GOAL	GOAL
To increase rural incomes in the YAR through agricultural development.	Increased agricultural production. Improved agricultural trade balance. Increased farm income.	YARG statistics. Socio-economic analyses.	Agriculture will remain an important economic activity in rural Yemen.
SUBGOAL	SUBGOAL	SUBGOAL	SUBGOAL
To increase the supply of appropriately trained Yemeni men and women to plan, manage, implement, and evaluate development activities in the private and public agricultural sector of the YAR.	Increase in number of trained Yemeni men and women working in agriculture and rural development and a corresponding decrease in expatriates in key positions	1. YARG employment data. 2. MOE records. 3. MAF records on expatriate involvement in rural development	1. Incentive structure sufficient to attract Yemeni personnel to employment in the agricultural sector and to retain trained Yemeni personnel in the YAR. 2. There will continue to be a demand for trained Yemeni personnel in the agricultural sector.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
PURPOSE	END OF PROJECT STATUS	MEANS OF VERIFICATION	ASSUMPTIONS
To support the establishment within the University of Sana'a Yemen's first Faculty of Agriculture that is responsive to private and public sector development, and has appropriate linkage to the agriculture sector's production and institutional structure.	1. An operational indigenous Faculty of Agriculture within the University of Sana'a engaged in teaching and research, and assisting MAF extension activities. 2. Four hundred-eighty students trained and graduated, and assuming responsible positions in the private and public sector, and an established institutional capability to produce 120 graduates per year. 3. Ongoing collaboration between the Faculty of Agriculture, the MAF, the MOE, private agencies and agricultural producers on: a) research and research priorities b) extension c) curriculum development d) in-service training 4. A productive and ongoing relationship between the Faculty of Agriculture and U.S. Land-Grant University Faculties of Agriculture. 5. An operational instructional farm that is integrated into the curriculum of the Faculty of Agriculture and is providing students opportunities for relevant, practical experiences.	1. Project evaluation reports. 2. University/Faculty of Agriculture records. 3. Follow-up surveys of graduates. 4. Lists from U.S. Land-Grant Universities of seminars, special courses, and TDYs to support relationships with the Yemeni FOA. 5. Formative evaluations in the context of annual workplans and other existing project reporting fora.	1. University of Sana'a policies will continue to support the development of a Faculty of Agriculture. 2. Adequate facilities not funded by AID will be funded by 6/1/85 and available for use by 6/1/89. 3. Faculty of Agriculture will be successful in recruiting and graduating students in projected numbers. 4. Private and public agencies in the YARG, particularly MAF and MOE, will continue to be supportive of an indigenous Faculty of Agriculture. 5. Incentive structure for faculty will continue to attract and retain qualified personnel for the FOA. 6. Sana'a University will receive adequate budgets from the YARG, University tuition, and/or other donors. 7. University FOA policies, personnel, and budgets will be implemented during and after project in accordance to the schedule as outlined in the budget. 8. University/FOA facility and equipment maintenance and replacement policies will be implemented during and after the project.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
OUTPUTS	MAGNITUDE OF OUTPUTS	MEANS OF VERIFICATION	ASSUMPTIONS
1. An appropriate and flexible administrative/organizational structure which can accommodate projected growth in the Faculty of Agriculture and changes in the country's agricultural sector. 2. Trained Yemeni faculty capable of instructing at the B.S. level, conducting research on priority Yemeni rural development issues, and assisting other institutions in extension. 3. A flexible co-educational curriculum that is responsive to the training needs of the YAR. 4. An agricultural sciences library. 5. Agricultural sciences laboratories. 6. An instructional farm on the university campus. 7. Graduates at the B.S. level. 8. Programs for in-service and refresher training for professional agriculturalists in the private and public sector. 9. Faculty exchanges, seminars, and other evidence of relationships developed with the U.S. Land-Grant University Faculties of Agriculture.	1. One administrative/organizational structure. 2. Yemeni faculty trained in the following fields: a)7 in livestock and poultry production and protection. b)7 in crop production and protection c)3 in agricultural economics d) 6 in hydrology and agricultural engineering e)3 in agricultural education/Extension Methods f)3 in food science and technology g)1 in library science h)1 in ESL/Technical Agriculture 3. One co-educational curriculum. 4. One library. 5. Instructional and research laboratories in the following areas: a)animal and poultry science b)plant sciences c)agricultural mechanics d)soil science e)agricultural and product processing f)food science and technology g)agricultural media preparation 6. 120 B.S. graduates per year. 7. Two in-service training courses per year.	1. Project evaluation reports. 2. Project training and other records. 3. Site inspections. 4. University records. 5. Lists from U.S. Land-Grant Universities of seminars, special courses, and TDYs to support relationships with the Yemeni FOA.	1. Quality participants are available for training, will meet English language requirements, will complete training as scheduled, and will return to specified faculty positions. 2. Adequate facilities will be funded by 6/1/85 and available for use by 6/1/89. 3. Adequate water will continue to be available to support operation of facilities, including instructional farm. 4. Only minimal remedial education will be required of prospective Faculty of Agriculture students. 5. U.S. Land-Grant Universities will develop and nurture university relationships with the Yemeni Faculty of Agriculture.

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
INPUTS	QUANTIFIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
1. AID grant of $22.6 million over 11 year period (FY84-94).	(See budget)	1. AID Project Agreement(s). 2. YARG budget and records of budget allocations. 3. University records. 4. CID contract	1. AID grant to support architectural and engineering services for the design and supervision of facility construction will be approved and released in a timely manner. 2. Other donor funding of facility construction will be approved and released in a timely manner. 3. AID, YARG, and other donor commitment to supporting project remains strong throughout life-of-project. 4. Land for the Faculty of Agriculture and instructional farm will remain available. 5. The campus of the Faculty of Agriculture and particularly the instructional farm will not be negatively affected by urban encroachment.
2. YARG contribution of YR 148 million over same period.	(See budget)		
3. Implementation contract with CID.			

ANNEX C

APPROVAL INITIAL ENVIRONMENTAL EXAMINATION

C

CID

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON

RECEIVED

JUL 25 '83

YEMEN PROGRAM
SANA'A Y.A.R.

July 8, 1983

MEMORANDUM

TO: USAID/Yemen/AGR, Patrick Peterson

THRU: NE/TECH/AD, Archie Hogan

FROM: NE/PD/ENV, Stephen F. Lintner, Environmental Coordinator

SUBJECT: SPID - Yemen Faculty of Agriculture

I have reviewed the subject document and concur in the Mission's recommendation of a "Negative Determination." The subject subproject is exempt from further review under the provisions of FAA Section 216.2 (c)(vii). For construction and water and waste management issues the safeguards spelled out in the Initial Environmental Examination should be enforced.

cc: GC, NE

ANNEX D

YARG REQUEST FOR ASSISTANCE AND PRESIDENTIAL DECREE

YEMEN ARAB REPUBLIC

PRIME MINISTER'S OFFICE

جمهورية العربية اليمنية
رئاسة مجلس الوزراء

P. O. Box : 175 - SANA'A
Teleg. : GENPLAN
Phone : 2992-3
7350-10

صندوق بريد : ١٧٥ - صنعاء
تلغرافيا : جنبلان
تلفون : ٢٩٩٢٠٣
٧٣٥٠٦-١٠

Dept : Minister's Office
Our Ref : 54 ج ع
Date : 9 December 1982
Subject

الادارة : .....
رقم الصادر : .....
التاريخ : .....
الموضوع .

Dear Mr. Ward,

In a recent meeting with you, we discussed the status of project development for the Faculty of Agriculture, Sana'a University.

This letter is to confirm to the Agency for International Development that donor financing has been negotiated from other donors in an estimated amount of US$20 millions (excluding the cost of land) for the construction and basic equipping of buildings and facilities for the new Faculty of Agriculture. The Y.A.R. Government contribution for the construction and equipping of the Faculty of Agriculture will be about Yemeni Rials 43 millions (excluding the financing from other donors).

Is it possible for AID to finance the detailed engineering and architect services originally [illegible] in our January 26, 1982 letter No. 411. This is required so that donor commitment needed for financing construction and construction supervision services can be firmed up. We appreciate AID's favorable consideration of Yemen's request for assistance in the design and construction of an experimental farm for the Faculty of Agriculture, as well as training for faculty members and administrators, and technical assistance

Sincerely yours,

Fuad Kaid Mohammed,
Minister of Development Chairman
Central Planning Organization

Mr. Ward,
Director,

DIR/DD	
AGR	✓
[illegible]	
CONT	
EXO	
HR	
PROG	
RD	
CHRON	
RF	

CPO
Dept. of Technical Cooperation and Conference
Assistance Section

Ref: 411
Date: 1/26/1982

Subject: Contribution on Faculty of Agriculture Project

To:
The Director
USAID/Sanaa

This is to inform you that we have received Sanaa University's note No. 1531 dated 1/19/1982 regarding your contribution in the Faculty of Agriculture Project of Sanaa University and their request for a meeting to discuss the type and scope of assistance which USAID could provide in this vital project. In the previous meetings you have expressed your interest to contribute in this project specially in the following fields:

1. To provide participant training in Agriculture (Masters/ PHDs), 5 scholarships per year during the next five years.

2. Funding of technical studies related to Engineering Designs and specifications, inorder to submit these studies to the Iraqi fund for International Development.

3. To reclaim the land located inside the university campus of Wadi Dhahr Road to be a nucleus for the Faculty of Agriculture Farm.

We would also like to inform you that the government has obtained necessary funds for the Faculty Buildings. The project is given a higher priority in the plan.

Please take note and initiate necessary action and advise.

Thank you for your cooperation.

Fatehy Salem Ali
Deputy CPO

cc: Sanaa University

ANNEX D

PRESIDENTAL DECREE

ESTABLISHING THE FOA

Typed exactly as received from Abdulkader M. Uqba

Y.A.R.

President of the Republic and the Cabinet

Legal Office

REPUBLICAN DECREE NO. 51

YEAR 1982

FOR THE ESTABLISHMENT OF

AGRICULTURE FACULTY -

SANAA UNIVERSITY

AFTER THE DECREE INTRODUCTION AND CONSTITUTIONAL REFERENCES.

Item (1) - the establishment of the Agriculture Faculty and to to be included with Sanaa University faculties and valid under the rules of the law no. 89 for year 1977 "The Law of Establishing Sanaa University".

Item (2) - This decree is legal from its effective date and to be published in the Government Official Magazine.

Issued at the Republican Palace

Date of Issue 26th July 1982

Signed by

Ali Abdulla Saleh	Abdulkarem Al Irani	Ahmed Mohamed Abdul Malik Alasbahi
Y.A.R. President and Commander in Chief	Prime Minister	Minister of Education.

الجمهورية العربية اليمنية

ثامنة الجمهورية ومجلس الوزراء

الأمانة العامة

قرار جمهوري رقم (١٥) لسنة ١٩٨٢م

بإنشاء كلية للزراعة بجامعة صنعاء

بعد الاطلاع على الدستور الدائم

وعلى الاعلان الدستوري الصادر بتاريخ ٦/٢/١٩٧٨م بتشكيل مجلس الشعب التأسيسي

المعدل بالاعلان الدستوري الصادر بتاريخ ١٧/٤/١٩٧٨م .

وعلى الاعلان الدستوري الصادر بتاريخ ٢٢/٤/١٩٧٨م بالعمل بقرار مجلس الشعب التأسيسي بتحديد شكل رئاسة الدولة واختصاصاتها وعزلها .

وعلى الاعلان الدستوري الصادر بتاريخ ٨/٥/١٩٧٩م بتعديل بعض احكام الاعلانات الدستورية السابقة الخاصة بمجلس الشعب وتوسيع اختصاصاته .

وعلى قرار مجلس القيادة بالقانون رقم (١٣٦) لسنة ١٩٧٦م باعادة تنظيم وزارة التربية والتعليم وتعديلاته .

وعلى قرار مجلس القيادة بالقانون رقم (٨٩) لسنة ١٩٧٧م باصدار قانون جامعة صنعاء .

وبعد أخذ رأي مجلس الجامعة وبناء على عرض وزير التربية والتعليم :

وبعد موافقة مجلس الوزراء .

قرر

(١) تنشأ كلية للزراعة وتكون ضمن كليات جامعة صنعاء وتسري عليها احكام القانون رقم ٨٩ لسنة ١٩٧٧م باصدار قانون جامعة صنعاء .

(٢) يعمل بهذا القرار من تاريخ صدوره ، وينشر في الجريدة الرسمية .

صدر بالقصر الجمهوري بصنعاء

بتاريخ ٦ / شوال / ١٤٠٢هـ

الموافق ٢٦ / يوليو / ١٩٨٢م

د. محمد عبد الملك الاصبحي
التربية والتعليم

د / عبد الكريم علي الارياني
رئيس مجلس الوزراء

العقيد / علي عبد الله صالح
رئيس الجمهورية
القائد العام للقوات المسلحة

28

C.P.O.
Dept. of Projects and Loans
Ref : 75
Date : 1/7/1984

R. Fendel
OSE

Re Financing the Construction of Faculty of Agriculture at Sana'a University

To :
The Director,
USAID - Sana'a.

In reference to the previous correspondence with you regarding financing the construction of Faculty of Agriculture at Sana'a University;

We wish to advise you that the Govt. of Yemen represented by the CPO, is currently in touch with the relevent authorities to join in the financing operation of building the Faculty of Agriculture. The main parties are the Saudi Development Fund, who expressed their initial approval of financing the project. In case of financial difficulties, the Yemeni government will cover the deficit of financing the project from the State's budget.

In consideration of the above, please advise us as of your opinion.

Thanking you for your continued cooperation.

Please accept our best regards.

Director-General,
Projects and Loans

Anwar Rizq Al-Harazi

Deputy of the CPO

Fathi Salem Ali

بسم الله الرحمن الرحيم

SANA'A UNIVERSITY

Vice Rector Office

جامعة صنعاء

نائب المدير

RECEIVED

DEC 5 '83

YEMEN PROGRAM
SANA'A Y.A.R.

Date: 29th/Nov/1983.

Ref : . . . ; ٢

Dear Mr. Weden,Jr.,

Thank you for your letter dated November 2nd,1983. I am glad to note that we have reached the execution phase, and in this regard I wish to confirm;

1) The water from the well drilled for the Faculty of Agriculture will be used exclusively for that purpos

2) The planned farm will be primarly teaching & demonstration farm and will not be used for activiti outside the faculty and curriculum needs.

Hoping these points will pave the way for immedia work in the farm. With my best regards,

Yours Truly,
Sana'a Univers
Vice - Rector

Dr. A. Qirbi.

ANNEX E

TECHNICAL ANALYSIS

ANNEX E

TECHNICAL ANALYSIS

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ANNEX E

TECHNICAL ANALYSIS

I. Objective of the FOA.

The objective of the FOA is to increase the supply of appropriately trained Yemeni men and women to plan, manage, implement, and evaluate development activities in the private and public agricultural sector of the YAR.

II. Location and Physical Facilities of the FOA.

A number of location alternatives have been carefully examined by university officials and outside consultants. The initial study prepared in 1980 by Dr. Naser A. Al-Aulaqi, then Associate Professor of Agricultural Economics in the Faculty of Business and Commerce, addressed this issue. In a strong argument for locating the proposed FOA within the UOS, Dr. Al-Aulaqi pointed out:

> "The big requirement for nonagricultural sciences, whether at the B.A. or M.A. and Ph.D. levels, indicates that agricultural colleges impose on their students an amount of nonagricultural sciences in which other college (faculties) specialize. This warrants the existence of an agricultural college within the campus of the university so that students could be able to study the other requirements." 1/

Dr. Al-Aulaqi also cited the economic advantage in avoiding the costs of duplicating staff that would be necessary to reach all the elements of a baccalaureate program in isolation from the rest of the university. He concluded that the proposed FOA must be located on the UOS campus and that a building of about 20,000 square meters would adequately serve the needs of this new faculty. 2/

In April of 1981, Dr. I.A.M. Lucas, Principal of Wye College of the University of London, was invited to the YAR by UOS officials and the British Council. In addition to other items, Dr. Lucas addressed the question of location and firmly supported the stance of Dr. Al-Aulaqi citing the strong need to develop close ties, especially with the FOS. He also concluded that no single site in the YAR would be representative of all the country's diverse agricultural regions. 2/

During 1981, CID and USAID developed a report on a month-long fact-finding tour by selected the YARG officials of the Faculties of Agriculture in Jordan, the United Kingdom and the United States. This report also documents the need for locating the FOA within the UOS. 3/

In early 1982, at the request of the YARG, the UNDP/FAO sent a team of consultants to the YAR to prepare feasibility studies and recommendations concerning the establishment of an FOA. This team did not question alternative sites, indicating their assumption that the FOA would be an integral part of the campus. 4/

The League of Arab States sent a team to the YAR to study the establishment of a FOA in Yemen. The team considered a number of possible alternative sites and concluded with more than a dozen strong arguments for locating the FOA within the existing UOS. 5/

Thus, a number of studies have focused on the issue of location and all are unanimous in recommending that the FOA be located within the UOS. In this growing community of scholars, a young, indigenous faculty would have an opportunity to develop close ties with other faculties on the campus as well as to plant the seeds for the all-important linkages with the MAF and MOE, located nearby, and the remainder of the public and private agricultural sector.

While USAID will not finance the construction of buildings to house the FOA or purchase land on which to locate an instructonal farm, both items will provide essential and needed support facilities for the FOA. The YARG has agreed to finance the construction of a faculty building with funds expected to be made available through low-interest loans from sister Arab nations. The buildings will include offices, classrooms, libraries, laboratories, and greenhouse space, and, according to World Bank estimates, will cost in the vicinity of $20-22 million. A cost of $22 million, including $3 million for equipment, was projected by the firm of Gauthier, Alvarado and Associates (see p. 17, Annex K). USAID is proposing to provide A/E design consultants to work directly with construction architects and engineers to assure a functonal relationship between offices, classrooms, and research facilities. USAID, through the provisions of this proposed FOA Subproject, will provide essential classroom materials, library resources, teaching equipment, and construction observation services.

This subproject will also support the development of an instructional farm on about a 22-hectare site adjacent to the faculty building (see map, p. 30, Annex J). The farm will provide an essential practical training element for students enrolled in the FOA, utilizing demonstration plots for agronomic and horticulture crops, facilities for livestock and poultry, and examples of rain-fed and irrigated crop production. The use of this facility will be an integral part of many of the courses in the curriculum. It can also be used as a demonstration resource for local farmers or extension agents where the latest cultural practices can be shown via tours and workshops sponsored by the FOA. The details of this important instructional tool are presented in Annex J of this report. The university will provide the land for the instructional farm, and USAID will finance the site preparation, development and construction costs, as well as the procurement of necessary supplies, equipment, and participant training. Detailed analysis and justification are contained in Annex J. Based on prior

CID experience with the poultry and horticulture subprojects, it is recommended that 2 years be scheduled to bring the instructional farm to a functional state.

III. Proposed Structure and Organization of the FOA

In accordance with the recommendation of the FAPU, the land-grant model will serve as a guide to shaping the proposed FOA. 3/ Initially, resident instruction will be the primary functon of the FOA. It will take time for the FOA to establish its credibility with the MAF and with the grassroots elements of the agricultural sector in terms of the additional functions of teaching, research, and extension. While the FOA may not fully take on the two latter functions, it is critical that linkages be developed with the MAF as soon as possible. We have found in our discussions with MAF officials, a highly favorable attitude of cooperation in achieving such an end.

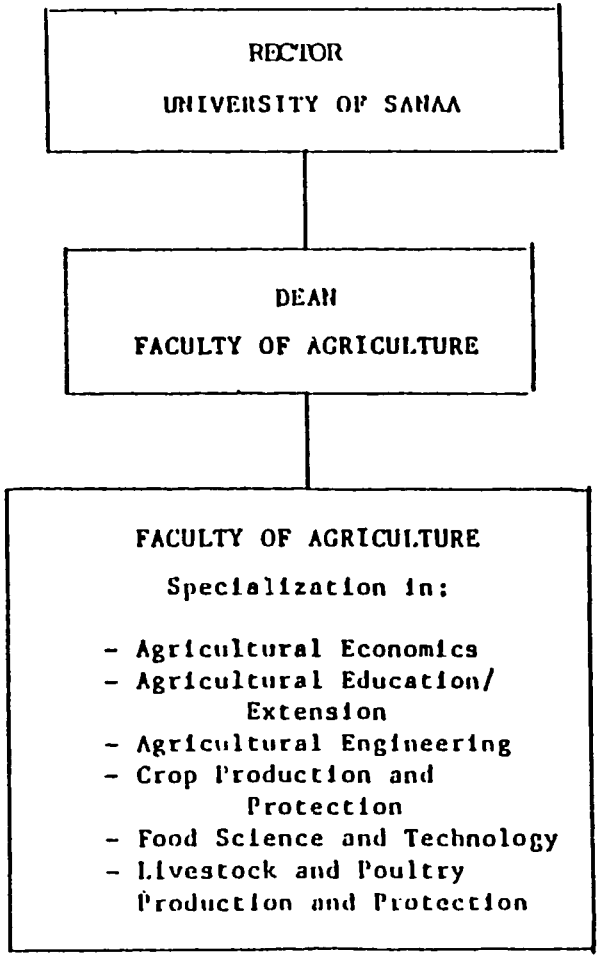
Figures E-1, E-2, and E-3 schematically depict the transition that would occur ideally if the land-grant model is to be eventually achieved. The EOPS will result in an indigenous faculty functioning as a single unit, under the leadership of a dean (Figure E-1). This rudimentary faculty will include some degree of specialization in agricultural economics, agricultural education and extension, agricultural engineering, crop production and protection, food science and technology, and livestock and poultry production. Prospective FOA members in crop production and protection will specialize in field crops, horticulture, and soil science. Agricultural engineering will include specialization in terms of irrigation and water relations, agricultural mechanization, and computer applications. The fisheries science areas have been excluded from the FOA because the curriculum for fisheries science differs markedly from that of the agricultural sciences. At some point in the future the UOS may decide to include fisheries sciences within the FOS, which currently teaches courses in marine science.

As the FOA grows, departmental units could eventually emerge within the FOA as shown in Figure E-2. Managed by appointed departmental heads, these units would operate expanded and more sophisticated programs of teaching, where students could, if desired, select greater specialization at the baccalaureate level.

Figure E-3 depicts the long-range organizational structure in which the Dean is assisted administratively by Associate Deans responsible for leadership in teaching, research, and extension. Faculty members in each department would participate in all three activities, some holding joint appointments in at least two areas. In essence, this is the generalized land-grant model, and it may take 15 to 30 years to achieve its parallel in the YAR. The important point is not so much that this model be achieved; rather it is critical that the FOA eventually impact, through whatever means and linkages necessary, the rural agricultural sector which prinicpally consists of the Yemen farmers. If this can be done effectively through MAF channels of research and extension, the goals of this subproject will very likely be realized.

FIGURE E-1

PROPOSED ORGANIZATION FOR FACULTY OF AGRICULTURE
UNIVERSITY OF SANAA, END-OF-PROJECT STATUS(1993)



36

FIGURE E-2

PROPOSED ORGANIZATION FOR FACULTY OF AGRICULTURE, UNIVERSITY OF SANAA, INTERMEDIATE STATUS (1999)

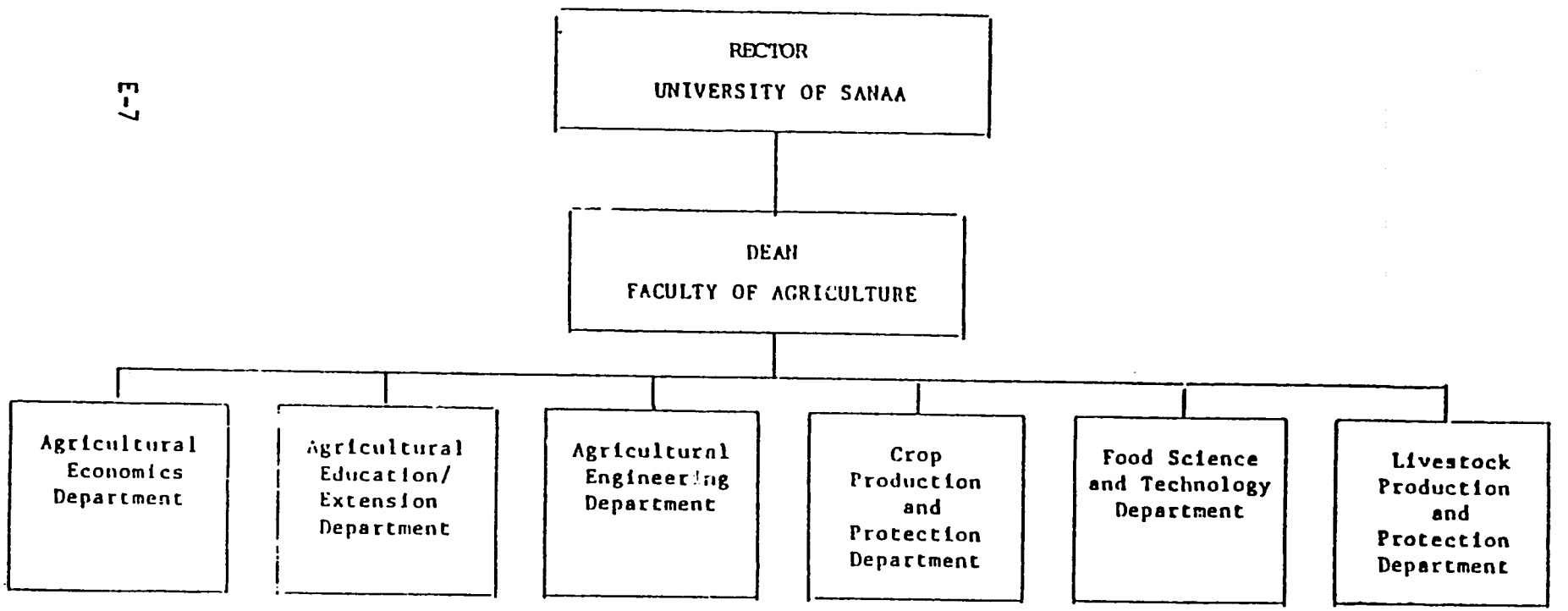
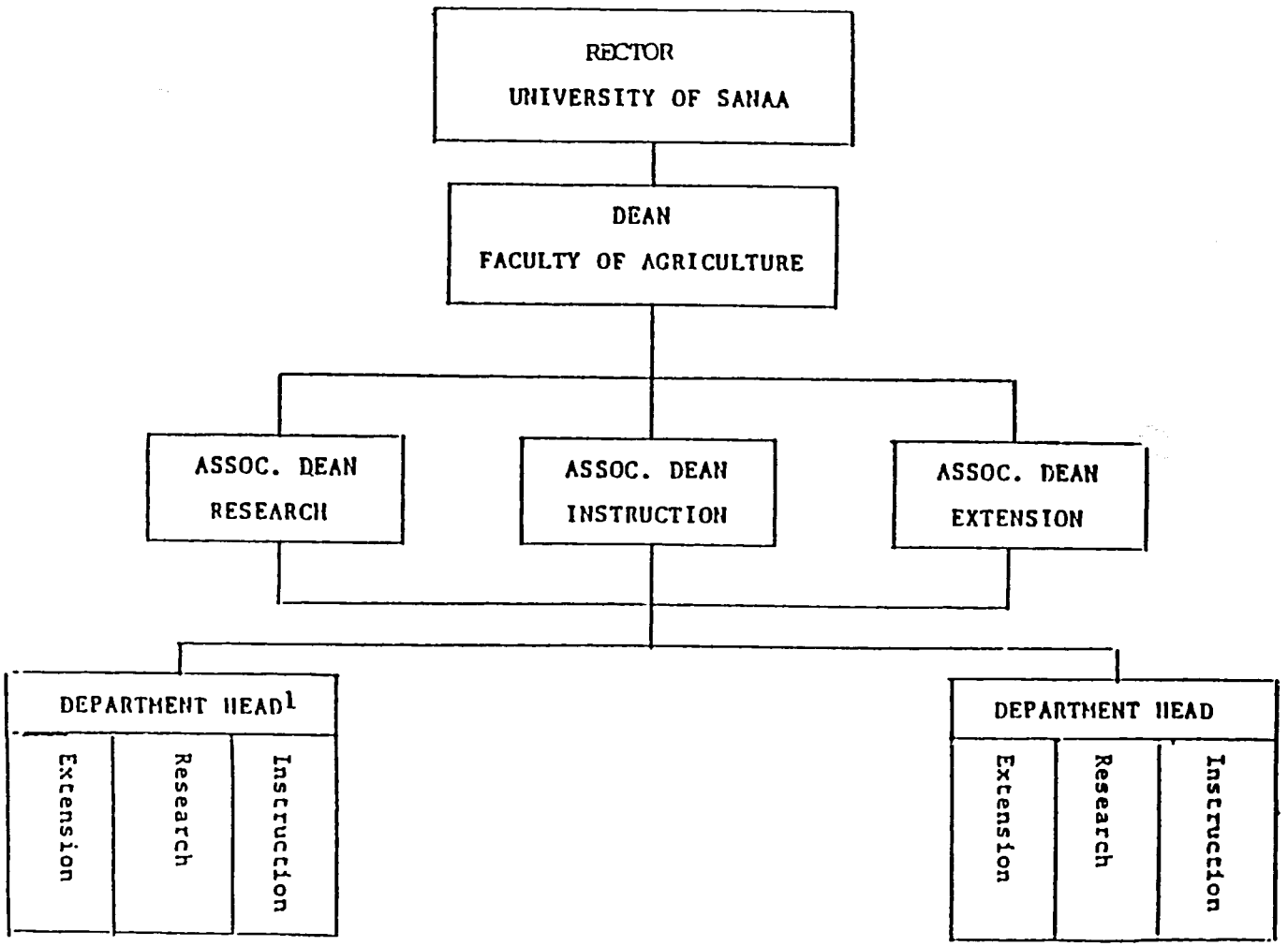


FIGURE E-3

PROPOSED ORGANIZATION FOR FACULTY OF AGRICULTURE, UNIVERSITY OF SANAA, ULTIMATE STATUS (2010)



[1] It is expected that multiple departments may eventually develop in response to changing needs.

IV. Training and Staffing Plan for the Proposed FOA

Key elements of this subproject are:

A. Internships of 6 months in length in the United States for the Yemeni Dean Designate and the Yemeni Farm Manager Designate, and

B. Academic preparation of prospective Yemeni faculty in the area of specialization targeted for the FOA. Table E-1 illustrates the phasing of the participant training.

Two participants are scheduled for 3 years of study in the U.S. beginning in the second year of the subproject. One of them will earn either a second baccalaureate or a M.S. degree in Library Science. The other will earn an M.A. degree in ESL with emphasis in technical agriculture.

Graduate preparation will be provided for 29 prospective FOA members. Seven scholarships have already been authorized under the Core Subproject. Eleven trainees will be selected to begin graduate study in the second subproject year and five, three, and three trainees in successive years. It is anticipated that 5.5 years will be required for each of them to earn both the M.S. and Ph.D. degrees. Only 3 percent of the trainees from Yemen sponsored by USAID have not earned degrees. Among those completing degrees about 25 percent have not returned immmediately, but 100 percent have returned within 5 years to Yemen. Providing for 29 Yemeni to begin graduate study takes into account the past experience of a possibility that up to 25 percent of those completing degrees may not return immediately to Yemen. Also, it should be noted that Yemeni completing Ph.D. degrees under sponsorhip of other donors may join the FOA.

Graduate training programs will be designed such that formal coursework will be completed abroad, and the research and thesis may be done in-country with supervisory visits by the student's major professor at an appropriate point in the progress toward completion of the research. Some research supervision will be possible by CID in-country professional personnel. Such a mechanism will enable Yemeni graduate students to focus research projects on important problems of Yemeni farmers and will initiate the important process of establishing linkages and credibility with the agricultural sector of the YAR. It will also promote the development of important long-range linkages between the FOA and the U.S. agricultural institution. Such a relationship could eventually be beneficial at both institutions in terms of developing library research, sponsoring special seminars, etc. This procedure is outlined more completely in Section VII , pg. E-45 of this Annex.

Table E-2 presents a staffing plan for the FOA showing the need for expatriate staff in order to meet anticipated enrollment projections during the third subproject year. Current plans are to enroll the first class of agricultural students in the fall of the second subproject year. It is

TABLE E-1

PROPOSED PHASING OF FOA PARTICIPANT TRAINING AT U.S. LAND-GRANT UNIVERSITIES BY AREA OF SPECIALIZATION, SUBPROJECT YEAR, STUDY EMPHASIS, AND TARGETED FOA RESPONSIBILITY

AREA OF STUDY AT U.S. LAND-GRANT UNIVERSITY	Core Project 1983 2/	SUBPROJECT YEAR 1	2	3	4	5	6	7	8	9	10	11	TARGETED FOA RESPONSIBILITY 1/
Horticulture	◄					►							Crop Prod. & Protection
Poultry Science	◄					►							Livestock/Poultry
Agricultural Economics	◄					►							Agric. Economics
Entomology	◄					►							Plant & Animal Protect.
Soil & Water Management	◄					►							Crop Prod. & Protect.
Animal Science	◄					►							Livestock/Poultry
Agricultural Engineering	◄					►							Agric. Engineering
Library Science 3/			◄		►								Agric. Library
ESL/Technical Agriculture 4/			◄		►								Faculty of Agriculture
Agricultural Marketing			◄					►					Agric. Economics
Farm Management			◄					►					Agric. Economics
Irrigation, Water Relations			◄					►					Agric. Engineering
Gen. Agricultural Eng.			◄					►					Agric. Engineering
Extension Methods			◄					►					Agric. Educ./Ext.
Animal and Poultry Nutrition			◄					►					Livestock/Poultry
Plant Breeding Genetics			◄					►					Crop Prod. & Prot.
Food Science & Technology			◄					►					Food Science & Tech.
Citrus, Vegetable Production			◄					►					Crop Prod. & Protection
Layer, Broiler Production			◄					►					Livestock/Poultry
General Soil Science			◄					►					Agric. Educ./Ext.
Secondary Teacher Training				◄					►				Agric. Educ./Ext.
Cattle, Sheep, Goat Production				◄					►				Livestock/Poultry
Cereal, Forage Production				◄					►				Crop Prod. & Protection
Livestock Grazing Management				◄					►				Livestock/Poultry
Soil Morph., Fert., Physics				◄					►				Crop Prod. & Protection
Agricultural Mechanization					◄					►			Agric. Engineering
Extension Methods					◄					►			Agric. Educ./Ext.
Livestock & Poultry Breeding					◄					►			Livestock/Poultry
Computer Applications						◄					►		Agric. Engineering
Human Nutrition						◄					►		Food Science & Tech.
Food Chemistry Processing						◄					►		Food Science & Tech.
TOTAL IN TRAINING	7	7	20	25	28	25.5	22	16.5	8.5	4.5	1.5	0	

1/ See proposed organizational structure, Figure E-1

2/ Limited training was authorized prior to SPID approval. Seven participants have been identified and approved for U.S. graduate training as of 10/83.

3/ Second baccalaureate or M.S. degree in Library Science.

4/ M.S. Degree in ESL with emphasis in Technical Agriculture.

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TABLE E-2

STAFFING PLAN FOR FOA SHOWING PHASING OF

EXPATRIATE STAFF BY TRAINED YEMENI FACULTY THROUGH SUBPROJECT DURATION

Area of Specialization or Responsibility	Subproject Year 1/ and Staffing Source										
	1	2	3	4	5	6	7	8	9	10	11
Agricultural Economics 2/			Trained Yemeni Staff								
Agric. Education/Extension 3/					Expatriate Staff					Trained Yemeni Staff	
Agricultural Engineering				Expatriate Staff			Trained Yemeni Staff				
Crop Production & Protection						Trained Yemeni Staff					
Food Science & Technology				Expatriate Staff					Trained Yemeni Staff		
Livestock/Poultry Prod.				Expatriate Staff			Trained Yemeni Staff				
Dean of FOA		Expatriate Staff Advisor						Trained Yemeni			
Instr. Farm Manager		Expatriate Advisor						Trained Yemeni			
FOA Librarian			Expatriate Advisor				Trained Yemeni				
FOA ESL Specialist			Expatriate Advisor				Trained Yemeni				

1/ Assumes prospective students enrolled in University of Sanaa Faculty of Science during third subproject with enrollment in FOA during fourth subproject year.

2/ Assumes trained Yemeni available

3/ Assumes first classes in agric. ication/extension in fourth year of curriculum.

proposed that first year students be enrolled in the FOS, since the majority of their courses will be in that area. Students will begin their agricultural coursework during the third subproject year (second year of enrollment), thus necessitating some expatriate staffing as indicated in certain areas. Trained Yemeni faculty are already available in agricultural economics, and crop production and protection. Expatriates would be provided by this subproject in the areas of agricultural education/extension, agricultural engineering, food science and technology, and livestock/poultry production and protection as shown in the table. The expatriates will acquire experience in irrigation, growing crops, and acquiring and managing livestock on the instructional farm prior to the use of the farm for teaching in year 4.

The subproject also provides for expatriates in an advisory role to the Dean of the FOA, the Instructional Farm Manager, an ESL Specialist in Technical Agriculture, and the FOA Librarian. In each case, the Yemeni professional will have returned to Yemen in time to join with their expatriate counterparts for the advisory period indicated.

The detailed SOW for the USAID-funded expatriate staff will be developed and agreed upon as an integral part of the Annual Work Plans. This Initial Work Plan, covering the period of March through September 1984, is provided in Annex O, and includes the draft SOW for the initial contingent of expatriate technical assistance.

V. Institutional Linkages

The goal of this subproject is to increase the income in rural areas by contributing to agricultural development. The FOA will accomplish this goal by three major functions:

*training of B.S. graduates;
*conducting meaningful agricultural research; and
*providing workshops, demonstrations, training sessions, and applied instruction materials to farmers, farm families, and agricultural interests around the YAR.

In order for these functions to be provided effectively, a series of institutional linkages will be necessary. Two types of linkages are envisioned: administrative and operational.

Administrative linkages are those where specific supervisory or financial relationships exist. Operational linkages are those relationships without specific supervisory or financial responsibilities, but which depend upon cooperation and mutual benefit in order to remain intact. Operational linkages are effective means of coordination and long-range planning, and can be an important avenue in avoiding duplication of efforts.

A. Policy Linkages

Policy linkages are essential to the successful functioning of the FOA. Among the decisions to be made are identification of short-,

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intermediate- and long-term goals. These decisions will be most effectively made when coordinated with CID/Yemen, MAF and MOE. The linkages to accomplish these goals are shown diagrammatically in Figure E-4. This set of linkages provides sufficiently broad input from agricultural development agencies to provide a coordinated program to the agricultural sector. Linkages will exist at several levels, ranging from the Rector-Minister level, to the Dean-faculty level.

B. Training Linkages

The education and utilization of trained agricultural workers is a cooperative venture involving the various secondary schools, the FOA, the graduate-level education programs located outside Yemen and the employers of the graduates. These relationships are shown in Figure E-5. One portion of the linkages will be achieved by the movement of personnel, students and graduates. The other linkage will take the form of consultative feedback as outlined. A Curriculum Review Committee, consisting of five senior faculty members, is proposed to solicit feedback from the employers of students, as well as from the graduate level educational institution attendees and faculty members. By this process, an element of quality control will be established. This feedback will provide a quantitative tool for making changes to the curriculum and to the individual course outlines.

C. Research Linkages

A research program responsive to the agricultural technology needs of the YAR can best be achieved by a system of linkages as outlined in Figure E-6. This scheme will allow input from those people and agencies best prepared to guide the selection of general areas of research expertise as well as identification of specific research projects. Linkages will be established at both the administrative level (deans, department heads and directorate leaders) and the operational levels (faculty members, experimental farm directors, technical institute directors and individual faculty members from international educational and research institutions). The financial support for these linkages has been established in the subproject budget. Costs will involve deployment of TDY and expatriate faculty as well as travel and technical support for in-country researchers.

D. Linkages to Impact Farm Households

The most effective means of promoting agricultural development in the YAR will involve applications of the contemporary, scientific and agricultural expertise directly to the agricultural production sites, namely local farms. This process requires the extensive network of linkages shown in Figure E-7. This system involves a cooperative effort of the FOA, MAF, and MOE assisted by USAID/Yemen, CID/Yemen and the other international donor funded agricultural research and demonstration farms.

Because of the complexity of this linkage scheme, it is proposed that an Extension Coordinating Committee (ECC) be established to

FIGURE E-4

FACULTY OF AGRICULTURE

Policy Linkages

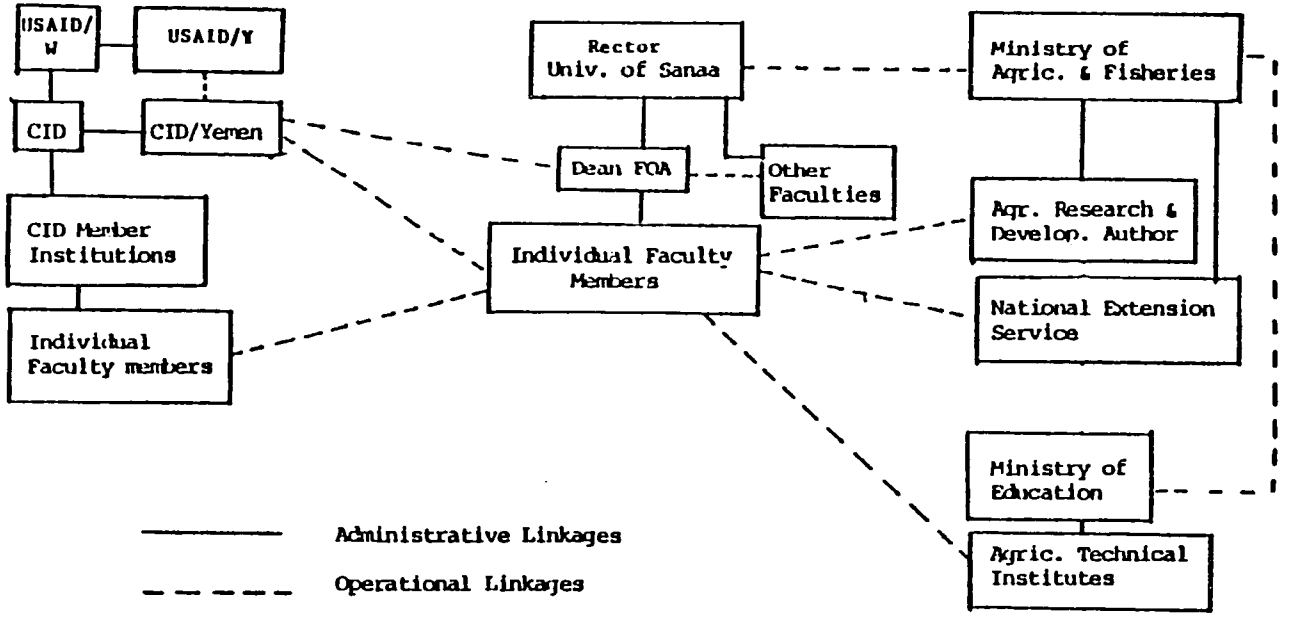


FIGURE E-5

FACULTY OF AGRICULTURE

Training Linkages

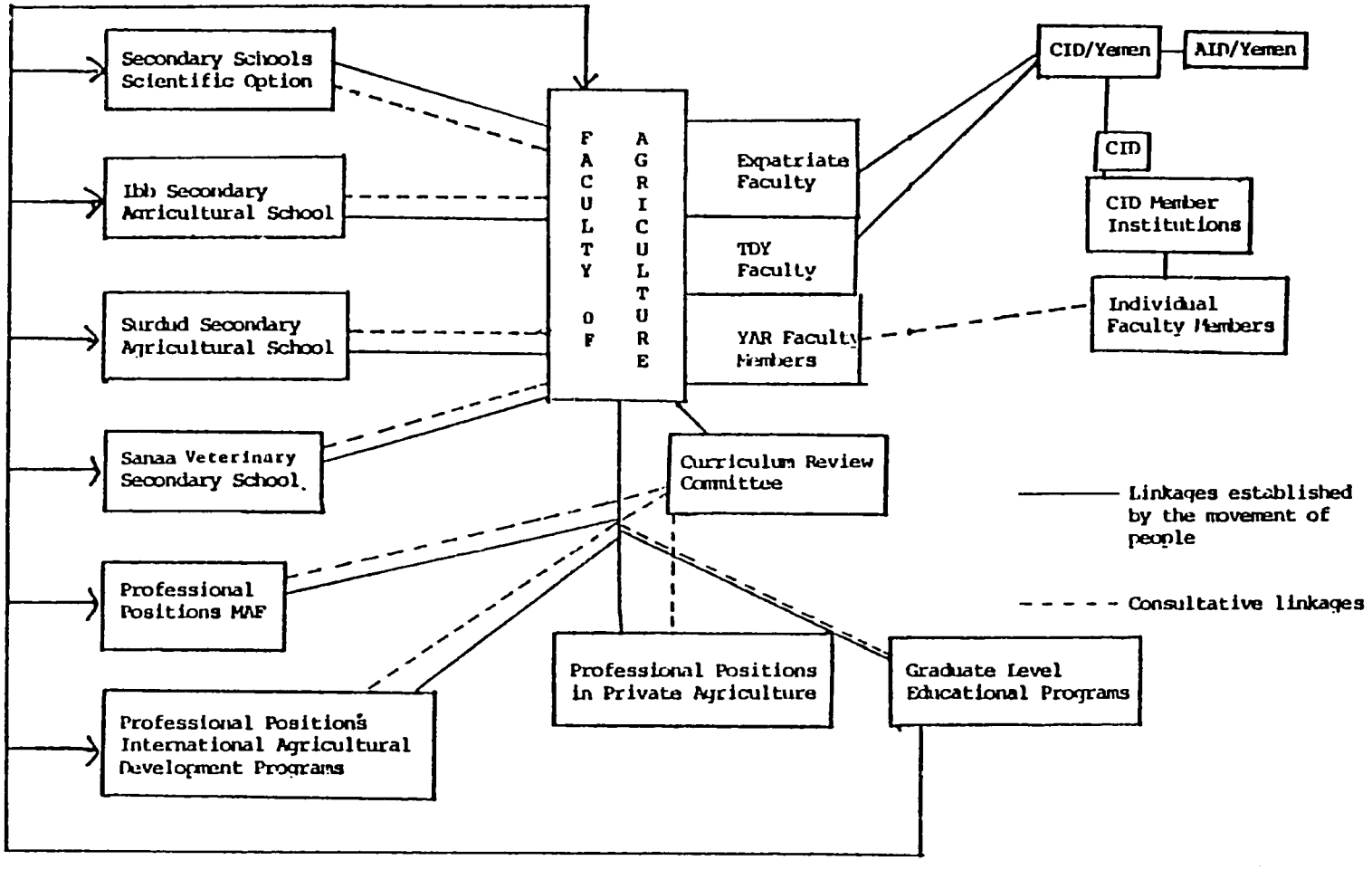
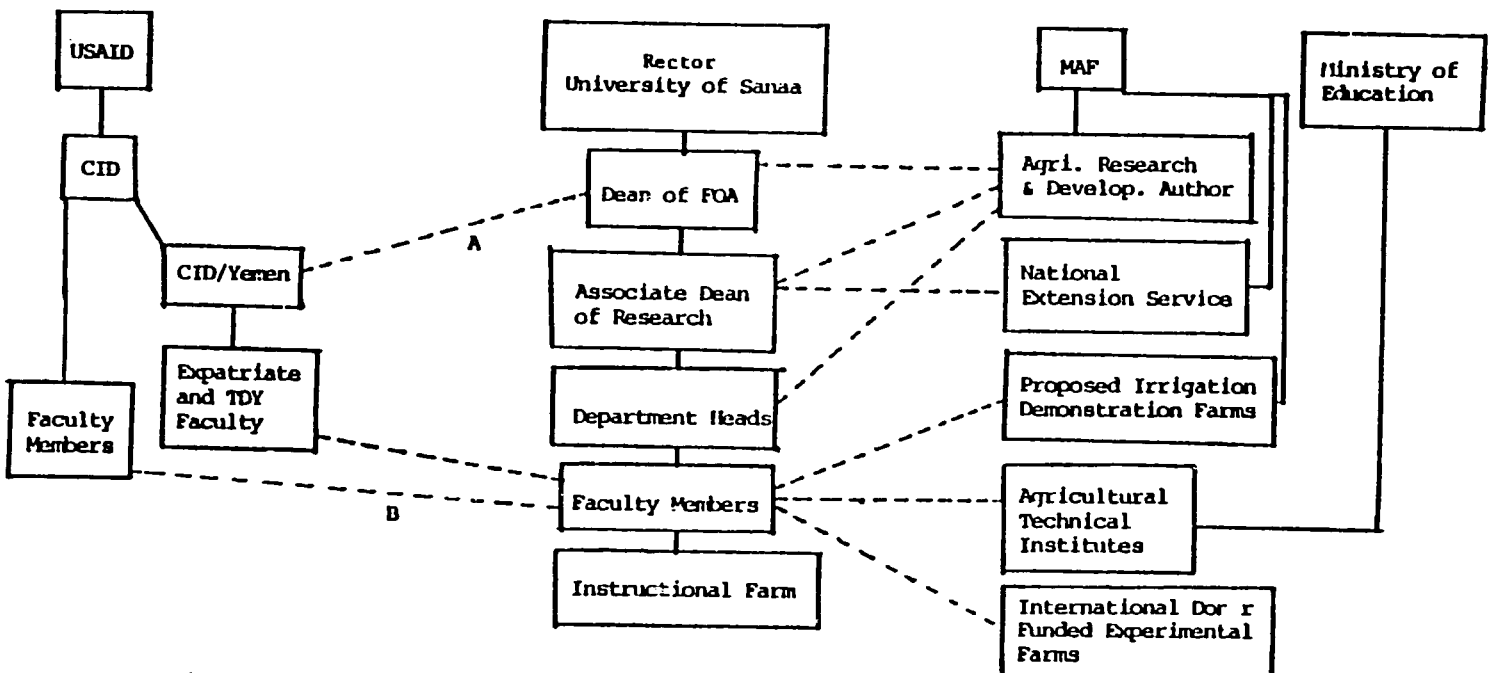


FIGURE E-6

FACULTY OF AGRICULTURE

Research Linkages



A. Linkage established during the early years by expatriate Faculty Advisor.

B. Linkage established during the participant training process and maintained by TDY assignments

——— Administrative Linkages

- - - - - Operational Linkages

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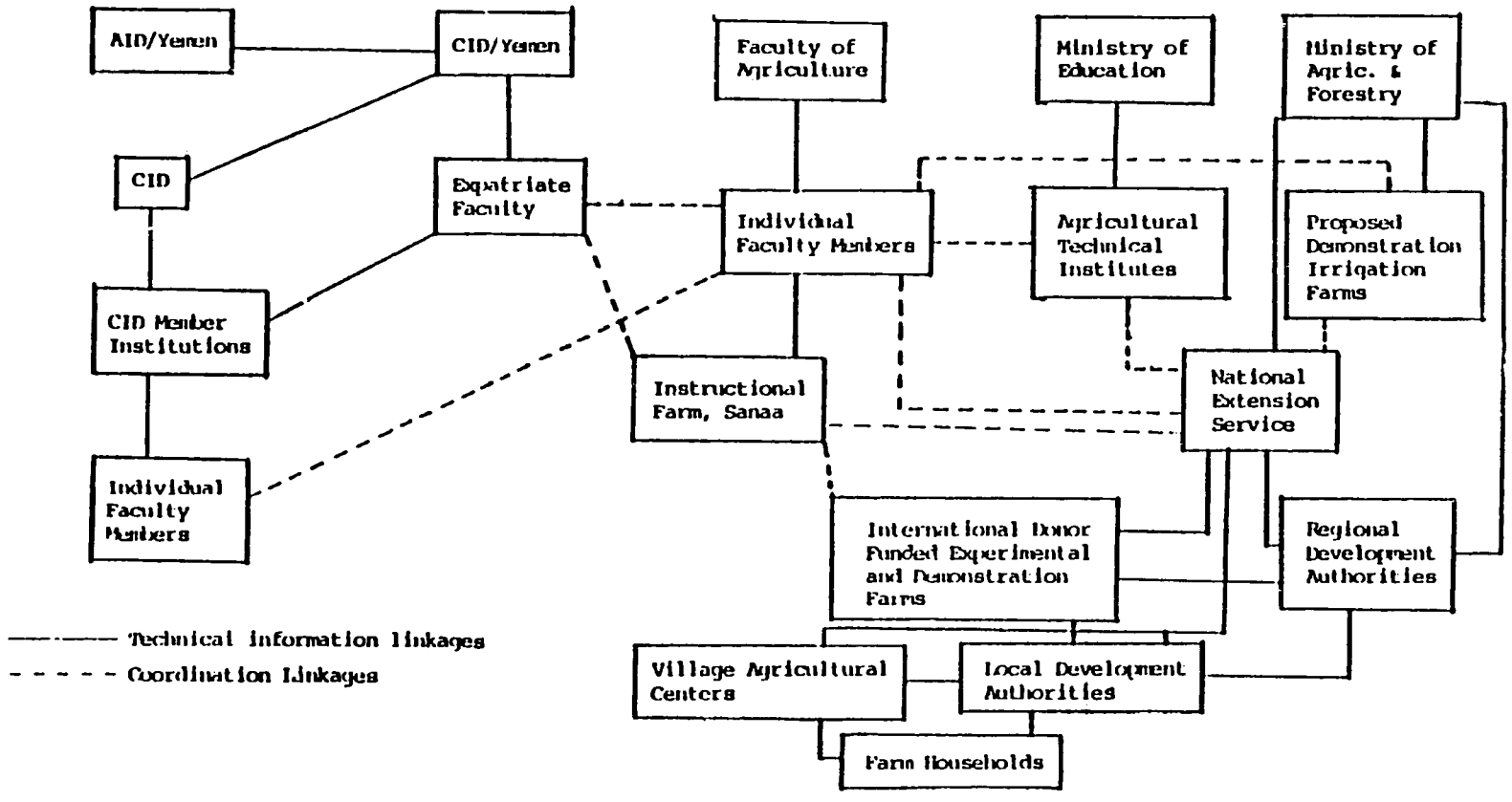
FIGURE E-7

FACULTY OF AGRICULTURE

Linkages to Impact Farm Households



monitor the coordinating process. The ECC shall consist of representatives of the Dean, FOA, MOE, MOA, major donor organizations, and three local officials to represent the farmers of the YAR. This committee is responsible for advising the Dean, FOA and the extension education members of the faculty as to how the process can best be judged to meet the needs of the YAR Agriculture.

VI. Recommended Curriculum

A recommended curriculum is outlined in Table E-3, followed by course descriptions for the basic courses to be included in the first year of instruction. In the initial years, students will pursue a common curriculum in general agriculture, with courses in a number of areas of emphasis. As the program matures and faculty are added, specialized degrees may develop as needed and appropriate. No fixed timelines have been established for this transition.

The curriculum has been designed to meet the needs of several emphasis areas in agriculture. Table E-4 shows the emphasis areas and individual courses within each area. Course descriptions of the technical agricultural courses and practicums are included in this annex.

Several areas of concern that relate to curriculum are discussed below.

A. Involvement of Yemeni in Curriculum Design

The FOA curriculum has been developed by the SPP team in cooperation with officials of the UOS. The basic science block was reviewed by the Dean of the FOS and his Department Heads. Course credits and course descriptions are aligned with courses now being offered in the FOS.

The technical agricultural curriculum for the second, third, and fourth years has been reviewed by Dr. Nasser Aulaqi of the UOS. Dr. Aulaqi has involved key staff members in the review of the technical curriculum.

The proposed curriculum has been discussed with secondary school directors, agricultural technical school staff, university staff, and USAID staff. The recommendations of each group have been considered in the curriculum design.

The SPP team has devoted 24 staff days to reviewing the agriculture of Yemen. Observations of agricultural practices and needs have been considered in the design of the coursework and practicum for the FOA.

B. Basic Science Block in the FOS.

Dr. Ali El-Shekeil, Dean of the FOS at the UOS, stated that the FOS can accommodate FOA students in the basic science classes if at least a 5-month notice is given the university on numbers to be expected. The FOS

TABLE E-3

RECOMMENDED CURRICULUM FOR GENERAL AGRICULTURE
UNIV. OF SANAA-FACULTY OF AGRICULTURE

( ) Semester Credit Hours

Year 1 1/		Year 2		Year 3		Year 4	
Arabic	(3)	Arabic	(3)	Feeds and Feeding	(3)	Animal Production	(3)
English	(6)	English	(6)	Animal/Poultry Improv.	(3)	Poultry Production	(3)
General Chemistry	(8)	Animal and Poultry Science	(3)	Plant Growth/Soil Fertility	(3)	Cereal/Forage Production	(3)
General Zoology	(4)	Plant Science	(3)	Plant Breeding	(3)	Advanced Farm Mngt.	(3)
General Botany	(4)	Soil Science	(3)	Agricultural Marketing	(3)	Agricultural Policy	(3)
Physics	(4)	Farm Management	(3)	Agricultural Business Management	(3)	Fruit & Vegetable Production	(3)
Mathematics	(4)	Plane Surveying	(3)	Farm Machinery	(3)	Food Quality Evaluation/ Quality Control Systems	(3)
Islamic Civilization	(3)	Agricultural Mechanics	(3)	Plant Propagation	(3)	Pasture/Range Management	(3)
		Microbiology in Food Technology	(3)	Food Processing/Human Nutrition	(3)	Extension Methods	(3)
		Pasture/Rangeland Resources	(3)	Pasture/Rangeland Analysis	(3)	Rural Sociology	(3)
		Statistics	(3)	Entomology	(3)	Fiscal & Personnel Management	(3)
				Plant Pathology	(3)	Irrigation & Drainage	(3)
TOTAL CREDIT HOURS	36		36		36		36
Vacation Practicum I 2/		Vacation Practicum II 2/		Vacation Practicum III 2/			

1/ Students will be enrolled in the Faculty of Science for the first year of training.
2/ English classes will be taught in a newly created language center.
2/ See description of practicums and minimum competency lists.

TABLE E-4

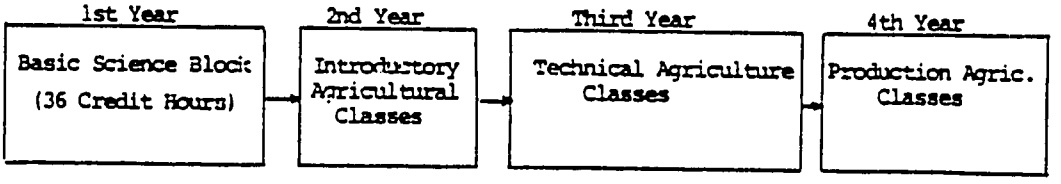
GENERAL AGRICULTURE CURRICULUM EMPHASIS AREAS

YEAR 1	EMPHASIS AREA	YEAR 2	YEAR 3	YEAR
BASIC SCIENCE BLOCK . Arabic (3) . English (6) . Chemistry (8) . Botany (4) . Zoology (4) . Physics (4) . Mathematics (4) . Islamic Civilization (3) .	ANIMAL/POULTRY SCIENCE	Animal and Poultry Science (3)	Feeds and Feeding (3) Animal/Poultry Impr. (3)	Animal Pro Poultry Pr
	PLANT/CROP/SOIL SCIENCE	Plant Science (3) Soil Science (3)	Plant Growth/ Soil Fertility (3) Plant Breeding (3)	Cenal/Fora Production
	AGRICULTURAL ECONOMICS	Farm Management (3)	Agricultural Marketing (3) Agricultural Business Management (3)	Advanced Farm Management Agricultural Policy
	AGRICULTURAL ENGINEERING	Plane Surveying (3) Agricultural Mech. (3)	Farm Machinery (3)	Irrigation Drainage (
	HORTICULTURE	-	Plant Propagation (3)	Fruit and Production
	FOOD TECHNOLOGY	Microbiology in Food Technology (3)	Food Processing/ Human Nutrition (3)	Food Quali Evaluation Control Sy
	PASTURE/RANGE MANAGEMENT	Pasture/Range Resources (3)	Pasture /Range Analysis (3)	Pasture/Ra Management
	ENTOMOLOGY/PLANT PATHOLOGY	-	Entomology (3) Plant Path. (3)	-
	EXTENSION METHODS	Statistics (3)	-	Extension Rural Soci Fiscal and Management

Technical Agriculture Credits = 99.

TABLE E-4 (Cont.)

BASIS SCIENCE BLOCK COURSE DESCRIPTIONS



Arabic Language (3 credit hour - University Requirement)

Islamic Civilization (3 credit hour - University Requirement)

English (12 credit hours in 1st and 2nd years) (4,0)

English as a second language: introduction of agricultural vocabulary; Courses include vocabulary, structure, speech, reading, writing, listening comprehension and study skills.

General Chemistry (8 credit hours) (3,3)

General Chemistry I (4 credit hours) (3,3)

(a) Atomic structure - The periodic properties - Chemical bonding - Molecular geometry. Introduction to organic Chemistry. (Nomenclature, classification, structure and properties of organic compounds).

(b) Practical: Qualititative chemical Analysis I - Identification of simple and mixed anions.

General Chemistry II (4 credit hours) (3,3)

(a) Gases laws and the kinetic theory of gases. Liquid state-solid state-solutions - thermo-chemistry chemical equilibrium - applications on ionic equilibria in solutions.

(b) Practical: Qualitative chemical analysis II: Identification of simple and mixed cations.

Biology I (4 credit hours)

Cell Biology, cell activities, energetics, cell division, principles of genetics, plant morphology, tissue types, development, plant and animal biology and physiolgy of the different systems.

Biology II (4 credit hours)

Principles of classification, nomenclature, plant and animal diversity to represent the major phyla/evolutionary concept of different groups. Plants and animals and their environments.

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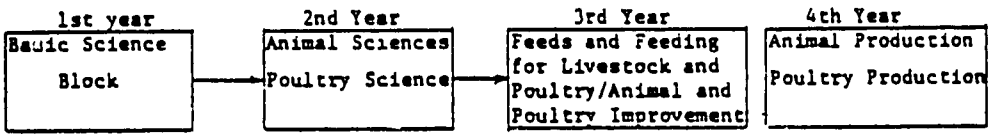
TABLE E-4 (Cont.)
(2,2) = Theory, practicum, hours per week)

ANIMAL AND POULTRY SCIENCE EMPHASIS



Animal and Poultry Science

Principles of modern livestock production; local breeds and types of livestock; market and breeding classes of cattle, sheep and goats; live animal and carcass evaluations. Introduction to poultry production including: classes, breeds and types of poultry; the poultry industry (worldwide/Yemen); physiology; management involving incubation brooding, growing and adult care, and culling; housing; feeding and sanitation.

Feeds and Feeding for Livestock and Poultry (3 credit hours) (2,2)

Metabolism and digestive physiology; nutritional deficiencies, feedstuff composition; nutrient requirements of livestock and poultry; ration formulation;feed processing; feeding recommendations.

Animal and Poultry Improvement (3 credit hours) (2,2)

Genetics, breeding systems, selection principles; anatomy and physiology of reproductive organs; artificial insemination.

Animal Production (3 credit hours) (2,2)

Nutrition, breeding, health and sanitation and management of cattle, sheep and goats.

Poultry Production (3 credit hours) (2,2)

Incubation, brooding, rearing, management, housing, health and sanitation, feeding, processing of poultry; and commercial egg production.

TABLE E-4 (Cont.)

(2,2) = Therory, practicum hours per week

PLANT, CROP AND SOILS EMPHASIS

1st Year	2nd Year	3rd Year	4th Year
Basic Science Block	Plant Science Soil Science	Plant Growth/Soil Fertility Plant Breeding	Cereal/Forage Crop Production

Principles of Plant Science (3 credit hours) (2,2)

Fundamental principles and concepts of plant science: planting, culture, rotation, production, hazards, quality and improvement of crops.

Soil Science (3 credit hours) (2,2)

Origin, formation, classification; physical, chemical and biological characteristics; effects of soil management on agricultural production

Plant Growth/Soil Fertility (3 credit hours) (2,2)

Soil water; water movement in plants; water in dryland crop production; relationships between soil properties and plant nutritient availability; use of fertilizers and manure; evaluation of fertility status of soils.

Plant Breeding (3 credit hours) (2,2)

Genetic and cytogenetic principles, methodologies and theories in improvement of cereal, forage and horticultural crops; review of current literature in plant breeding.

Cereal and Forage Crop Production (3 credit hours) (2,2)

Production, distribution, adaptation, ecological relationships, morphological and taxonomic relationships, markets, utilization and quality aspects of cereal crops species; varieties, mixtures, establishment, production and management of forage crops.

TABLE E-4 (Cont.)
AGRICULTURAL ECONOMICS EMPHASIS

(2,2) = Theory, practicum hours per week

1st Year	2nd Year	3rd Year	4th Year
Basic Science Block	Farm Management	Agricultural Marketing Agricultural Business Management	Advanced Farm Management Agricultural Policy

Farm Management (4,0)

Agriculture as a business; the decision-making process; tools of decision making; acquiring, organizing and managing land, labor and capital resources; reasons for success and failure.

Agricultural Marketing (3 credit hours) (3,1)

Marketing functions; economics of agricultural markets; marketing firms and their services; price determining forces, marketing problems; cooperatives.

Agricultural Business Management (3 credit hours) (3,1)

Introduction to management concepts and applications in agricultural business, emphasizing production, financial and marketing decisions, as well as personnel management.

Advanced Farm Management (3 credit hours) · (3,1)

Applications of economic principles and concepts to issues of farm planning and organization under conditions of certainty and uncertainty

Agricultural Policy in Yemen (3 credit hours) (4,0)

The state of the Yemen economy with special attention to the agricultural sector; forces determining gross national product, GNP, balance of payments, public sector revenues and expenditures; international agricultural marketing policy; agricultural production policy; agricultural research policy.

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TABLE E-4 (Cont.)

AGRICULTURAL ENGINEERING EMPHASIS

(2,2) = Theory, practicum hours per week.

1st Year	2nd Year	3rd Year	4th Year
Basic Science Block	Plane Surveying Agricultural Mechanics	Farm Machinery	Irrigation and Drainage

Plane Surveying (3 credit hours) (2,2)

Use of engineer's transit, tape and level; differential surveying methods.

Agricultural Mechanics (3 credit hours) (1,3)

Procedures and practices in the agricultural mechanics shop including safety, hand and power tools, hot and cold metal working, arc and oxy-acetylene welding, concrete and wood construction.

Farm Machinery (3 credit hours) (1,3)

Operational theories, lubrication, fuels and oils and preventive maintenance of tractors and small engines; operation, maintenance, adjustments, calibration and use of farm implements.

Irrigation and Drainage (3 credit hours) (1,3)

Pressurized and gravity irrigation systems; water management; pumps and wells; surface and subsurface drainage systems; ponds and dams; erosion control.

TABLE E-4 (Cont.)

(2,2) = Theory, practicum hours per week

HORTICULTURE EMPHASIS

1st Year	2nd Year	3rd Year	4th Year
Basic Science Block	Plant Science	Plant Propagation	Fruit and Vegetable Production

Principles of Plant Science (3 credit hours) (2,2)

(See course description in plant/crop/soils emphasis)

Plant Propagation (3 credit hours) (1,3)

The regeneration of plants from vegetative and reproductive tissue and organs; horticultural and physiological principles, methods and techniques for laboratory, greenhouse, nursery, field and orchard.

Fruit and Vegetable Production (3 credit hours) (2,2)

Varieties, adaptation, climatic requirements, pollination requirements, thinning, prunning, effects of rootstocks and management of tree and small fruits; seed, plant production, varieties, irrigation, nutrition, harvesting and economies of vegetable production; control of weeds, insects and diseases in fruit and vegetable crops.

TABLE E-4 (Cont.)

(2;2) = Theory, practicum hours per week.

FOOD TECHNOLOGY EMPHASIS

1st Year	2nd Year	3rd Year	4th Year
Basic Science Block	Microbiology in Food Technology	Food Processing and Human Nutrition	Food Quality Evaluation and Quality Control Systems

Microbiology in Food Technology (3 credit hours) (2,2)

Role of microorganisms in food spoilage, infection and intoxication; basic principles in contamination control and germicidal treatment during processing, preparing and distributing food for consumption.

Food Processing and Human Nutrition (3 credit hours) (2,2)

Methods of processing and preserving fruit, vegetables, meats, dairy products, cereal grains and beverages; relationships of food and its components to health and nutrition of children, young adults, adults and elderly people; relationship of processing methods to nutritional value of foods.

Food Quality Evaluation/Quality Control Systems (3 credit hours) (1,3)

Standards and quality grading; detection, extraction and identification of extraneous materials in foods; principles of quality control; quality control philosophy and systems and application in food industry; use and application of statistical techniques in quality control

TABLE E-4 (Cont.)

PASTURE AND RANGE MANAGEMENT EMPHASIS

(2.21)= Theory, practicum hours per week

1st Year	2nd Year	3rd Year	4th Year
Basic Science Block	Pasture and Rangeland Resources	Pasture and Rangelanrl Analysis	Pasture and Range Management

Pasture and Rangeland Resources (3 credit hours) (2,2)

Nature and management of pastures and rangelands in the different regions of the Yemen Arab Republic; integrated land use with emphasis on plant animal - soil interactions; varieties and species grown in each climatic area.

Pasture and Rangeland Analysis (3 credit hours) (2,2)

Evaluating pasture and rangelands; inventory, forage utilization, range conditions and trend; field problems; use of aerial photographs and sampling theory. Requires field trips.

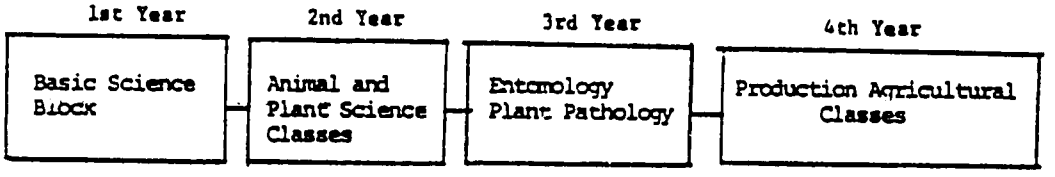
Pasture and Range Management (3 credit hours) (2,2)

Basic physiological characteristics and growth strategies of plants; importance of these strategies in managing rangelands; species and varieties of cultivated and non-cultivated plants; establishment, production and grazing management of improved pastures.

TABLE E-4 (Cont.)

(2,2) = Theory, practicum hours per week

ENTOMOLOGY/PLANT PATHOLOGY EMPHASIS



General Entomology (3 credit hours) (3,1)

Recognition, biology and management of injurious and beneficial insects; biological and microbal controls; chemical controls.

Plant Pathology (3 credit hours) (3,1)

Symptoms, causal agents, diagnosis, prevention and control of plant diseases

TABLE E-4 (Cont.)

(2,2) = Theory, practicum hours per week

EXTENSION EMPHASIS

1st Year	2nd Year	3rd Year	4th Year
Basic Science Block	Statistics	Agricultural Science Classes	Extension Methods Rural Sociology Fiscal and Personnel Management

Principles of Statistics (3 credit hours) (4,0)

Design of experiments; descr[illegible] statistics; sampling; tests of significance; correlation and regression; nominal, ordinal and interval data; parametric and non-parametric tests.

Extension Methods (3 credit hours) (4,0)

Organization, scope and responsibilities of extension services; adult learning; diffusion and communication processes; social action processes; teaching methods; leadership skills; program planning; visual aids.

Rural Sociology (3 credit hours) (2,2)

Sociological study of rural land use and settlement patterns, farming systems, rural villages, institutions and linkages with the larger society.

Fiscal and Personnel Management (3 credit hours) (4,0)

Financial planning, budgeting and monitoring; enterprise financing; accounting and auditing methods; analysis of personnel objectives; professional growth planning; supervision techniques.

is currently providing science instruction to the faculties of science, engineering, education, medicine, and commerce. Dean El-Shekeil assured the SPP team that the FOS would continue to provide staff to teach the basic science block for the FOA beyond the first year. The only limiting factor at present is space for a greatly expanded enrollment. The new facilities of the FOA will be used in future years with the FOS providing teachers for the classes. Details of basic science classes are described in Table 4 of this annesx.

C. Detailed Curriculum

The details of the technical agricultural curriculum are shown in Table E-3. Each emphasis area is defined in terms of courses offered and the description of each proposed course. The allocation of time for lectures and practicums are shown in parenthesis by each course name.

Computer application will be infused in all curriculum emphasis areas rather than being taught as specific classes. A staff member will be trained in computer application at a U.S. university. It will be the responsibility of that staff member to weave computer applications into all curriculum areas.

D. Vacation Practicums

In addition to the completion of coursework, a student is expected to have minimal competence in the basic skills of agriculture. Three vacation practicums are proposed as a method for acquiring those minimum competencies. Some competencies will be met in the technical classes while others must be obtained during the vacation practicum. A recommended list of agricultural competencies are included in the recommended curriculum (see E-32 to E-35). Credits for practicums should be variable in accordance with the scope of the individual assignments.

1. Vacation Practicum I

Supervised orientation and field trips to different agricultural regions of the YAR will be the focus of the first vacation practicum. The purpose will be to show students the variability in ecological and climatological conditions under which agriculture is practiced in Yemen and the different farming systems being utilized and under development. Elective credits may be given for this practicum.

2. Vacation Practicum II

Intensive and closely supervised experience on the instructional farm will be emphasized during the second vacation practicum. Students will learn the basic skills of livestock and crop production through "hands on" experience with plants, animals, poultry, soils, machinery, and agricultural engineering projects.

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3. Vacation Practicum III

Supervised work experience in a public or private agricultural organization will be the final praccticum emphasis. Students will be expected to perform routine duties of a planned work assignment. Evaluation will be based on performance at the job site. Use should be made of MAF demonstration farms, i.e., HITS and PETS in planning student practicums.

E. Vocational Agricultural Teacher Preparation

Currently a Masters' Degree is required to teach vocational agriculture in the three agricultural secondary schools (Ibb, Surdud, and Sanaa).. For this reason, a teacher preparation option is not included in the recommended curriculum.

Once the FOA is established, the teacher preparation option can be implemented by requiring an additional semester of study in the following classes.

Secondary Teaching Methods (Classroom)	3 credit hours
Secondary Teaching Methods (Practicums)	3 credit hours
Secondary Agricultural Currriculum	3 credit hours
Student Teaching and Internship	9 credit hours
Total Requirements	18 credit hours

If the secondary agricultural programs are greatly expanded in the future, an adequate supply of trained teachers can be prepared through this option. The governmental requirements for teachers would then need to be adjusted to the basis of a B.S. degree in agriculture plus 18 credit hours in teacher preparation.

F. Competencies

Instructors of each instructional area will establish a list of minimum competencies that a student must be able to perform at the end of 4 years of training. Some competencies can be met in the classroom and laboratories of regular classes. Other skills must be learned on the instructional farm and in vacation practicums.

Minimum competency requirements will both support and enhance the agricultural curriculum. These requirements insure that the graduate can "do" as well as "talk" about agriculture. Since the graduates will be involved in extension and teaching activities, the competence factor is critical for success.

Examples of agricultural competencies and their relationship to the curriculum are shown in the following lists. These lists are an illustration and not intended as a complete requirement for the student. Instructors will modify the competency list until it reflects the needs of Yemen agriculture.

1. Animal and Poultry Science

*Identify body parts of live animals
*Select animals on body conformation
*Evaluate carcass' and cuts of meat
*Slaughter animals and poultry
*Apply sanitation measures to livestock and poultry facilities
*Recognize common diseases of livestock and poultry
*Treat livestock and poultry for parasites
*Take temperature of animals
*Administer injections to animals
*Administer vaccines to poultry
*Diagnose pregnancy in cattle and sheep
*Inseminate cattle artifically
*Administer drenches and boluses to animals
*Spray and dust animals for external parasites
*Assist ewes and cows at parturition
*Treat navel cords of newborn animals
*Graft young animals on foster mothers
*Teach calves to drink milk
*Start young animals on feed
*Castrate livestock
*Apply eartags, tatoos and neck chains for identification
*Band poultry for identification
*Use squeeze and cutting chutes to work animals
*Load and haul livestock
*Feed animals according to their nutrient requirements
*Cull non-layers from a production flock
*Perform beak trimming, dubbing, and specking poultry
*Develop incubator techniques
*Caponize
*Slaughter and process poultry
*Grade, candle, and clean eggs for consumption
*Artificially inseminate poultry
*Brood poultry

2. Plant, Soil, Crop Science, and Horticultre

*Identify common crops and weeds
*Prepare a seed bed for a crop
*Cultivate crops
*Set and move irrigation pipe
*Regulate surface irrigation water on crops
*Identify moisture content of soil by feel
*Recognize maturity levels of crops
*Apply fertilizers correctly (time, amount, and method)
*Formulate and apply pesticides

*Treat seed for planting or storage
*Plant seed at appropriate rate and depth
*Check temperature and moisture content of stored crops
*Identify and control common plant pests
*Conduct germination test on seed
*Read and interpret soil survey
*Identify soil structure and relate to capability
*Determine soil group (alluvial, colluvial, loess, and residual)
*Determine when soil is ready to be tilled
*Determine soil texture
*Identify major areas of a soil profile (topsoil, subsoil, and parent material)
*Determine slopes of land
*Test soil pH
*Collect and prepare soil samples for anlaysis
*Determine land use and capability class of soils
*Propagate plants by seed
*Propagate plants by layerage
*Propagate plants by division
*Propagate plants by cuttings
*Propagate plants by budding and grafting
*Prepare planting medias
*Prune trees, shrubs and vines
*Establish and care for turf
*Water nursery and greenhouse plants correctly
*Operate greenhouse environmental control systems
*Fertilize container grown plants
*Plant and transplant horticultural crops
*Sterilize soil and soil media
*Control greenhouse pests by spraying and fogging
*Prepare horticultural plants and crops for marketing
*Operate horticultural equipment (rotovator, rototiller, garden tractor, soil shredder, soil sterilizer, sprayers, and mowers)

3. Agricultural Engineering

*Maintain gasoline and diesel engines
*Hitch and unhitch implements correctly
*Operate tractor and tillage equipment
*Operate tractor and seeding equipment
*Operate tractor and harvesting equipment
*Check fluid level, couple and service hydraulic units
*Lubricate agricultural implements
*Make minor repairs on agricltural implements
*Adjust plows and mowers
*Calibrate grain drills, fertilizer spreaders, and sprayers

*Construct forms for concrete slabs, walks, and footings
*Construct small farm buildings
*Repair buildings
*Construct fences
*Install a simple electrical circuit
*Use common hand tools
*Use common power tools
*Sharpen and repair hand tools
*Use an arc welder
*Use an oxy-acetylene welder for cutting, brazing and mild steel welding
*Measure, cut, ream, and thread pipe
*Splice and assemble plastic pipe
*Drill and tap holes
*Use a farm level in differential leveling and drainage

4. Agricultural Economics

*Conduct inventories of livestock, poultry, plants, and equipment
*Compute depreciation of buildings and equipment
*Keep production records on livestock, poultry and crops
*Determine cost effectiveness of instructional farm activities
*Maintain accounts of instructional farm (receipts, bills, invoices, and payments)
*Determine efficiency of production for instructional farm enterprises
*Develop budgets for instructional farm operation

5. Extension Methods

*Prepare a tape-slide presentation
*Prepare technical articles for newspaper
*Prepare and conduct demonstrations in all competency areas
*Plan and conduct in-service sessions

G. Workshops, Short Courses, and In-Service Sessions

The FOA will become the focus of technology transfer to the rural population in the YAR. Workshops, short courses, in-service sessions, and seminars will be developed according to the needs of rural farmers and disseminated through trained agriculturalists to the various regions of the YAR.

1. Workshops

The FOA will plan and conduct a series of 1-day and 2-day workshops on current agricultural topics and practices. These workshops will be available to MAF staff and other groups in the public and private sector.

2. Short Courses

The FOA will provide short courses for the upgrading and updating of agricultural technicians and other groups. The short courses will offer undergraduate credit in the beginning and possible graduate credit as the UOS develops advanced degree programs. The courses will be intense instruction of 1-3 week duration and carry credit appropriate to the total instructional time. Visiting professors on TDY assignments can be utilized to conduct short courses. Since U.S. university staff will be visiting their graduate students in Yemen it makes TDY assignments more cost effective if that staff member can also conduct a short course during the visit. Short courses will be correlated with established credit classes at the UOS.

3. In-Services

Extension service staff, MAF staff, agricultural instructors and others need constant updating in agricultural technology. The FOA will assess the in-service needs, establish in-service priorities, and conduct in-service sessions within the various regions of Yemen. In-service sessions will be designed to update technologies that will impact Yemen agriculture. In-service activities will be closely coordinated through the extension component of the MAF.

H. Entry and Exit Standards

The UOS has a set of entry and exit standards for each faculty within the UOS. The FOA standards will be consistent with those now used by the FOS.

1. Entry Standards

The UOS will accept students into the FOA from any of the agricutural technical schools or secondary (science option) schools with national exam scores of 60 percent. The passing grade for graduation from secondary schools is 50 percent. The entry standards for each faculty are:

Faculty of Arts	56 percent
Faculty of Science	60 percent
Faculty of Law	62 percent
Faculty of Commerce	66 percent

A student must have met the requirements of the military draft to be accepted in the FOA.

The FOS requires a degree of competency in the English language for entry into its program. The FOS conducts classes in English. The entry requirement for English is not anticipated to be a major limitation for students entering the FOA.

2. Exit Standards

The UOS has established the following standards for completion of a B.S. degree in the FOA.

- Completion of 144 semester credit hours;
- Minimum of 12 hours of English;
- All elective courses must be within the FOA or the FOS;
- Six hours of Arabic language;
- Three hours of Islamic civilization;

I. Future Expansion of Curriculum

The proposed curriculum is one that meets the needs for general agriculturists in Yemen. A general curriculum offers many advantages during the establishment of a FOA. As trained Yemeni staff return to the FOA with specialized skills, more specialized courses can be added to the curriculum. Each of the curriculum emphasis areas can be expanded into specialized program options. Specialization should not occur until the general curriculum is well established and a full Yemeni staff is in place.

A fisheries program should be considered as part of the FOS. The FOS has a program in marine biology at the present time. With the addition of other courses, the needs of the fisheries industry can be addressed in the FOS curriculm.

J. Evolution Time Frame for Specialization of Curriculum

Enroll students in Sciences Classes (first year program)	Year 2
Add teacher preparation courses	
Add electives according to student enrollment and manpower needs of Yemen	
Offer B.S. degrees in specialized options such as animal and poultry science, and agronomy	
Offer M.S. degrees when curriculum becomes sufficiently specialized	Year 20
Offer Ph.D. degrees in specialized agricultural options when the FOA is fully developed	Year 30

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K. English Language Training

The UOS requires that students have adequate preparation in English in order to enter the FOS. A minimum of 12 semester credit hours in English will be required for completion of a B.S. degree in the FOA after initial enrollment. There is no well defined standard for measuring proficiency levels of graduates of the degree program in agriculture.

Graduates of the FOA that wish to pursue a graduate program in the U.S. must have a TOEFL score of 450 to enter an intensive ESL program in preparation for technical training. A TOEFL score of 500 or more is needed for entry into a graduate school program. Engish language proficiency, as measured by TOEFL scores, must become a standard for selection of USAID-sponsored students. The UOS should emphasize ELS training for all FOA students without penalizing those that fail to achieve a high level of English proficiency.

In order to prepare students for graduate programs in English speaking universities, the FOA must establish English language standards that are based on attainment of TOEFL scores of at least 450. A planned continuum of English language development is necessary to achieve the minimal levels of proficiency required by American universities.

Past efforts in delivery of ESL to foreign students and trainees show that maximum progress is made when:

1. ESL is a continuous developmental process that extends throughout the duration of the program.

2. Technical vocabulary is introduced gradually, starting early in ESL traning.

Based on the experience of OSU and the U.S. Department of Labor in working with Saudi Arabian trainees, the following conceptual model (Table E-5) is proposed for ESL in the FOA.

The TOEFL should be used as a motivational goal for students and as a measurement of proficiency in determining progress. All students in the FOA will not be expected to reach this ESL goal. Those students that will be going into graduate programs must be aware of the TOEFL requirements.

An ESL staff member has been proposed in the budget. That person's responsibility will be to coordinate the formal English classes with the technical curriculum and to monitor student progress in English proficiency. The ESL staff member will provide English classes with technical vocabulary lists from agricultural courses to maximize the impact of ESL training.

L. Course Load for Students

The proposed curriculum is based on a student involvement of 24 hours per week in classroom and laboratory activities. This time is

TABLE E-5

CONCEPTUAL MODEL FOR ESL

1st Year	2nd Year	3rd Year	4th Year
English Classes 6 credit hours (Required)	English Classes 6 credit hours (Required)	English Classes (Electives)	English Classes (Electives)
Introduce technical vocabulary	Increase use of English in technical ag. classes and practicums	Heavy use of English in lectures, labs and practicums	Total use of English in lectures, labs and practicums of agricultural classes
Administer TOEFL as measure of proficiency	Administer TOEFL as measure of proficiency	Administer TOEFL as measure of proficiency	Administer TOEFL. (Minimum score of 450 required for selection into US-based graduate programs)

consistent with the course load requirements of American universities. The student will be required to take 18 credit hours each semester during the 4-year program in order to fulfill the 144 credit hours for a B.S. degree.

M. Faculty Work Loads

The current faculty work loads at the UOS are assigned on the following basis:

Full Professor	8 credits
Associate Professor	10 credits
Assistant Professor	12 credits

The FOA is designed for teaching, research, and extension. Staffing and training plans have considered the need for development of strong components in extension and research. Based on standards of U.S. universities, some 40 percent of the staff members' time should be devoted to teaching. The remaining 60 percent should be split between extension and research duties.

The credit load was computed for each course in the proposed curriculum. The following formula was utilized in computing credit load:

Credit Load (Lecture credit x sections) + (Lab credit x sections)

The total credit load of all courses was 330 credits.

Twenty-two faculty members are scheduled for overseas training in the future and seven faculty members are currently in training in the United States. When the faculty is fully functional, there will be 29 members of the instructional staff if all trained staff return to the FOA. The SPP Team recognizes that some may not have returned by the end of the subproject.

The credit load per staff member was computed as follows:

$$\text{Credit Load per Staff} = \frac{\text{Total Credit Load}}{\text{Total Staff}}$$

The credit load for each staff member is 11.4 credits per year or 5.7 credits per semester. This figure is consistent with the current faculty work loads at the UOS.

The percentage of time allocated to teaching, extension and research will vary for individual staff assignments depending on the technical area that is being staffed. These percentages will also fluctuate from one semester to another. Such flexibility in staffing will enhance the development of trained staff to the best advantage.

Table E-6 shows projected faculty work loads for the FOA. This table includes those people that are targeted for training in the U.S.

N. Effect of School Calendar on Curriculum

The instructional program at the UOS is organized by semester. The two semesters are 16 weeks in length with 3 weeks of each semester being devoted to examinations. The actual time for instructional activities is 13 weeks.

Each year, Ramadan occurs 2 weeks earlier than the preceding year. The univesity sets the school calendar 1 year in advance. Although the school starting and closing dates will change each year, the total instructional time will not be affected by Ramadan. The Ramadan holiday lasts approximately 1 month during the school vacation period.

Vacation practicums must be conducted during a 2-month time frame as a result of Ramadan. This will not affect the quality or scope of the planned practicum but will limit the time in which the student must complete the practicum assignments.

O. Need for Teaching and Laboratory Assistants

The staffing plan for the instructional farm includes a technician for each area of instruction. These technicians will serve as teaching assistants during practical instruction on the farm. The planned technicians are adequate to fulfill the need for teaching and laboratory assistants on the instructional farm. There will be some instances in which the technician can be utilized in related on-campus laboratories.

The UOS currently uses teaching and laboratory assistants as direct hires based on the needs of individual laboratories and class loads. Within the developmental years, the need for assistants will not be a critical factor. As the enrollment increases and the curriculum begins to be specialized there will be a need for teaching and laboratory assistants beyond the technicians planned for this project.

The FOS will be teaching the first year curriculum. Classes in the science block will need laboratory assistants in chemistry, botany, zoology, and physics. Most of the laboratory assistants currently in these areas are from Egypt and other Arab countries. The UOS will provide the teaching and laboratory assistants for the science block students as part of their ongoing staffing procedures.

The staffing plan and staff work loads show that teachers will have reasonable teaching loads so that time will be available for extension and research. A reduced work load allows the teacher to spend more time in the supervision of laboratory activities. The need for teaching and laboratory assistants should not be a constraint during the development of the FOA.

TABLE E-6
PROJECTED FACULTY WORKLOADS AT MAXIMUM ENROLLMENT
450 Students in Technical Courses

Include currently qualified staff member at University of Sana'a

Program Area	Emphasis of Training of Yemeni Being Trained in the United States	Courses Assigned from Curriculum	Time Allocation Percentage		
			Teaching	Research	Extension
Agricultural Economics (42 credits)	1. Agricultural Marketing	Agricultural Marketing (10)	40	30	30
	2. Farm Management	Advanced Farming Systems (10)	40	30	30
	3. General Ag. Economics	Agricultural Business Mgmt. (10) Managerial Approaches (6)	70	15	15
	*4. Ag. Economics (Nasser)	Agricultural Policy (6)	25	50	25
Agricultural Engineering (52 credits)	5. Irrigation and Water Relations	Irrigation and Drainage (10)	40	30	30
	6. General Ag. Engineering	(Irrigation and Drainage (4) (Ag. Mechanics (4) (Farm Mechanics (4)	50	25	25
	7. General Ag. Engineering	Agricultural Mechanics (10)	40	30	30
	8. Agricultural Mechanization	Farm Machinery (10)	40	30	30
	9. Soil and Water Management	Plane Surveying (10)	40	30	30
	10. Computer Applications			100	
Agricultural Extension and Education (26 credits)	11. Extension Methods	Rural Sociology (10)	40	30	30
	12. Extension Methods	(Extension Methods (10) (Fiscal and Personnel Dev. (6)	70	-	30
	13. Secondary Education	(Courses to be added at a later date)	-	-	-

TABLE E-6 (Cont.)

Program Area	Emphasis of Training of Yemeni Being Trained in the United States	Courses Assigned from Curriculum	Time Allocation Percentage		
			Teaching	Research	Extension
Animal Science and Poultry (86 credits)	14. Cattle, Sheep, Goat Production	Animal Production (10)	40	30	30
	15. Animal Nutrition	Feeds and Feeding (10)	40	30	30
	16. Animal Science	Pasture and Range Resources (10)	40	30	30
	17. Poultry Production	Animal and Poultry Science (10)	40	30	30
	18. Layer, Broiler Production	Poultry Production (10)	40	30	30
	19. Livestock, Poultry Breeding	Statistics (6) Animal and Poultry Improvement(10)	70	10	20
	20. Livestock Grazing Management	Pasture/Range Analysis (10) Pasture/Range Management (10)	80	-	20
Crops/Soils/Horticulture/Entomology (90 credits)	21. Cereal, Forage Production	Plant Science (10) Cereal, Forage Production (10)	80	-	20
	22. Plant Breeding and Genetics	Plant Breeding (10) Plant Pathology (10)	80	-	20
	23. Horticulture	Plant Propagation (10)	40	30	30
	24. Citrus, Vegetable Production	Fruit and Vegetable Prod. (10)	40	30	30
	25. Soil Morphology, Fertility	Plant/Growth Fertility (10)	40	30	30
	26. General Soil Science	Soil Science (10)	40	30	30
	27. Entomology	Entomology (10)	40	30	30

TABLE E-6 (Cont.)

Program Area	Emphasis of Training of Yemeni Being Trained in the United States	Courses Assigned from Curriculum	Time Allocation Percentage		
			Teaching	Research	Extension
Food Science and Technology (24 credits)	28. General Food Science and Technology	Microbiology (10)	40	30	30
	29. Food Processing/Human Nutrition	Food Processing/Human Nutrition (10)	40	30	30
	30. Food Chemistry/Processing	Food Evaluation (10)	40	30	30
TOTAL 330 credits		330 credits			

P. Secondary School Curricula

The nature of the secondary school curriculum will have an impact upon enrollment in the FOA and student survival within the agricultural curriculum. Many students (estimated 80 pecent) will enter the FOA from the science option secondary school. A comparison of the secondary curriculum and the first year FOA science curriculum is shown in Table E-7. A review of this information will show that a reasonably smooth transition can be made from secondary schools into the first-year curriculum.

The agricultural schools at Ibb and Surdud offer 3 years of training in agricultural subjects and physical education. Graduates of the program receive a regular secondary certificate of graduation. The students meet their science requirements through theory and application. The FOA curriculum includes pasture and range management emphasis that is not included in the agricultural school curriculum. However, the agricultural curriculum does provide a good base for range management through units of agronomy and animal husbandry.

Table E-8 shows the existing courses at Ibb and Surdud as compared with the proposed courses for the FOA by emphasis area.

The Sanaa Veterinary Secondary School offers a highly specialized curriclum for training veterinary assistants. Many of the graduates are expected to enter veterinary schools in Egypt. The relationship of the curriculum at Sanaa Veterinary Secondary School and the proposed FOA first-year curriculum is shown in Table E-9.

VII. Relationships with U.S. LGUs

The long-term success of this subproject is highly dependent upon the training of the faculty members and the extent to which their efforts are responsive to agricultural needs of the YAR. One technique by which this subproject proposes to insure the success of the FOA in increasing rural income in the YAR is to promote a direct linkage between individual FOA faculty members and experienced LGU faculty members in the U.S. These relationships will support the subproject's purpose, subgoal, and the Title XII collaborative management by serving as a vehicle for the long-term exchange of ideas and personnel which will continue long after USAID funding ceases.

Once a participant has been selected for U.S. training, successfully completed 12 to 18 months of academic work, and selected a major advisor, the major advisor and student will be brought to the YAR for a 14-21 day orientation and consultation with USAID, CID and FOA staff. In addition to enhancing the faculty advisors' understanding of the YAR agriculture, the purpose of the trip will be to select a specific agricultural problem that would be appropriate for the participant's research and thesis or dissertation. Alternate training schedules for this procedure are proposed in Table E-10.

TABLE E-7

COMPARISON OF SECONDARY SCHOOL (SCIENCE OPTION) CURRICULUM WITH PROPOSED CURRICULUM FOR BASIC SCIENCE YEAR IN FACULTY OF AGRICULTURE

Secondary 1/	Faculty of Agriculture
Mathematics (3 years) - includes general math, algebra analytical geometry and calculus.	Mathematics (5 credits)
Biology (3 years)	General Botany (4 credits) Zoology (4 credits)
Chemistry (3 years)	General Chemistry (8 credits)
Physics (3 years)	Physics (3 credits
Mechanics and Statics (1year)	(Relates to agricultural engineering courses of 2nd year of program)
Arabic Language (3 years)	Arabic (6 credits)
Religious Education (3 years)	Islamic Civilization (3 credits)
English Language (3 years)	English (12 credit hours in first and second year)

1/ Secondary curriculum for Hodeidah school.

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TABLE E-8

Curriculum Comparison for
Agricultural School/Faculty of Agric.
(Ibb and Surdud)

Curriculum Units for Secondary Agriculture Schools at Ibb & Surdud	Courses Proposed for Faculty of Agriculture
Agronomy (3 years)	Plant Science, Soil Science, Plant Growth/Soil Fertility, Plant Breeding/Cereal-Forage-Crop Production
Horticulture (2years)	Plant Propagation, Fruit and Vegetable Production
Crop Protection (1 year)	Entomology, Plant Pathology
Animal Production (3 years)	Animal Science, Poultry Science, Feeds and Feeding, Animal and Poultry Improvement, Animal Production, Poultry Production
Agricultural Engineering (3 years)	Plane Surveying, Farm Machinery, Irrigation and Drainage
Ag Extension and Rural Sociology (3 years)	Statistics, Extension Methods, Rural Sociology, Fiscal and Personnel Management
Agricultural Economics (1 year)	Farm Management, Agricultural Marketing, Agricultural Business Management, Advanced Farm Management, Agricultural Policy
Food Technology	Microbiology in Food Technology, Food Processing/Human Nutrition, Food Quality Evaluation/ Quality Control Systems
Animal Production (3 years)	Pasture/Range Resources, Pasture/Range Analysis, Pasture/Range Management

TABLE E-9

Relationship of Agricultural Secondary Curriculum to Proposed FOA Curriculum

(SANAA VETERINARY SECONDARY SCHOOL)

VETERINARY SECONDARY SCHOOL	FACULTY OF AGRICULTURE
Mathematics (3 years)	Mathematics (4 credits)
Biology	
Anatomy and Histology	Botany (4 credits)
Physiology	Zoology (4 credits)
Parasitology	
Bacteria and Viruses	
Poultry Diseases	
Dairy and Meat Examination	
Veterinary Medicine	
Principles of Surgery	
Bio-chemistry	Chemistry (8 credits)
Animal Breeding	
Animal Policy	
Animal Nutrition	
Vocational Health	
Pathology and Lab Tests	Physics (4 credits)
Dairy and Meat Processing	
Pasture Management	
Feed and Feed Manufacturing	

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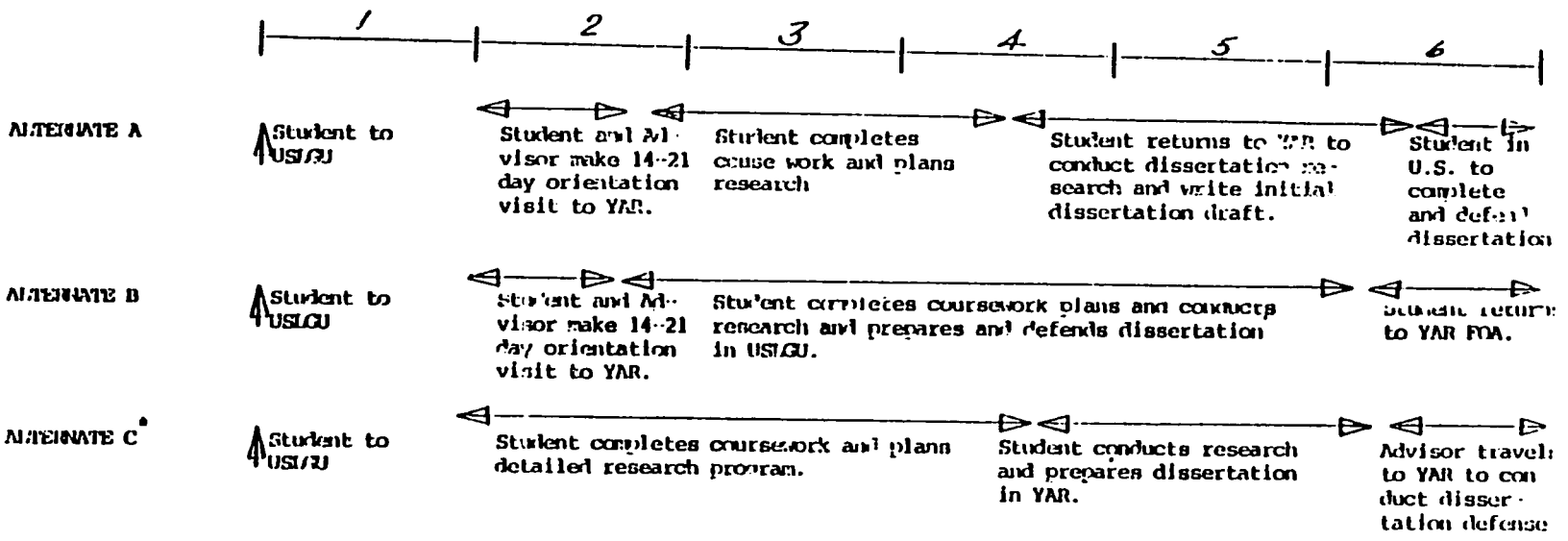
TABLE E-10

ALTERNATE PARTICIPANT TRAINING SCHEDULES

YEAR OF PARTICIPANT TRAINING



Assumes faculty advisor's being familiar with agriculture in the Y.A.R.

The balance of the graduate training would proceed as described in Section IV-B, pg E-9 of this Annex. The participants' major professor would have the flexibility to return to the YAR for final consultation and assistance in completing the graduate research, before both return to the U.S. to present and defend the thesis or dissertation. In addition, the major professor would be called upon, while in-country, to present special seminars, workshops, and in-service training and his/her area of expertise. Upon completion of the graduate work, the participant trainee would return to the YAR and join the FOA. Alternatively, the final dissertation defense could be held in the YAR by appointing appropriate subproject and CID personnel to the participants graduate committee.

If competent people at both ends were encouraged to participate, this process would result in a cadre of professionals at U.S. LGUs that would become increasingly aware of and involved in the agricultural development of the YAR. From this awareness and investment, it would be highly possible that U.S. graduate students will be encouraged to focus on agricultural problems in the YAR. A logical extension of such a cadre would be that courses or special seminars on agriculture in the YAR might be designed for integration into the univesity curriculum or program at the LGUs. It would also be likely that library resources would be developed at both ends (YAR and U.S. LGUs) that would further encourage the exchange of ideas and appropriate technology.

The subproject has the provision for the use of consultants from U.S. LGUs at regular intervals. Such contracts would also nurture and strengthen linkages with U.S. LGUs.

Finally, as trained Yemeni participants return to the FOA, it will be important to seek modification in existing policies at U.S. LGUs in order to encourage these young faculty members to serve as graduate advisory committee members in the YARG and eventually major professors for future Yemeni graduate students. Such policies should also extend to CID and USAID professional staff who could be directly involved in the YAR with the FOA.

It is crucial to the success of this subproject that the development of university linkages with U.S. LGUs be given high priority. If this is not done adequately, the impact of the subproject and the overall ADSP could be short-lived, and fall short of its ultimate goal as envisioned in the Title XII legislation.

VIII. Integration of the Instructional Farm

An instructional farm is proposed as an essential and integral part of the FOA. The facility is to be located on a 22-hectare site immediately adjacent to the UOS campus. The strategy and physical aspects of the instructional farm are described in Annex J of this SPP. The farm is essential to the training, research and teaching missions of the FOA. It will include space allocated for demonstrations to students, provide specific skill development experiences for students, provide a training site for extension personnel and farm leaders, and provide an opportunity for the initiation of

specific research projects related to agricultural production in the YAR of the following types of activites.

A. Agronomic and horticultural crop production;

B. Livestock and poultry production;

C. Rainfed and irrigated crop production;

D. Mechnical equipment operation and maintenance.

The instructional farm was designed to complement and support the coursework of the curriculum. In each of the emphasis areas, specific competencies are envisioned which will be demonstrated and practiced at the instructional farm. Tnose competencies are listed in Section VI-F, pp E-32 of this Annex.

Beyond development of the specific competencies discussed above, the instructional farm will be used to support overall instructional objectives. This use will be especially critical in the YAR where students are expected to come from diverse climatic, geographical, and agricultural regions of tne country. These students may have had little experience in improved agricultural practices outside their home villages.

IX. Institutional Analysis

A. University of Sanaa

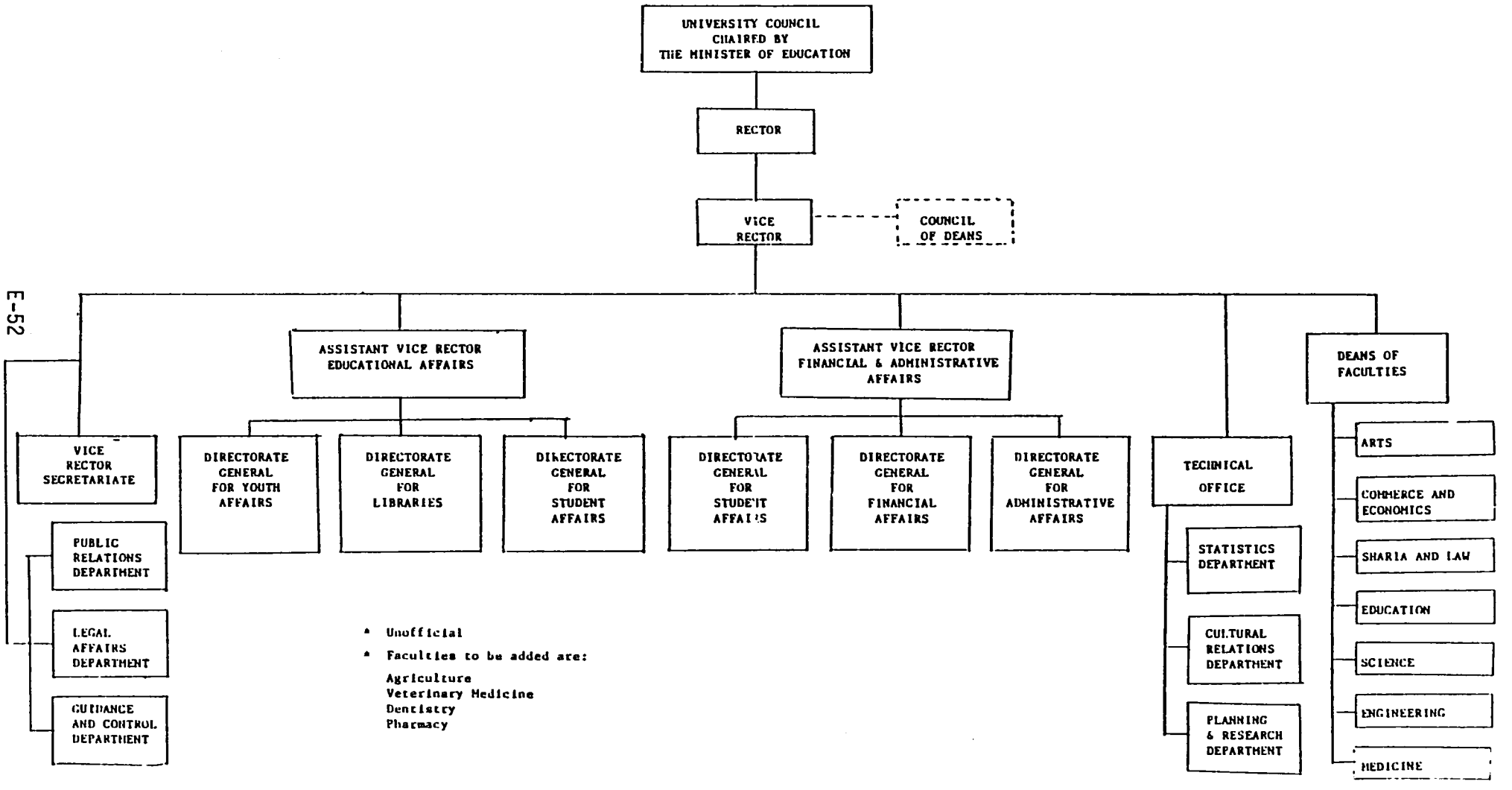
The UOS, founded in 1970, is a very young university. It has made remarkable growth in the physical plant on the original campus and has expanded to a new campus. Beginning with nine staff members and 64 students the university has grown to 231 staff members and 6,872 students in the 1982/83 academic year.

An administrative structure has evolved as shown in Figure E-8. This is a structure similar to that which has proven effective in U.S. LGUs. University policies are prescribed by the University Council which is chaired by the Minister of Education and has as members the Rector, Vice Rector, Deans of the seven faculties, and four members appointed by the Prime Minister from outside the UOS. The latter four are currently the Dean of the Public Administration Institute, Director of the Educational Research Center, a member of the Prime Minister's office and a member of the Presidential Advisory Committee. The UOS was initially part of the MOE. Today, however, it is independent of that ministry but maintains a vital linkage with the Ministry through the Minister of Education chairing the Advisory Council.

There is an informal Deans' Council which is chaired by the Rector. This council meets each week and may submit recommendations to the University Council.

FIGURE E-8

THE ADMINISTRATIVE STRUCTURE OF SANAA UNIVERSITY



Support services for the entire university are performed by the departments and directorates shown in Figure E-8.

The UOS submits a calendar-year budget request each October to the Ministry of Finance and CPO. Budget submission is independent of submissions from other government entities.

The faculties of Engineering and Medicine were initiated in 1983. The first classes were taught in October, 1983. The UOS is proposing to add four more faculties: Agriculture, Veterinary Medicine, Pharmacy and Dentistry. These will require new facilities and will increase the administrative and operative costs of the university. The administration indicated that they were prepared for this additional load.

A detailed census of university students for the academic year 1982/83 is presented in Table E-11 and E-12. Note that the number of students varied greatly among faculties, each faculty had female students, and there were 317 international students. Enrollment statistics for the fall semester of 1983 were not available at the time this report was written, but an increase over the previous year was indicated.

The university has responded to the increase in numbers of students with increases in staff. As shown in Table E-13, the number increased from 181 in 79/80 to 231 in 82/83. Many of them are non-Yemeni who will be replaced by qualified Yemeni as they become available. Since 79/80 the rates of non-Yemeni to Yemeni has decreased only slightly. The number of staff members by origin, rank, and sex within each faculty during the 1982/83 academic year is presented in Table E-14. University policy dictates that responsibility for classes and laboratories is assigned only to professors, assistant professors, lecturers, and assistant lecturers. Note that none of the Yemeni held the rank of professor and that four were assistant professors. Among the non-Yemeni 42 were professors (including one female) and 44 were assistant professors. Demonstrators aid in classes and laboratories. In this category there were 38 Yemeni (including three females) and 25 non-Yemeni (including 25 females).

Success of several faculties depends upon the capability of the FOS which performs a vital service role. That faculty teaches courses for students in other faculties as follows:

1. Education: 70 percent of the science education courses;

2. Commerce and Economics: mathematics and some statistics;

3. Engineering: mathematics, physics and chemistry; and

4. Medicine: mathematics, physics and biology.

In the 1982/83 academic year the FOS had 495 students majoring at the undergraduate level in departments of mathematics, physicis, chemistry, and biology (including botany, zoology and marine sciences).

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TABLE E-11

NUMBER OF STUDENTS BY YEAR, SEX, AND ACADEMIC YEARS, 1978/80 - 1982/83, UNIVERSITY OF SANAA

Academic Year	1st Year		2nd Year		3rd Year		4th Year		Total		
	M	F	M	F	M	F	M		M	F	TOT.
79/80	2017	214	757	113	525	61	472	61	3771	449	4220
80/81	2000	250	930	113	553	84	528	61	4011	508	4519
81/82	2343	325	1051	139	673	85	354	81	4518	654	5172
82/83	3010	383	1467	182	950	126	638	89	6065	807	6872

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TABLE E-12

GENERAL CENSUS OF UNIVERSITY STUDENTS

ACADEMIC YEAR 1982-83

FACULTY	FIRST YEAR						SECOND YEAR						THIRD YEAR						FOURTH YEAR						SUB-TOTAL						TOTAL		GRAND TOTAL
	Regular		Part-time		Inter-national		Regular		Part-time		Inter-national		Regular		Part-time		Inter-national		Regular		Part-time		Inter-national		M		F		Inter-national				
																									Regular	Part-time	Regular	Part-time					
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F					M	F	M	F	
COMMERCE AND ECONOMICS	476	54	165	13	8	8	278	34	100	5	8	9	172	17	93	4	5	5	162	13	57	1	6	2	1088	415	118	23	27	24	1530	165	1695
SHARIA AND LAW	1284	39			6		675	9			3		377	8			3	1	135	5			2	11	2531		41		14	2	2545	63	2608
EDUCATION	234	46			11	8	165	40			1	2	139	24			2	1	111	22				1	649		132		14	12	663	144	807
ARTS	557	105			53	38	156	63			24	16	89	35			19	5	66	25	3	1	6	6	868	3	228	1	102	65	973	294	1267
SCIENCES	194	68			22	4	50	28			7	3	41	22			10	4	27	8			3	4	312		126		42	15	354	141	495
TOTAL	2745	312	165	13	100	58	1324	147	100	5	43	30	818	106	93	4	39	16	561	73	60	2	17	14	5448	418	665	24	199	116	16065	807	6872

TABLE E-13

NUMBER OF FACULTY MEMBERS BY ACADEMIC YEAR AND ORIGIN, UNIVERSITY OF SANAA

Academic Year	Faculty Members*		
	Yemeni	Non Yemeni	Total
79/80	56	125	181
80/81	67	150	217
81/82	61	149	210
82/83	77	154	231

* Includes faculty ranks of Professor, Asst. Professor, Lecturers, Asst. Lecturer and Demonstrator.

TABLE E-14

NUMBER OF STAFF MEMBERS BY ORIGIN, RANK, SEX & FACULTY, UNIVERSITY OF SANAA

Faculty	Yemeni												Non-Yemeni												Total	
	Professor		Assistant Professor (Equivalent to US Rank of Associate Professor)		Lecturer (Equivalent to US Rank of Associate Professor)		Assistant Lecturer (Equivalent to US Rank of Instructor)		Demonstrator (Equivalent to US Rank of Teaching Assistant)		Total		Professor		Assistant Professor		Lecturer		Assistant Lecturer		Demonstrator		Total			
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Sharia & Law					3						2		5		4		5		4				13		18	
Arts			1		5		5	1	9	1	20	2	14		16		14	1	1				45	1	65	3
Science			1		3		1		6	2	11	2	18		17		8		4		23	2	70	2	81	4
Education					3			1	7		10	1	1				4						5		15	1
Commerce			2		2		11		11		26		4	1	6		5		2				17	1	43	1
Total			4		16		17	2	35	3	72	5	41	1	44		35	1	7		23	2	150	4	222	9

Courses for majors and non-majors are taught in the FOS facilities on the "old" campus. These facilities are used from 0730 to 1400 hours. The dean of the FOS said that more students can be served by increasing numbers in classes and laboratories and by utilizing laboratories from 0730 until 1800 hours. This expansion can accommodate growth for approximately 2 years at which time the need for additional classroom and laboratory space will be critical.

The FOS began graduate level instruction in the 1983/84 academic year. A diploma will be granted to students completing 24 credits post baccalaureate of science in analytical chemistry or applied geology.

Although the growth of the university has been rapid, the process appears to have been well planned. Discussions are underway for a centralized enrollment and a computerized student record process.

B. Faculty of Agriculture

The FOA, as proposed, is compatible with conditions in the UOS. It should benefit from the administrative structure, policy mechanisms, and services which have evolved in the UOS.

The dean of the FOA will have a challenging task of securing funding for research and extension activities within the UOS budget. These functions will be more significant in the FOA than in the remainder of the UOS and, therefore, probably are not initially well understood by his fellow deans and other university administrators. Funding should also be pursued through the MAF. The Ministry has been supportive of the creation of the FOA.

Women students and women staff members should be readily accepted in the FOA since they are in all the other faculties and fill leadership roles in the MAF.

The FOA will follow the staffing pattern used throughout the university. Initially, the staff will consist of Yemeni and non-Yemeni. The latter will be replaced as Yemeni educated to the Ph.D. level (dictated by university policy) return to Yemen. As many as 29 Yemeni are scheduled to be educated to that level so that they may serve in the FOA.

The FOS has the capability and has expressed a willingness to assume teaching the courses of mathematics, physics, chemistry, botany and zoology in its facilities for a few years since enrollment in the FOA will, initially, be low. However, it is imperative that classrooms and laboratories for these courses be constructed in the facilties of the FOA or elsewhere in the UOS. The demands upon the facilties of the FOS are heavy now and will increase as enrollments in the departments and the faculties it serves increases and other faculties are added. The FOS will provide staff members to teach the courses in the facility constructed for the FOA.

FOOTNOTES

1. Al-Aulqi, Nasser; "Preliminary Study on the Establishment of a College of Agriculture at the University of Sanaa", University of Sanaa, YAR, April 1980.

2. Lucas, I.A.M.; "Proposed Faculty of Agriculture for the University of Sanaa - a Discussion Document". University of London, England, April 1981.

3. CID/USAID, Study Tour and Recommendations, Faculty of Agriculture Planning Unit". CID/Yemen Report 1981-3, October 1981.

4. UNDP/FAO. "Faculty of Agriculture, University of Sanaa, YAR, Consultants Report". By M.A. Taha and A.M. Bonagon. TCP/Yem/0104, March 1982.

5. League of Arab states. "A Study on Establishment of Faculty of Agriculture in Sanaa University". Arab Organization for Agricultural Development. Kartoum, Sudan, April 1981.

ANNEX F

SOCIAL SOUNDNESS ANALYSIS

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SOCIAL SOUNDNESS ANALYSIS

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ANNEX F

SOCIAL SOUNDNESS ANALYSIS 1/

I. The Agricultural Sector of Yemen 2/

A. Geography

Yemen is divided into three major geographical zones. First, the Tihama is the humid, semi-desert plain bordering the Red Sea. The Tihama is intersected by seven drainages or seasonal waterways (wadis) originating in the highlands and extending to the sea. Intensive cultivation of cereals, sugar cane, and tropical fruits is carried out in the foothill wadis. The second zone, bordering the eastern extremity of the YAR, is the arid sandy desert region of the interior Arabian peninsula. Population is sparse and limited mostly to nomadic tribes. Between these two regions is the third zone, the highland regions, where 90 percent of the country's population live. The highlands consist of steep mountains, plateaus and sharply eroded wadis. Much of the arable land is extensively terraced and cropped. The people live in fortified rock houses in villages that are perched high on mountain ridges. Annual rainfall varies from 100 mm in the Tihama to 300 mm in the highlands, and from 1200 mm in the south to 200 mm in the north, and essentially zero rainfall in the arid eastern interior. Agriculture of the country is largely dryland farming. Less than 15 percent of the total cropped area receives some form of irrigation, largely temporary diversion from seasonal monsoons and tubewells.

B. Population

The 1975 census is the only census ever taken in Yemen. Projections based upon this census place the 1982 population near 8 million. About 85 to 90 percent is resident, with the remainder being emigrant labor working in other Arab countries, primarily Saudi Arabia. Net annual population growth is estimated at 2.6 to 2.9 percent. Life expectancy is 42 years but is increasing rapidly with improved access to isolated villages, education through mass media and improved health facilities. Ninety percent of the population lives in rural areas, usually in small villages of under 500. The estimated number of households is 1,097,678 with an average size of 7.3 persons and with one person per household being temporarily absent abroad. Households generally consist of the extended family (parents, children and their families, cousins, aunts and uncles) under patriarchal countrol.

C. Historical Setting and Recent Trends

The nature of agricultural production had not changed in Yemen for more than a thousand years prior to the overthrow of the Imam in 1962. Climate in the highlands is amenable to year-round production but availability

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of water limits this choice to only 5 to 15 percent of the farmers. Where water is available, crop production in most of Yemen has consisted primarily of subsistence grain crops, mostly sorghum and millet. Coffee and cotton were grown on a commercial scale but recent labor shortages have seen a decline in both. Livestock, principally cattle, goats, sheep, donkeys, camels, and poultry, have been an integral part of traditional farming. Livestock have been used for meat, dairy products, transport, power for crop cultivation, and dung for fuel. Most production was for family consumption while a limited amount was used for barter or for sale. The traditional system is very labor intensive for all activities, including household chores of fuel and water gathering, cooking, crop production, livestock herding, terrace building and community activities such as road and school construction.

Terrace building was the principal method to preserve and conserve the most scarce productive resourses, land and water. Drought resistant sorghum and millet were the principal subsistence and risk aversion crops. Cows, kept in confinement, utilized crop residues for forage and provided milk and cheese, and dung for fuel. Goats and sheep utilized any available land for grazing and provided meat. Camels, donkeys and cows provided transportation and power for field cultivation and plowing, threshing and well lifts.

Ravaged by the 1962 civil war and a 7-year drought from 1967 through 1973, the country experienced a decline in agricultural production of one-fourth to one-half. Male emigration to the oil rich Arab countries commenced in the early 1970s and continues to this day.

As remittances began to flow back to Yemen from the oil fields, new influences began to change the traditional economic system. Land prices increased rapidly. Availability of water increased marginally as new wells were dug. Water prices increased. Purchases of consumer goods, including food imports, increased. The price of preferred Yemeni food goods, especially fresh chickens and locally grown crops, increased significantly. Large investments in secondary road construction, wells with motorized pumps, trucks for transport, tractors for hire, and home construction have occurred. Since 1970, unskilled labor wage rates have increased from YR 5 to YR 40-70 per day. Skilled labor wages have increased from YR 30 to 300-400 per day.

Other changes have resulted from the switch to a labor scarce and relatively capital abundant market economy. Women are now responsible for most of the agricultural production in Yemen, in addition to livestock and poultry production. In response to consumer demand, a large percentage of the irrigated cropland above 1500 meters has been shifted to qat production, a plant whose leaves are mildly narcotic. Qat leaves are chewed in daily social gatherings that are held each afternoon. While little is known about the effects of qat, it is generally recognized as a stimulant.

Livestock numbers, particularly sheep, goats, donkeys, and camels, have declined for several reasons. Motorized vehicles have replaced donkeys and camels for transportation, except in the most isolated regions. Increases

in locally constructed schools have led to more farm children attending school rather than herding family sheep and goat flocks. Strong growth in commercial broiler production has also occurred since 1979. The average number of livestock per household, exclusive of chickens, typically ranges from five to nine head.

Land holdings are highly fragmented due to tradition such as Islamic inheritance laws and the geography and terracing on steep terrain. Fragmentation also is used by Yemeni farmers as a hedge against variable micro-climates and moisture conditions. The average number of parcels per rural household ranges from 2.7 in the coastal Province of Hodeidah to 6.8 in the Central Highland Province of Dhamar. The size of family holdings varies greatly. More than 90 percent of all family or household holdings are less than 5 hectares. Some two-thirds of all family holdings are less than 1 hectare. While very small holdings dominate the Yemeni scene in total numbers by total area, the size distrubtion of land is skewed toward larger holdings, especially in Dhamar, Hodeidah, Hajjah, and Taiz provinces. Holdings of greater than 5 hectares comprise slightly over 50 percent of all the land area for the six provinces included in the 1981 agricultural census (Dhamar, Hodeidah, Hajjah, Mahweet, Taiz and Ibb). In those six provinces, totally owned holdings comprise over 60 percent of all holdings. Only 12 percent are totally share-cropped, a more common practice in Mahweet and Ibb provinces.

Field crops, primarily sorghum and millet, account for 73 percent of total land use. Permanent crops such as alfalfa and fruit trees account for 5 percent, temporary fallow, 8 percent; and abandoned land, 12 percent of total land use and 2 percent in other uses, according to the census. Some 84 percent of the holdings are totally dependent upon rainfall. Another 8 percent depend totally upon some form of irrigation (springs, pumps, spate). Vegetable and fruit production are common on such irrigated land. The remaining 8 percent employ a mix of rainfed and supplemental irrigation.

Family labor continues to be the dominant labor source. Temporary hired labor and traded labor among farmers comprise the remainder.

Some 85 percent of the holdings use draft animals for field work. Nearly 30 percent hire tractors on a rental basis to handle heavy plowing. Some of the steepest terrace lands will not accommodate existing mechanized traction as evidenced by 14 percent of the holdings using only manual tools. About three-fourths of the holdings in Taiz and Ibb use commercial fertilizer in small amounts. Fewer than 20 percent of holdings in Dhamar and Hodeidah provinces use commercial fertilizers. Farmers are well aware of disease, insects, and fungus problems, but only about 5 percent of holdings in the six provinces use pesticides. Agricultural chemicals have not yet been tested nor are they available to any great extent.

Shortage of labor has led to abandonment of marginal agricultural land, neglect of terraces, some erosions, and adjustment of some terraces to accomodate mechanization.

The fisheries industry, while very small, is thriving because of strong consumer demand and increased catches in recent years. only 3,000 to 4,000 fishermen in 40 communities comprise the industry.

Forestry is essentially a non-existent economic enterprise. The country has been essentially denuded of trees, so much so that fuel for cooking is sold at a premium. Women spend a significant amount of time collecting limbs from thorny shrubs and scrub trees.

The dominant socio-economic conditions currently influencing Yemen's agricultural sector are summarized as follows:

1. Relative labor scarcity and high wage rates, due to emigration to Arab oil fields, a phenomenon whose growth appears to have peaked;

2. Increased dependency on womens' labor in all agricultural production activities and in the raising of livestock and poultry;

3. High local investments in roads and schools which have increased access to isolated areas;

4. High capital cost of infrastructure development because of mountainous terrain;

5. A bustling private sector with demand for consumer goods and strong preference for Yemen produced food products in spite of higher domestic food prices; and

6. An unspecified, but real, economic impact from rapid expansion of qat chews as a recent social phonomena.

II. Education in Yemeni Society

A. Background

Today, religion plays a relatively minor role in the educational system in Yemen. However, the traditional Kuttab system still exists in towns and villages as it has for centuries. The curriculum includes study of the Arabic language, the Quran, fiqh (Islamis rules), Hadith (words of the Prophet) and elementary arithmetic.

Most Kuttab schools are maintained by religious endowments, waqf, and generally are a part of the Mosque Foundation. Each religious sect has its own mosque where the Shayks pass on religious learning. Oral recitation and memorization are emphasized.

In addition to the religious schools there are three religious colleges in Yemen, where Arabic philosophy, Islamic law, commentary of the Quran, traditions and history are taught. They are located in Bir Al Azab,

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Dhamar and Zabid (see Figure F-1, "The Religious Education System in the YAR (Kuttab)".)

In addition to the traditional religious educational system, a secular school system has evolved. A secular grade school system was introduced during the reign of Imam Ahmad which provided a 6-year primary course, a 3-year preparatory course and a 3-year secondary course. Teacher training institutes were also established. However, before the revolution of 1962, there existed no proper budget for education. Teachers depended entirely upon religious donations (waqf), the contributions of private parties and irregular contributions from the Imam. 3/

Institutionalization of the educational system occurred after the Revolution. However, the greatest advances were made after the end of the civil war in 1969. Student enrollments along with the number of primary, preparatory, secondary and teacher training institutes increased dramatically. Technical vocational institutes were established along with the UOS (See Figure F-2, "The Secular Educational System in the YAR").

B. Education and Training Needs on the YAR

The YAR is desperately short of manpower, at all technical and management skill levels, to implement its ambitious modernization plan. Almost no institutional capacity for education and training existed at any level prior to 1970. At the time of the revolution in 1962, only 919 primary schools existed in the entire country, with enrollment of 61,000 students, as shown in Table F-1. There were only eight preparatory and secondary schools enrolling about 2,000 students. No improvement in this situation occurred until after 1969 with termination of civil war activity.

In the decade of the 1970's, through the initial YARG Three-Year Plan (1973-76) and the FFYP (1976-81), the YARG placed major emphasis upon establishment of an educational system to develop human resources. The system utilizes a year structure of 6, 3, 3, and 4 respectively for primary, preparatory, secondary, and university levels. Most primary and preparatory structures have been built by LDAs. The number of such schools increased to over 3,700 by 1980/81. The number of secondary schools increased from three in 1962 to 94 in 1980/81. (The number of teacher training institutes totaled 17 in 1981/82. In addition, there are four long-term technical vocational training institutes). The schools and institutes have been financed largely by the YARG (MOE) and donor assistance.

The UOS, the YAR's only university, opened in 1970. Sixty-four students were enrolled in the faculties of Arts (literature), Law and Religion, and Sciences, while the staff numbered 14. In 1973/74 two other faculties were added; Education, and Business and Commerce. In 1983, the faculties of Engineering and Medicine were initiated. Plans exist to add faculties of Agriculture, Veterinary Medicine, Pharmacy and Dentistry. By 1980, there was a total of 4,220 students enrolled in the five faculties of the UOS; 449 women and 3,771 men. In addition, there were 630 students on

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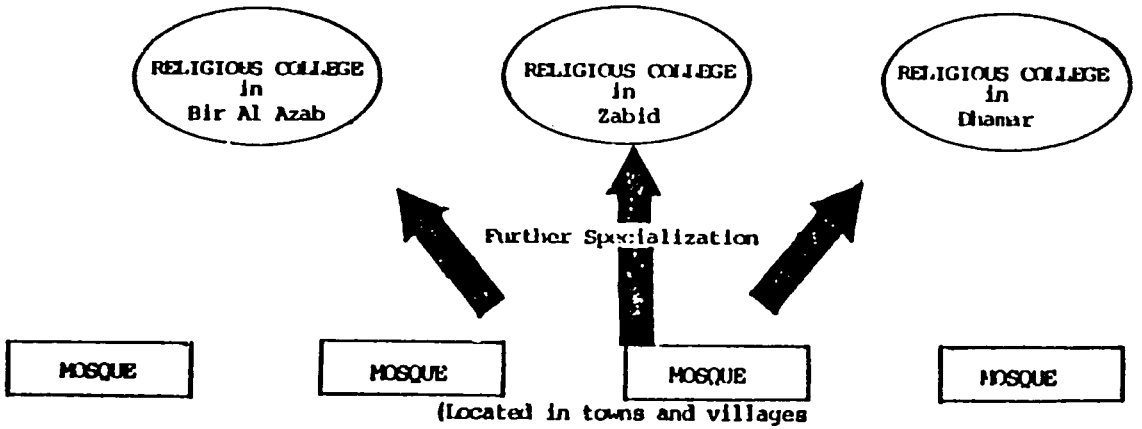
THE RELIGIOUS EDUCATIONAL SYSTEM

in the

YAR
(Kuttab)



NOTES:

I. Administration of the religious educational system: by the Shaykh or college.
II. Funding: religious donations (waqf) or private contributions.
III. Curriculum: Arabic language, Quran, fiqh (Islamic rules), Hadith (words of the prophet), elementary arithmetic. College curriculum includes Arabic philosophy and Islamic law (sharia').
IV. Approach: oral recitation/memorization.

SOURCE of DATA: Swiss Technical Cooperation Service, Final Report, 1978.

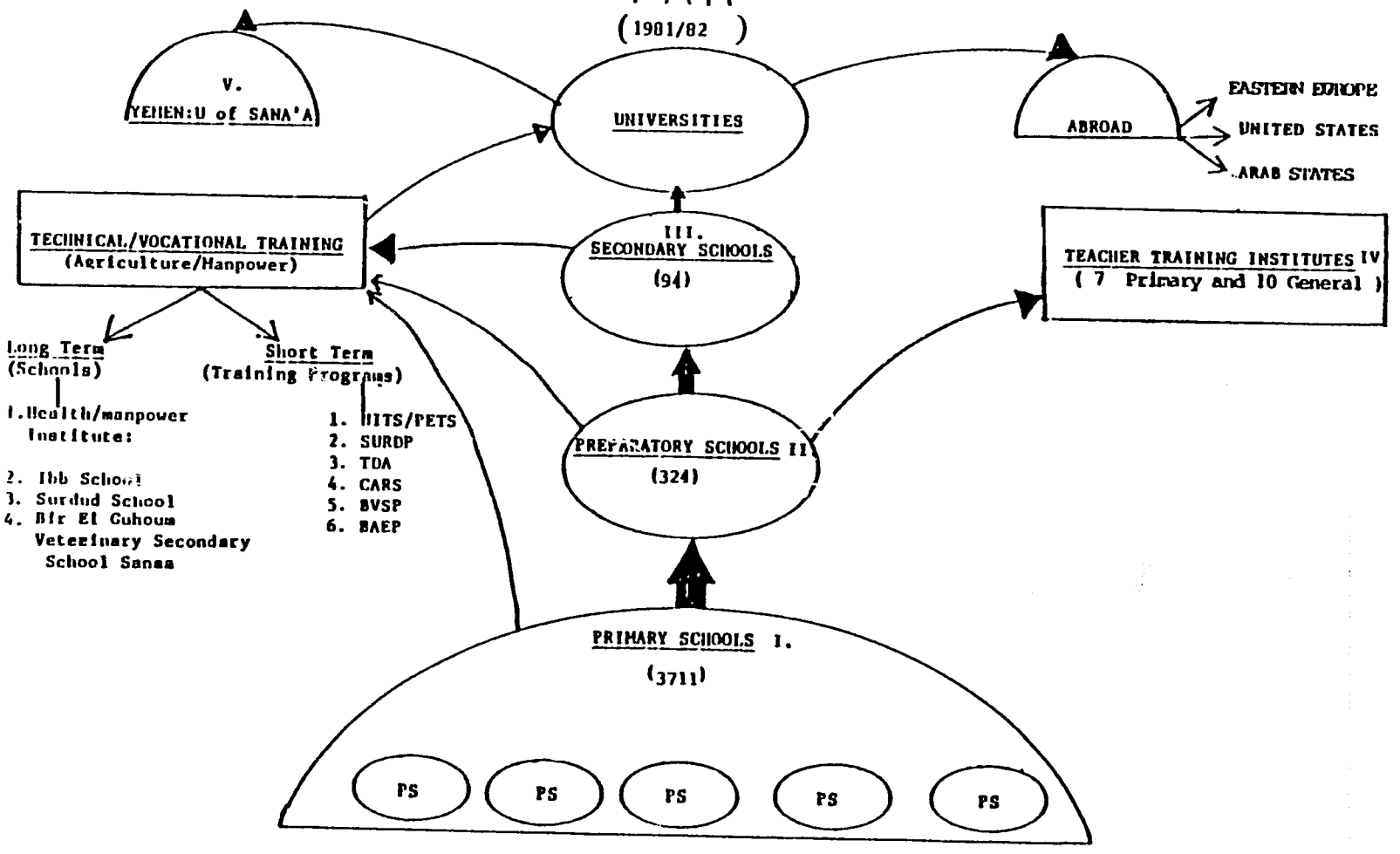
Figure F-1

SECULAR EDUCATIONAL SYSTEM

in the

YAR

(1981/82)



Source of Data: Ministry of Education

FIGURE F-2

TABLE F-1

GROWTH IN SCHOOLS AND ENROLLMENT IN THE YAR EDUCATIONAL SYSTEM

1962/63 to 1981/82

LEVEL	NUMBER OF SCHOOLS				NUMBER OF TEACHERS				NUMBER ENROLLED (THOUSANDS)			
	1962/63	1971/72	1979/80	1981/82	1962/63	1974/75	1979/80	1981/82	1962/63	1971/72	1979/80	1981/82
PRIMARY	919	1115	2543	3711	-	5825	6727	11700	61	119	335	522
PREPARATORY	5	47	197	324	-	599	1061	1640	1	6	20	32
SECONDARY	3	6	55	94	-	233	480	806	-	1	8	12
UNIVERSITY	-	1	1	1	-	14	153	210	-	1	4	5
TOTAL	927	1169	2796	4130	-	6671	8421	14356	62	127	367	571

SOURCE: Ministry of Education and University of Sanaa
*For 1971/72, 1974/75 Figures were used.

grants in Arab friendly countries in various specializations in 1979/80 4/. Enormous educational progress has been made in the YAR. By 1980, 36 percent of the primary school age population and 4 percent of the secondary school age population were enrolled. Student enrollments increased dramatically, too. (See Table F-1, "Growth in Schools and Enrollment in the YAR Educational System", 1962/63 to 1981/82). Attrition rates of students appears to be high at all levels.

The MOE statistics indicate that about 15 percent of the students entering Grade 1 complete Grade 9, and about one-half of the students completing each higher level proceed to the next level of schooling. Nevertheless, the literacy rate has increased to over 20 percent. It should be noted, however, that overall literacy figures are more applicable to the male population than to the female population. For example, in 1975, illiteracy (persons able to read but not to write) was about 74 percent among males and 98 percent among females over 10 years of age. 5/ In 1981/82, females made up less that 15 percent of enrollments at all levels, with the exception of commercial secondary schools and teacher training institutes where they made up 22 to 43 percent of the enrollment, respectively. (See Table F-2, "Student Enrollment in the Primary, Preparatory, Secondary, Teacher Training and Technical Institutes and Universities").

In general the participation of Yemeni girls in the formal educational system has been low even in areas where they have access to schooling. The major constraints to educating females in Yemen have been "social attitudes and parental ignorance, family obligations keeping girls at home and the pattern of early marriage". 6/ Families objected to educating daughters on moral grounds. Girls were not allowed to study publically in the presence of boys and male teachers. 7/

Today, it appears that many of these attitudes toward educating females are beginning to change. As more and more women become educated, social barriers will begin to break down. Progress is being made and it will continue.

The quality of schooling is relatively low, reflecting the shortage of buildings, furniture, equipment, teaching materials, and teachers. Teacher shortage is the most critical education problem at all levels. While teacher numbers exceed 8,400, the proportion of expatriates in the preparatory and secondary levels averages about 90 percent versus 70 percent at the university level.

Non-formal education and training also exists. The MOE has primary responsibility for such activity. In addition to the technical secondary schools, the MOE has initiated about 100 literacy centers which reached over 2,200 adults in 40 villages since 1979. Such adult classes provide training courses in electricity, carpentry, sheetmetal and welding, construction, automotive and general mechanics, agriculture, health care, home economics, nutrition, sewing, and weaving. Also provided are country-wide literacy classes which are intended to provide Grade 4 literacy and arithmetic

TABLE F-2

STUDENT ENROLLMENTS IN PRIMARY, PREPARATORY, SECONDARY, TEACHER TRAINING AND TECHNICAL INSTITUTES AND UNIVERSITIES

SCHOOL	1979/1980					1981/1982				
	FEMALE		MALE		TOTAL	FEMALE		MALE		TOTAL
	Number	% of Total	Number	% of Total		Number	% of Total	Number	% of Total	
Primary	41,707	12	293,542	88	335,249	71,394	14	451,602	86	522,996
Preparatory	2,795	13	17,969	87	20,764	4,571	14	27,995	86	32,566
Secondary	1,046	13	7,183	87	8,229	1,353	12	10,292	88	11,645
Teacher Training (Primary)	303	33	604	67	907	284	43	375	57	659
Teacher Training (General)	285	48	312	52	597	310	35	578	65	888
Commercial Secondary	81	21	313	79	394	96	22	331	78	427
Technical Secondary	1	.3	355	99.7	356	0	0	454	100	454
Ibb Secondary Agricultural School	-0-	-0-	53	100		-0-	-0-	118	100	118
Surdud Secondary Agricultural School	-0-	-0-	35	100	35	-0-	-0-	31	100	31
Bir El Guhoum Veterinary Secondary School (Sanaa)	---	---	---	---	---	-0-	-0-	30	100	30
Sanaa University	449	11	3,771	89	4,220	654	13	4,518	87	5,172
Universities Abroad	-0-	-0-	630	100	630	-0-	-0-	652	100	652

SOURCE: Ministry of Education and The Agricultural Sector Assessment YAR, 1982.

NOTES ON THE SECULAR EDUCATIONAL SYSTEM IN THE YAR

Primary Schools:	6-Year Program; ages of the students 6-11 years. Prior to 1983, primary school graduates could enter primary school teacher training institutes. Now, only preparatory school graduates are admitted to these training institutes
Preparatory Schools:	3-Year Program; ages of the students 12-14 years.
Secondary Schools:	3-Year Program; ages of the students 15-17 years. In addition to the government schools there are seven commercial and three technical secondary schools.
Teacher Training	(Includes primary teacher training institutes). 3-Year Program; ages of the students 15-17 years. The MOE has proposed that the program be increased to a 5-year program and then to a 6-year program.
University of Sanaa:	Faculties of Law, Commerce and Economics, Education, Science, Engineering and Medicine. Faculties proposed include Agriculture, Pharmacy, Dentistry, and Veterinary Medicine.

skills. Enrollment levels in the literacy classes exceeded 10,400 in 1979/80. Health Centers provided by the Ministry of Health enrolled 90,000 in 1979/80 in their health classes. Eight community development centers provided training in embroidery, sewing and home economics.

A country's educational system, besides being a training ground for its future manpower, is also the basis for the perpetuation and modification of its own cultural and social value system. With a significant portion of Yemeni teachers at all levels, including the university level, being foreigners, such objectives may not be met. Yemenization of the education system is an important goal to reduce dependency upon other countries and to focus upon problems, problem priorization, and approaches to problem solutions which embody a Yemeni perspective. Yemeni trained abroad do not get a Yemeni agricultural focus, nor are they necessarily provided with the types of technical skills which are matched to the needs of Yemen agriculture. The training of Yemeni through the FOA is intended to address such deficiencies. The faculty will provide educaton for those who will provide the services and leadership needed for developing the agricultural sector.

C. The FOA Subproject Purpose

The primary purpose of the FOA Subproject is to develop the institutional capacity within the YAR to train Yemeni men and women as agriculturists at the baccalaureate level. This is to be accomplished through the establishment of a FOA within the UOS.

The faculty is to be engaged in training, teaching and research activities that will increase the pool of agricultural personnel for the public and private sectors. FOA graduates can provide services to the agricultural sector at all levels in addition to providing the administrative and scientific leadership needed to modernize traditional agriculture in Yemen and thereby increase production.

The FOA Subproject is to generate skilled men and women who are trained with an applied focus. This applied focus is intended to place primary emphasis upon the immediate needs of increasing agricultural production in Yemen. It is important to recognize that a primary performance criteria for the FOA operations is on improving production in the agricultural sector. Past experience in the Middle East 8/ points to a number of issues that should be considered including: (1) higher agricultural education, (2) subcollegiate agricultural education, and (3) agricultural extension. The following list provides a summary of the recommendations from past experiences.

1. Conclusions and recommendations for higher agricultural education in the Middle East:

a) Higher agricultural education must include practical field experience during the course of study.

b) A basic knowledge of human nutrition should be required of agricultural college graduates. (The knowledge may be provided by a required course).

c) Agricultural college students should be trained in community service and development.

d) Agricultural colleges should organize refresher courses, short courses, and round table discussions to be offered on a continuing basis.

e) Agricultural colleges should involve their alumni in evaluating, at regular intervals, the type of training they have received and the training currently being offered.

f) A Significant number of the professional staff of agricultural colleges should be in constant touch with local people and familiar with current rural and agricultural problems in order to improve their teaching and research methods and to guarantee their relevancy.

g) Agriculture college students should be given experience in identifying problems and learning where to find answers (such as effective use of libraries and utlizing research results). Case studies may be used to advantage.

h) Agricultural colleges should place more emphasis on recruiting students from agricultural and rural areas.

i) Professors in the different colleges of the Middle East, after acquiring experience in the area, should write textbooks in their specialities, adapted to local conditions.

j). Professors should attend international congresses and conferences in their field of specilization, and institutions should attempt to seek all possible sources of funding for travel.

k) Additional emphasis in the curriculum of agricultural colleges should be given to communicative skills, human sciences, pedagogy, and international development (such as the world economic order).

l) Agricultural colleges should coordinate their programs with the needs of the employers of the graduates of the colleges.

m) There should be an ongoing exchange of ideas and much greater communication among all agricultural colleges of the Middle East and Arab World.

2. Conclusions and recommendations for sub-collegiate agricultural education in the Middle East:

a) The teaching of agriculture and nutrition in rural areas should be instituted at both the primary and secondary school levels. (This should be accomplished through formal instructional means as well as indirectly through farm youth organizations).

b) The mass media should be utilized to provide learning for all, including those who are illiterate.

c) Fully equipped farms or production training units ranging from small to large, and involving various levels of investment and technology, should be established in intermediate institutions to enable students to learn the required skills.

d) The objectives of each level of education should be agreed upon and publicized.

3. Conclusions and recommendations for agricultural extension in the Middle East:

a) Greater integration and coordination between various development programs in rural areas are high priority needs.

b) Extenion and research personnel should communicate and enter into dialogue so that research findings can easily and promptly be disseminated and applied.

c) Extension must be viewed by national agricultural and rural development leaders as a two-way process so that researchers are made aware of the needs of farmers without delay.

d) Extension should be an important function of university programs, including training.

e) In view of the reportedly slow growth of agriculture in response to extension work over a long period, agricultural universities should do research on factors responsible for this state of affairs.

f) Extension programs should be responsive to the recognized needs and aspirations of farmers and rural people. (This can best be done by getting farmers and villagers involved in both planning and implementation). Emphasis needs to be placed on the training and recruitment

of women extension agents to that the needs of women farmers can be met more effectively.

III. Sources of FOA Students

A. Opportunities for Training in Agricultural Subjects in the YAR

Agricultural education in the YAR is limited. No agriculture is taught in the primary, preparatory or secondary schools. However, students can take a science option in the secondary school system which includes 3 years of training in mathematics, biology, chemistry, physics, mechanics and statistics. This training provides a sufficient academic background for pursuing further education in agricultural subjects. Specialized long-term training in agriculture in the YAR is available through technical agricultural secondary schools. Short-term training programs are offered by various donor projects.

1. There are three technical agricultural secondary schools: The ISAI, the Surdud Agricultural Secondary School and the Bir el Guhoum (Sanaa) Veterinary Secondary School. 9/

a) The ISAI began operations in 1979 with USAID assistance. The school offers a 3-year agricultural course for training extension agents and technicians. Graduates can pursue university agricultural studies. Approximate enrollments of students have been: 53 in 1979/80, 78 in 1980/81, 118 in 1981/82, 107 in 1982/83 and 114 in 1983/84. The operating capacity is about 150 students per year.

b) The Surdud Agricultural Secondary School began in 1981. IBRD will finance expatriate staff salaries for 4 years. The school offers a 3-year agricultural course for extension agents and other technicians. The design capacity is for 180 students, although enrollments have been 35 students in 1981 and 31 in 1982.

c) The Bir el Guhoum (Sanaa) Veterinary Secondary School opened in 1982 and is financed by IBRD, including equipment and staff salaries for 4 years. The school offers a 3-year program that integrates animal production and health subjects to produce animal husbandry and veterinary technicians. The design capacity is about 180 students or 60 per year. Student enrollment for 1982 was 10 and for 1983 it was 30.

2. In addition to the long-term institutionalized education programs, short-term training, up to 1 year, is provided under various donor projects in extension, veterinary science and mechnization. Currently the following projects offer training:

a) The CARS has trained about 170 agricultural extension agents between 1974 and 1982, through 11-month courses. The Sourthern Uplands Rural Development Project (SURDP) recruits about 90 percent of the graduates and the remainder were recruited by other development projects. Currently, about 70 percent of the graduates continue to serve on these projects, while the remainder have gone on to more advanced agricultural studies or other positions related to agriculture. SURDP extension agents can receive refresher courses through CARS.

b) The TDA conducts 11-month extension training in its Wadi Zabid facilities. Approximately 150 agents have received training. Training and refresher course are offered as needed.

c) The British Veterinary Services Project (BVSP) has trained about 100 animal health assistants since 1976 through seven 12-month courses under the MAF auspices. In 1982, 21 students were enrolled. Because of the low demand for this training, the project has had to admit primary school graduates. Attrition has been about 30 percent and only about 50 percent of the graduates have joined the agricultural services. Alternatively, many students have opted to continue higher education in other institutions, often in unrelated subjects.

d) The British Agricultural Engineering Project (BAEP) trained about 20 mechanics between 1978 and 1982 in a one-year course in tractor repair. The trainees are mostly employees from the public sector. Also, the project has trained SURDP extension agents in a one-month course in tractor operation and maintenance. Most all SURDP agents will have this training by the end of 1983. Two-week courses are offered for rural mechanics.

e) The Sourthern Uplands Rural Development Project (SURDP) and TDA offer short-term training of 11 months. Since 1974, 320 extension agents have received such training.

3. Under the ADSP, funded by USAID, two subprojects have provided training opportunities in agriculture: The HITS and the Poultry Extension and Training Subprojects (PETS).

a) HITS began in early 1983, although horticulture training began much earlier. Informal and formal training programs for extension agents, agriculturists and farmers have been scheduled. The informal training programs that have been scheduled include two 3-week courses for extension agents in sub-tropic, tropic and deciduous horticulture in Al Jarouba,

Al Irra; and one 3-week course in nursery management in Al Irra. It is anticipated that there will be approximately 30 participants per session; informal 3-day extension courses will be offered for farmers. Extension training also will be provided to farmers via TV programs and video cassettes. In 1983 short training courses for agricultural technicians were given at Al Jarouba. In addition, a 2-month informal training program in nursery management was given in the USA. Four trainees participated in this program.

Formal academic training has been scheduled: eight B.S. students, two M.S. students, and two Ph.D. students are expected to complete their training over the next 6 years in the USA. Currently one student is in the USA working and M.S. degree in Horticulture. Six-month training courses in the USA are scheduled for eight agricultural inspectors/technicians in Horticulture work.

b) PETS began in 1982, and offers formal and informal training. Formal training includes 16-week sessions in poultry management. In the first session, there were seven students enrolled and five completed the courses. Currently five are enrolled in the second 16-week session.

Informal one-hour training sessions in poultry production are offered on a continuing basis in the rural villages. Following the earthquake in 1982, the subproject distributed approximately 2,741 pullets in the Dhamar area. One-hour training sessions in feeding, watering and housing poultry were given to approximately 429 men and 191 women.

Agricultural extension training in the YAR was first developed during the 1974-76 period under the auspices of three rural development projects. A total of 36 centers have been established in the area of Hodeidah, Wadi Zabid, Ibb and Taiz. Training for these centers has been carried out by TDA and CARS. In 1982, the MAF proposed a new organization. Under this proposed organization there would be a new structure, the General Administration for Extension and Training. Extension and training offices are to be established at the provincial, district and village levels. Implementation plans are expected to proceed slowly due to a shortage of trained staff. Graduates and trainees of the long and short term training programs discussed above will provide needed staff for the extension service. 10/

Agriculutral education in the YAR is inadequate. Improvement at all levels is needed, especially for technicians and B.S. graduates who can fill middle-level jobs essential for providing services to farmers. 11/

Of particular concern, is an inadequate supply of trained women in agricultural fields. Women are integrally responsible for all phases

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of the agricultural production in the YAR, in addition to being responsible for livestock and poultry production, vegetable gardening, beekeeping, limited marketing and household chores. Hence, schooling and training for women at all levels is essential for balanced development of Yemen society.

The official policy of the YARG encourages women to attend school. However, may traditional families do not support this policy. Traditional Yemeni still believe that schooling is for boys and that girls are to marry at an early age and raise children instead of attending school. Consequently, while overall literacy exceeds 20 percent, that for women is very low, perhaps 2 to 3 percent. New preparatory and secondary schooling for women are available where separate classrooms are provided. In fact, in 1981/82, of the total enrollment in primary, preparatory, and secondary schools, 14 and 12 percent were girls, respectively. Furthermore, 13 percent of the students enrolled in the UOS were women (See Table F-2).

The traditional division of labor in Yemeni rural society and extensive male labor in emigration place many women farmers in key production roles. It is important for the FOA course offerings to reflect this need. The FOA program will encourage female enrollment and participation in production and management classes in livestock production, food technology, nutrition, agricultural production, and management. These subjects are expected to be of great interest to women who train to be agricultural scientists and/or extension agents. There are 23 women extension agents in SURDP now. Further initiatives by the YARG to encourage female involvement through the MAF and NES are expected to be slow. Observable changes in agricultural production, cropping patterns, and family household patterns require close analysis, as they may affect women and children differently than men. Inaccessibility of women to the market and lack of opportunity to accumulate capital for investment appear to be extremely important economic issues as Yemeni agricuture becomes more market-oriented. 12/

B. Source of Students

The major sources of students for the FOA will be the graduates from the secondary schools who have taken the science option (see Annex D). In addition, graduates from the long-term technical agricultural secondary schools and trainees from the short-term agricultural training programs who have appropriate academic background will be potential candidates for admission to the FOA (see Figure F-3). Recent discussions with MOE officials indicate that a total of 5,562 students are currently (1983/84) preparaing to graduate in secondary schools. Prospective graduates in the three agricultural secondary schools number 67 students.

C. Student Educational Preference Study

One important factor in evaluating the likely success of the FOA in the YAR is the interest of secondary students enrolling in an agricultural curriculum. In order to assess this factor a questionnaire (Figure F-4) was designed and administered to students in the scientific stream of the

FIGURE F-3

SOURCES OF STUDENTS FOR THE FACULTY OF AGRICULTURE (FOA)

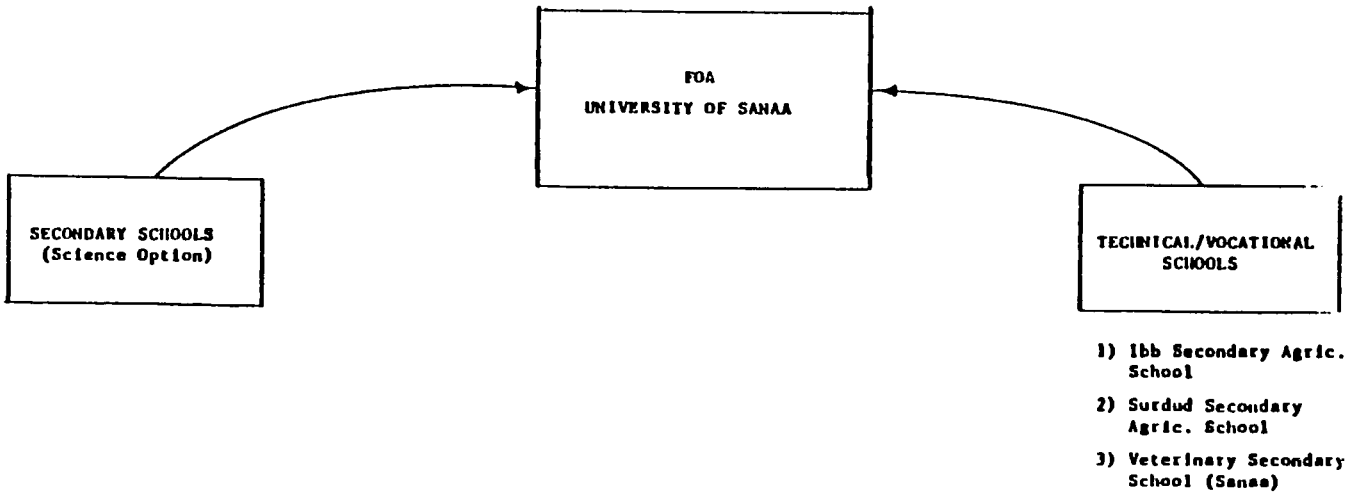

FIGURE F-4

STUDENT EDUCATIONAL PREFERENCE

QUESTIONNAIRE

English Translation of Questionnaire Presented to Yemen Secondary School Students to Determine Their Educational Plans and Preferences. a/

QUESTIONNAIRE

1. Do you plan to enroll at the University of Sanaa upon completion of your secondary education program? Yes or No

2. If you plan to enroll in the University of Sanaa, please rank the following faculties according to your enrollment preference. Indicate first, second and third choices.

Agriculture
Business and Commerce
Education
Engineering
Islamic Law
Medicine
Veterinary Medicine b/

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a/ Questionnaire presented to and explained to students in Arabic by an Arabic speaking university faculty member.

b/ This option was offered only to students at the Sanaa Veterinary Secondary School.

secondary school system, to students in the two agricultural secondary schools and to students in the Sanaa Veterinary Secondary School.

1. Administration of Questonnaire

Individual copies of the questionnaire translated into Arabic were provided to each student in the classes selected. Prior to distribution of the questionnaire, an Arabic speaking University faculty member or secondary school official explained the role of the SPP team to the students as well as the details of the questionnaire.

2. Processing of Responses

The initial step in processing the responses was to tabulate them by class as shown in Table F-3. Student responses were tabulated in the order collected and student numbers assigned to facilitate review of recording accuracy. For each student their indication of university plans was recorded along with their ranking of the alternate faculties.

Student responses by class were summarized in Table F-4. For each of the faculties, the number of students indicating it as their first choice, first or second choice, and first, second or third choice were tabulated and reduced to percentage of students indicating plans to attend the UOS.

3. Observations

a) Hodeidan

(1) Over 90 percent of the secondary students sampled indicated an intention of attending the UOS.

(2) Seven percent of the secondary students sampled indicated agriculture as their first choice faculty.

(3) Fifty-eight percent of the secondary students sampled indicated agriculture as being among their top three faculty choices.

(4) Engineering, Medicine and Agriculture were the top three faculty choices, in that order.

b) Taiz

(1) Over 97 percent of the secondary students sampled indicated an intention of attending the UOS.

(2) Fifty-three percent of the secondary students sampled indicated agriculture as their first choice faculty.

(3) Eighty-two percent of the secondary students sampled indicated agriculture as being among their top three faculty choices.

TABLE F-3

INTEREST SURVEY RESULTS FOR THE OMAR IBN ABD ALAZIZ SECONDARY SCHOOL IN HODEIDAH: THIRD LEVEL

Tabulation of data obtained by administration of the educational preference questionnaire to students in third level of Omar Ibn Abd Alaziz Secondary School

School: Omar Ibn Abd Alaziz - Boys

City: Hodeidah

Class: Third level Natural History

Date of survey: 19 October 1983

Student	Plan to Attend Univ of Sanaa	Choices: Agr	Bus Commerce	Educ.	Engr.	Islam Law	Med
1	Y	3			2		1
2	Y		3		2		1
3	Y	3			1		2
4	Y	2	3	5	1	6	4
5	Y		1		2		3
6	Y	3		2	1		
7	Y	3			1	2	
8	Y	2		3	1		
9	Y	4	5	6	2	3	1
10	Y	1			2		3
11	Y	1			2		3
12	Y	3	2	6	1	5	4
13	Y	6	5	4	2	3	1
14	Y	3	5	2	4	6	1
15	Y	4	6	5	1	3	2
16	Y	1	2	3	4	5	6
17	Y	1	2	3	4	5	6
18	Y	1	2	3	4	5	6
19	Y	4	3		1	5	2
20	Y	3	4		1		2
21	Y		3		1		2
22	Y		3			1	2
23	Y	5	4	6	1	2	3
24	Y		2		3	1	
25	Y	3			1		2
26	Y	2			3		1
27	Y	3			2		1

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TABLE F-4

ANALYSIS OF SECONDARY STUDENT RESPONSES TO POST-SECONDARY EDUCATION PREFERENCE QUESTIONNAIRE, YEMEN ARAB REPUBLIC, NOVEMBER, 1983.

School	M/F (♂/♀)	City	Class	Number of Students	Number Planning to Attend UOS	Agriculture						Business & Commerce						Education						Engineering						Islamic Law						Medicine					
						Top 1		Top 2		Top 3		Top 1		Top 2		Top 3		Top 1		Top 2		Top 3		Top 1		Top 2		Top 3		Top 1		Top 2		Top 3		Top 1		Top 2		Top 3	
						No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Omar Ibden	M	Hodeidah	3 Natl. History	27	27	5	18	8	30	17	63	1	4	5	18	10	37	0	0	2	7	6	22	12	44	20	74	22	81	2	7	3	11	6	22	7	26	14	52	18	67
Abdalla	M	"	2 Engl. Language	40	40	3	8	10	25	26	65	0	0	4	10	12	30	1	3	2	5	4	10	19	48	34	85	37	93	0	0	0	0	6	15	15	38	26	65	33	83
Bilquis	F	"	2 Engl. Language	34	34	0	0	7	21	15	44	1	3	11	33	17	50	3	10	3	10	7	21	8	24	17	50	23	68	1	3	2	6	5	19	20	59	24	71	24	71
Bilquis	F	"	3 Chemistry	28	26	1	4	8	31	17	65	0	0	1	4	4	19	0	0	1	4	2	8	8	31	17	65	21	81	0	0	3	12	6	23	17	65	21	31	22	85
Faroq	M	Taiz	2 Mathematics	47	47	24	51	32	68	38	81	0	0	7	15	11	23	0	0	1	2	3	6	11	23	24	51	38	81	1	2	3	6	4	9	9	19	23	49	35	74
Faroq	M	"	3 Chemistry	47	47	43	91	45	96	47	100	0	0	0	0	4	9	0	0	0	0	1	2	2	4	24	51	36	77	1	2	2	4	2	4	1	2	18	38	26	55
Bilquis	F	"	2 Engl. Language	38	35	15	43	23	66	29	83	0	0	2	6	8	23	2	6	2	6	3	9	3	9	15	43	21	60	0	0	3	9	3	9	14	40	22	63	27	77
Bilquis	F	"	3 Engl. Language	27	26	3	12	11	42	16	62	1	4	2	8	5	19	0	0	1	0	0	0	7	27	20	77	22	77	0	0	0	0	0	0	15	58	17	65	20	77
S. A. Hassan	M	Sanaa	Physics	31	21	2	10	3	15	12	57	0	0	4	19	9	43	0	0	0	0	0	0	13	62	19	90	20	95	0	0	2	10	2	10	6	29	11	52	13	62
S. A. Hassan	M	"	Math.	63	56	3	5	10	18	31	55	4	7	11	20	23	41	0	0	0	0	0	0	21	38	46	82	49	88	0	0	2	4	6	11	27	48	35	68	42	75
Aarwa	F	"	Physics	44	36	1	3	9	25	21	58	2	6	11	31	16	44	0	0	1	3	3	8	2	6	15	42	20	56	0	0	4	11	10	28	28	78	30	83	33	92
Aarwa	F	"	English	56	56	3	5	12	21	22	39	4	7	16	29	23	41	4	7	9	16	10	18	17	30	32	57	38	68	2	4	7	13	11	20	26	46	36	64	39	70
Sanaa Veterinary	M	"	1st, 2nd	25	25 1/	4	16	13	52	18	72	0	0	3	12	5	20	0	0	0	0	1	4	0	0	8	32	13	52	1	4	1	4	4	16	6	42	10	40	14	56
Surdud Agric. Institute	M	Surdud	All	95	69	69	100	69	100	69	100	0	0	0	0	2	3	0	0	0	0	0	0	0	0	3	4	3	4	0	0	1	1	1	1	0	0	0	0	1	1
Ibb Agric. Institute	M	Ibb	1st Year	29	29	14	48	20	69	24	83	2	7	5	17	7	24	0	0	1	3	3	10	8	28	19	66	25	86	0	0	4	14	6	21	5	17	9	31	19	66
Ibb Agric. Institute	M	"	2nd Year	33	33	32	97	33	100	33	100	0	0	8	24	15	45	0	0	0	0	4	12	1	3	15	45	25	76	0	0	0	0	1	3	0	0	7	21	13	39
Ibb Agric. Institute	M	"	3rd Year	27	27	24	89	25	93	26	96	0	0	0	0	6	22	0	0	0	0	2	7	0	0	6	22	19	70	0	0	4	14	5	17	3	10	19	70	22	81

1/ Veterinary Medicine was chosen the Top 1 by 14 (56%), Top 2 by 15 (60%), and the Top 3 by 18 (72%) students.

(4) Agriculture, Medicine and Engineering were the top three faculty choices, in that order.

c) Sanaa: Regular Secondary Schools

(1) Eighty-seven percent of the secondary students sampled indicated an intention of attending the UOS.

(2) Five percent of the secondary students sampled indicated agriculture as their first choice faculty.

(3) Forty-four percent of the secondary students sampled indicated agriculture as being among their top three faculty choices.

(4) Engineering, Medicine and Agriculture were the top three choices in that order.

d) Sanaa Veterinary Secondary School

(1) All twenty-five of the students sampled indicated an intention of attending the UOS.

(2) Fifty-six percent of the students sampled indicated Veterinary Medicine as their first choice faculty.

(3) Sixteen percent of the students indicated Agriculture as their first choice faculty.

(4) Seventy-two percent of the students indicated Agriculture as being among their top three faculty choices.

e) Surdud Agricultural Secondary School

(1) Over 95 percent of the students who responded to the question of their desire for further education responded positvely. They have an almost universal interest in university level training.

(2) All of the students who ranked the alternate faculties selected agriculture as their first choice.

f) ISAI

(1) All of the 89 students who responded to the questionaire indicated plans to attend the UOS.

(2) Seventy-eight percent of the students indicated the Faculty of Agriculture as their first choice.

(3) Over 93 percent of the students indicated the Faculty of Agriculture as being among the top three faculty choices.

(4) The students were equally divided in their choice of engineers and medicine as alternatives to agriculture.

D. FOA Student Considerations

1. Criteria for Admittance

The following criteria for admittance to the FOA have been established tentatively:

a) Graduation from any of the agricultural technical schools or secondary (science option) schools with national exam score of 60 percent.

Pass	50 percent
Faculty of Arts	56 percent
Faculty of Science	60 percent
Faculty of Law	62 percent
Faculty of Commerce	66 percent

b) Military draft requirements have been met; and

c) Degree of English language competency necessary.

2. Other Issues

At this point a number of unresolved issues remain. It is not clear how equivalent or comparable the secondary (science option) school curriculum is with that provided through the agricultural secondary schools. It appears that the agricultural secondary schools have relinquished required math courses for applied agricultural courses. This, remedial training in math may be required for some students. This may also be the issue in English language training for some. A comparison of national scores would be helpful.

One year military service is required of all able-bodied men. The one exception is for all men who are in teacher training who may substitute the military requirement with 1 year of teaching in primary or secondary schools in rural areas. Adoption of this option may need to be explored for agricultural students if incentives are not adequate to attract sufficient rural based students to the FOA.

IV. Beneficiaries

A. Primary: Students and Faculty

The primary beneficiaries of the FOA Subproject are expected to be the agricultural students trained at the B.S. level who enter the private and public sectors directly or who go on for advanced degrees. Salaries, prestige, personal satisfacton, and upward economic mobility are viewed as the principle economic and esthetic benefits.

The FOA is expected to assist the MOE in identifying the best FOA graduates for future study overseas. Upon return, some M.S. trained candidates are expected to be posted with the MOE as teachers for the agricultural secondary schools and fill proposed specialist positions with the NES in the provincial agricultural offices.

B. Secondary: Agricultural Sector Institution

The secondary beneficiaries of the FOA Subproject are expected to be the people served by agricultural institutions. The FOA will provide trained Yemeni men and women to fill technical and administrative positions for both public and private institutions with greatest intended emphasis upon public institutions. The public institutions include the research and extension components of the MAF, the semi-autonomous regional development authorities, and other public institutions such as the MOE which may require agricultural graduates to serve their program. The MOE is expected to benefit indirectly from the availability of trained Yemeni to staff the three agricultural secondary schools which they administer. People served by the small but expanding agri-business sector of Yemeni, including credit banks, agricultural input supply firms, and agricultural product processing and marketing firms also will be secondary beneficiaries. The extent to which the public versus private sectors will benefit from the FOA is not known at this time. The growth of each sector and the relative salary relationships between them will be contributing factors. A commentary on these expected beneficiaries is provided in Annex H (Manpower Analysis).

C. Tertiary: Farmers and Farmer Groups

The tertiary beneficiaries of the FOA Subproject are expected to be local villages through the improved technical training at the agricultural institutes, the FOA research studies and developments, the hiring of graduates of such institutions by the NES, and proposed posting to the provincial and local levels. The local extension centers are expected to test, evaluate, and modify for local conditions the research work conducted at the regional extension station. Several aspects of technology development, including water and public grazing land, likely will involve public (common property) issues for group improvement. Training of local paraprofessionals through technical classes and their employment by local groups (LDAs) may provide a means to enhance sensitivity of training and research to maintain focus upon local needs. Availability of television and radio media, even in isolated villages,

improves accessibility of villages and farmers to new technology. Farm families are expected to be the ultimate, but indirect, beneficiaries through institution building which has the capacity to develop and extend technology of relevance to Yemen agricultural needs. Yemen has an egalitarian tradition based on tribal law. This tradition allows any man direct access to leaders to present a grievance or request a favor. Such an egalitarian ethic is expected to provide direct access to government officials. This tradition is expected to serve not only as an important direct linkage to the FOA, but also as a means by which the FOA can link into all of the governorates.

A potential training bias, favoring non-farm village and urban students at the expense of those students with a farm background, is possible. This issue needs to be monitored carefully during the subproject. Current indications from the ISAI are that 80 percent of the students have farm backgrounds. Just how well those students will fare academically in competition with urban students entering the FOA through the secondary school science curriculum is not known. It is expected that up to 80 percent (120 to 150) of the FOA students will come from the regular (science option) secondary schools. However, because many villages are small, a large number of regular secondary school students are expected to have some familiarity with agriculture and are expected to be reflected in the FOA student population.

Of much greater concern is the dearth of productive investment opportunities in rural Yemen 13/. This poses a challenge for the FOA, MAF and NES as the mandate of these institutions is to provide applied technical knowledge of near-term application. The extent to which such issues are near-term in nature, and can be solved satisfactorily, will have a significant impact upon the credibility of the FOA and MAF.

D. The Impact of FOA on Women

Opportunities for educating Yemeni women are increasing slowly. It is important that serious thought be given to encouraging and supporting this trend at all levels of training. This is especially critical since extensive male emigration has placed many women in key production roles. Hence, it is important that women have access to appropriate training in agriculture, in order to improve their individual productivity, which in turn will contribute to the growth of the Yemeni economy.

It is essential that the FOA encourage female enrollment to accelerate their study of the agricultural sciences. In order to accomplish this objective, certain issues need to be addressed, and innovative recommendations proposed in response to the issues raised.

In order to encourage women to join the faculty, they need to be informed about the faculty. They need to have a support structure once they enroll, the curricula needs to include courses that will attract women, university research and extension activities must be responsive to the needs of rural women and men throughout Yemen, and job opportunities for B.S. graduates must be assessed.

There are several suggestions for encouraging women to enroll in the FOA. First of all, the FOA faculty could visit the secondary girls' schools to meet with the third-year science students, in order to inform them about the FOA and provide them with written literature about the faculty. It would be advantageous if this faculty member was a woman. Meeting with the parents could also be arranged.

Housing is another issue that is of particular concern for women. Some women will be able to stay in the womens' dorms with their family approval. For others, this may be more difficult. Assistance with arranging alternative housing with relatives or families would help to encourage the enrollment of women from more traditional families. As more women enroll, and as society begins to accept some of these changes, it will become increasingly easy for other women to enroll. Another incentive for women to enroll would be the availability of financial assistance. This is particularly important for families with several children. Usually the family resources are invested in the education of boys first, then the girls. If alternative assistance was available, it would encourage families to educate the girls also.

Orientation and a support structure for women, once they have enrolled, is extremely important. This can be accomplished through formal orientation sessions and informal group meetings of women students and women faculty members. A woman faculty student advisor could direct and advise women in their scholastic programs, give them moral support, and provide them with a positive role model to observe. It would be impossible for a male faculty to provide this type of support, since they do not face the same constraints as women.

The existence of women faculty members would help attract women students. Therefore, it is recommended that qualified women be identified in all fields of agriculture. Based on the established selection process for selecting participant trainees of the future FOA faculty, qualified women and men could be selected for advanced graduate training. A number of eligible women for participant training have come to the attention of the SPP team. (See Footnote 14 for a list of these women. Also see Table E-1, Annex E for list of the participant trainee positions). Additional discussion on the selection process is discussed in the text of Annex E.

The curricula of the FOA was designed to include courses that will attract women. Based on the assessed interests of women in secondary schools, and the needs of rural women, the recommended curricula for general agriculture is relevant to both women and men. (See Annex E, Table E-3). Because rural women are engaged in all aspects of agricultural and livestock production, food processing, management of farm and family resources, marketing, family nutrition and extension, there is no need to have a dual tract curricula.

University curricula, research and extension activities must be responsive to the needs of rural women and men. In order to accomplish this, it is recommended that women faculty members be represented and/or consulted

on the following university advisory boards: the Curricula Review Committee, the Research Advisory Committee and the Extension Coordinating Committee. (See Annex E, pp. E-12 to E-17 for further discussion of these committees).

E. Extending Benefits to Farmers and Farmer Groups

The local villages will benefit from the FOA through the improved technical training at the agricultural institutes, the hiring of graduates of such institutes by the NES, and the posting of these graduates to the provincial and local levels. It is at this level that women will find more limited opportunities to work because the traditional families do not allow women to work freely in rural areas.

Trained women can, however, work very effectively with rural women as extension directors, trainers of other women and as extension agents. The FOA can provide training for women in all aspects of agricultural sciences. In addition, training in management and communications is essential. With this background, women can provide the leadership necessary to support and promote an active national extension program that meets the needs of the entire rural population, men and women inclusive.

There are several types of media that are being employed for disseminating agricultural information to rural communities including television, video films, slide shows, printed materials, demonstrations and group meetings. Such media have proven to be an effective means for communicating information in the YAR. Therefore, what is needed are additional materials and more qualified extension personnel rather than new approaches.

Some of the films that are being used by the NES have been produced by the FAO of the United Nations, and by the Egyptian film industry. Other materials are produced locally. The FOA could provide leadership in producing films and other materials that are aimed at the agricultural sector through cooperation of their extension faculty. Men and women students could help in developing such materials through class projects.

Specific attention should be devoted to the preparation of informational materials for rural women by women students. Because of the social constraints that make it difficult for rural men and women to participate together in group meetings, much of the extension materials will need to be prepared with a specific target group in mind.

Also, the purpose for preparing the material must be identified. Television shows, films, videos, slides and printed materials have worked well for identifying and explaining new agricultural information and technology to rural farmers and villagers. In particular, television is an effective extension media since most rural villagers, even the poorest, own televisions or have access to them. Individual and group demonstrations have provided an effective approach to showing the farmers how to use the new information and

technology. Finally, daily or weekly meetings with the farmers provide a means for establishing a dialogue with them, and gives the farmers an opportunity to express their problems, concerns and needs.

F. Employment Opportunities for FOA Graduates

In order to attract students to the FOA, there must be employment opportunities for them after they graduate. It is anticipated that there will be many opportunities for the FOA graduates to staff the MAF and possibly the MOE in technical, professional and administrative roles; to staff the on-going donor-supported agricultural and rural development projects; to provide personnel for the emerging agri-business sector; to collaborate in the development and staffing of a National Agricultural Extension Service; and to provide technical expertise for numerous LDAs and a growing credit/banking system. (See Annex G for a comparison of salary levels for various occupations in the YAR, 1983).

All of these jobs would be available to both men and women. Already women are employed in the government ministries, private agri-business companies, academic institutions and donor projects. Among the women and men interviewed, there was a general consensus that it would be possible for professional women to work in these jobs.

Educational and job opportunities for Yemeni women have been limited in the past due to social traditions that restricted their activites to the home. However, these traditions are changing slowly. There are men and women pioneers who have taken the initiative to promote changes. They will be the ones who provide the momentum for continuing change and progress in Yemen. Their spirit is strong. Their own words best reflect their commitment towards accomplishing these goals.

> "The best way to protect a [Yemeni] woman is by educating her. She is a person, after all. By educating her, she will be protected from ignorance, disease and poverty, and, in turn, she can protect all of us... her family, her husband and the society. She is our sister...we are all human." (A male UOS faculty member, November 1983).

How fast will this change occur? It will be gradual, but it will happen. A Yemeni extension woman stated firmly:

> "Don't limit your thinking [in the development of the FOA] to what is possible today. The situation [in Yemen] will change over time. Every day and every month there are changes. Things are beginning to happen that were impossible before. In 5 years,

there will be many more opportunities for men and women than what are available today. We must look to the future with an open mind." (November 1983).

There are Yemeni who are committed to improving their society. They are willing, with adequate training, in part made possible by the establishment of the FOA, and they can succeed.

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FOOTNOTES

1/ Information presented in the Social Soundness Analysis is based on interpretation and analysis of secondary and primary data. Primary data was collected by administering formal questionnaires and conducting informal interviews and meetings.

Formal questionnaires were administered to students in secondary schools in Hodeidah, Taiz, and Sanaa and secondary agricultural institutions in Surdud, Ibb and Sanaa.

Informal interviews and meetings were conducted with men and women directors of secondary schools, agricultural training/vocational institutes, extension centers, UOS faculty members, Ministry personnel (Agriculture, CPO, Information, and Education), and various donor agencies. The following is a list of these respondents.

I. Secondary Schools

A. Hodeidah:

1. Director of the Omar Ibn Abd Al-Aziz Schools (boys).
2. Mabrouka Hamad Musa, Director of the Bilquis Secondary/Preparatory School (girls).
3. Assistant Director, Bilquis Secondary/Preparatory School.

B. Taiz:

1. Abdul Fateh Gamal, Director of the Farouk Secondary Schools (boys).
2. Anisa Shams, Director of the Bilquis Secondary/Preparatory (girls).
3. Saleh Zokair, Principal of the Mohamad Ali Othman School-Primary through Secondary Levels (Co-educational).
4. Sultana Sultan, Registrar of the Mohamad Ali Othman School.

C. Sanaa:

1. Director of the Gamel Abdul Nassar Secondary School (boys).
2. Director of the Arwa Secondary School (girls).

II. Extension Programs

A. Radaa Integrated Rural Development Project (Dutch Project):

1. Abdulla Hababi, General Manager.
2. Robbert H. Van Schagen, Team Leader.

3. Faiza Al-Hassiry, Women's Extension Agent.
4. Sharon Hart, Extension Specialist.

B. Southern Uplands Rural Development Project:

1. Mohamad Ezzo, Extension Specialist
2. Zeinab Ali Ali Mohamad, Women's Extension Director

C. Tihama Development Authority:

Abu Al-Maw'min Hasshim, Director.

Training Vocational Institutes

A. Surdud Agricultural Secondary School:

Omar A.G. Al-Arifi, Director.

B. Ibb Secondary Agricultural Institute (Including Administrative and Teaching Staff):

1. Robert R. Martin, Team Leader.
2. Nabil Al-Ansi, Director.
3. Sunny Langham, Project Director, NMSU.
4. Amin Abusher, Crops and Soils Instructor.
5. Musa Allagabo, Horticulture Instructor.
6. Hassan I. Gasim, Agricultural Instructor.
7. Mohamed Al-Garbawi, Food and Dairy Technology Instructor.
8. Awadallah Yousif Hamid, Animal Science Instructor.
9. Abou Soud Kairy, Agricultural Extension Instructor.
10. Don Swanjord, English as a Second Language Instructor.

C. Veterinary Secondary School (Sanaa):

Omar Mohsen Al-Bakri, Director

Ministries - Sanaa

A. Agriculture:

1. Mohamad Ariani, Director of Extension.
2. Abdull Hafiz Karhash, Deputy Director and Co-Manager.

B. Education:

1. Mohamad Al-Harazi, Director of Agricultural Education.
2. Fatima Fadhal, Director, Women's Education Section.
3. Fawziya Namaan, Director of Women's Secondary Schools
4. Ashwaq Al-Shabiy, Director of Preparatory Schools.
5. Najat Al-Yarima, Director of Primary Schools.

C. Information:

Ahlaah Al-Mutawakil.

D. Central Planning Office:

Nabila Al-Jarafi, Regional Planning Advisor.

E. Family Planning Institute:

1. Atiqa Shami, Deputy Director and President of the Women's Association.
2. Malika Othman, Family Planning.

V. University of Sanaa

A. Faculty of Commerce and Economics:

Nassar A. Aulaqi, Associate Dean.

B. Faculty of Science:

Ahmad Hamza Al-Yamani, Assistant Professor.

C. Planning Section:

1. Mohamed A. Mohsen, Director, Technical Office.

2. Mohamed Saadi, Assistant Director, Technical Office.

D. Office of UOS Rector:

Abu Baker Al-Qirbi, Vice Rector.

VI. Donors

A. AID:

1. Susan Coleman.
2. Koukab Al-Jofi.
3. Hans P. Peterson, Agricultural Development Officer.

B. American Institute for Yemeni Studies:

Lealand Swanson, Director.

Reference sources for this section include:

a. AID/Yemen, Agriculture Sector Assessment, Yemen Arab Republic, 1982.

b. Swanson, Jon C. and Mary Hebert, Rural Society and Participatory Development: Case Studies of Two Villages in YAR, Cornell, 1981.

c. World Bank, Agricultural Sector Study, November 17, 1981.

d. YAR, Agricultural Census Data, 1977-80, for Six Governorates.

3/ Ministry of Education.

4/ Ibid.

5/ Ibid.

6/ Myntti, Cynthia, 1979. Women and Development in Yemen Arab Republic. Germany, German Agency for Technical Cooperation, Ltd., p. 73.

7/ Ibid.

8/ Agricultural Education for Development in the Middle East, edited by John Ryan and Adeb T. Saad, American University of Beirut, 1980, pp 162-4.

9/ AID/Yemen, Agricultural Sector Assessment, Yemen Arab Republic, 1982, pp. 92-95.

10/ Ibid. pp. 87-88.

11/ Ibid. p. 95.

12/ Richard Tutwiler and Shelia Carapico, Yemeni Agriculture and Economic Change, American Institute for Yemeni Studies, 1981, pp. 167-8.

13/ Rural Development in the Yemen Arab Republic Strategy Issues in a Capital Surplus - Labor Short Economy, John M. Cohen and David B. Lewis, Development Discussion Paper No. 52. Harvard Institute for International Development, February 1979, pp. 47-54.

14/ List of potential women for participant trainee positions.

Name	Position
1. Fatima Fadhil	Director, Women's Education, MOE
2. Fawziya N'aman	Director, Women's Secondary Education, MOE
3. Ashwaq al-Sh'abi	Director of Preparatory Schools, MOE
4. Nayat al-Yarimi	Director of Primary Schools, MOE
5. Suad Ali Raja	English Instructor YALI, MA degree in Applied Linguistics, MA degree in Mass Communications

6.	Howa al-Ariyani	AID Participant, Headmistress Girl's School
7.	Jamila Ali Raja	Newscaster
8.	Somaiya Ali Raja	Kuwait TV
9.	Mabrouka Hamad Musa	Director, Bilquis Secondary/Preparatory School in Hodeidah
10.	Anisa Shams Cun	Director, Bilquis Secondary/Preparatory School in Taiz
11.	Sultana Sultan	Registrar, Mohamad Ali Othman School in Taiz
12.	Najiba Abdulgani	Deputy, MOH
13.	Wahiba Farah	Sana'a University - Education
14.	Mehtab Omar	Yemen Family Planning
15.	Atica Al-Shami	Deputy Director of Family Planning, Women's Association President
16.	Mubery Eshan	MAF Veterinary Services Project
17.	Bilquis al-Thibi	Central Planning Organization
18.	Othma Basha	Deputy Assistant, Legal Council, CPO
19.	Afrah Al-Hammami	Yemen Research Institute
20.	Nadia al-Thibi	Central Planning Organization
21.	Bilquis al-Hadrani	Yemen Research Institute
22.	Fatima al-Haraybi	Ministry of Agriculture, Poultry Project
23.	Ahlan Abdullmalik	Ministry of Information
24.	Nadia Saif	Director of Extension, Radaa Integrated Rural Development Project
25.	Koukab al-Jofi	AID Assistant
26.	Malika Othman	Family Planning

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ANNEX G

ECONOMIC AND BUDGETARY ANALYSIS

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ECONOMIC AND BUDGETARY ANALYSIS

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ANNEX G

ECONOMIC AND BUDGETARY ANALYSIS*

I. OVERVIEW OF ISSUES

A. General

The establishment of an FOA at the UOS is aimed at overcoming critical shortages of professional level manpower in YAR. A discussion of the probable incidence of primary, secondary, and tertiary benefits of the FOA Subproject is included in Annex F, Social Soundness Analysis. However, because of imprecise knowledge of the magnitudes of anticipated benefits and the difficulty of identifying social cost issues, it was necessary to consider an alternative to a conventional benefit-cost analysis of the FOA Subproject. In accordance with recommendations in the USAID Handbook, Appendix 3 E, a least cost analysis was undertaken.

The basis of the analysis is the determination of the cost of achieving (a part of) the Subproject End of Project Status (a given number of Yemeni trained to the B.S. level in general agriculture) via a set of alternative feasible training approaches. These approaches are:

1. Establish FOA at the UOS and train Yemeni to the B.S. level (FOA alternative);

2. Train Yemeni to the B.S. level in already established agricultural programs in Arab countries (Arab alternative); and

3. Train Yemeni to the B.S. level in already established agricultural programs in the U.S. (U.S. alternative).

B. Limitations of Analysis

As a least cost (or cost-effectiveness) analysis, the following study lacks some of the comprehensiveness of a thorough benefit-cost analysis. There are, therefore, some unquantifiable factors which should be kept in mind as the material in this annex is considered. One problem involves quality considerations. Are graduates of the FOA, an Arab institution, and a U.S. institution strictly comparable? It is expected that Yemeni students trained by Yemeni professors versed in the teaching, research, and outreach traditions of U.S. Land Grant institution will demonstrate a greater degree of proficiency in solving agriculture problems facing Yemen.

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* Note that this annex consists of two separate analyses. The economic analysis is covered in Sections I through IV below. The budgetary analysis is contained in Section V. The conclusions from both analyses are contained in Section VI.

The indigenously-trained students will be better suited for service in the YARG ministries and could better provide technical and managerial inputs into private sector (or mixed public- and private-sector) agriculture. Another factor not considered concerns foreign exchange losses due to students supplemental spending abroad. A detailed benefit-cost analysis may also require the analyst to address additional factors such as wage levels inside and outside of Yemen, productivity in agriculture, and a more thorough discussion of discount rate selection.

C. Organization

Following a discussion of relevant cost-effectiveness indicators, parameters, and variables, the analytical procedure is developed. Using base level (most likely) values of variables and parameters, base level set of "least-cost indicators" are derived. These reveal that one alternative will have a least cost advantage with respect to one or more of the indicators. Next, by systematically varying the value of variables used in the base level sensitivity analysis, the response of the indicators (and findings of least cost advantage) can be examined. The conclusions of this analysis are presented at the end of this annex.

II. LEAST COST ANALYSIS

A. Indicators

Table G-1 (a) indicates the three least cost indicators used in this analysis. These are:

1. Total Present Value of Costs for Each Alternative (Total PV Cost). The cost schedule for each alternative is used (along with an appropriate rate of discount) to derive a schedule of "discounted" costs. This is done to make dollars spent or received at different times comparable in value. The process of converting the given costs to a "present value" as of a given date (year 1 in this analysis) is called discounting. Summing the present values of costs over the planning horizon of the subproject results in the total pv cost.

2. Total PV Cost per Graduate Retained in YAR. This is a reduced value of indicator (1). Because the alternatives are assumed to result in different levels of permanent emigration from YAR, this indicator has a special relevance to the country's development prospects.

3. Total PV Cost per Graduate Joining MAF. This is also a reduced value of indicator (1). The alternatives are assumed to have some influence on whether graduates ultimately take employment with MAF. Because of the institutiona linkages of the proposed FOA to the MAF it is expected more its graduates wil be inclined to join MAF.

It has been suggested that least cost indicators be broken down to reflect the present value costs that will be paid by each of the co-financing donors. These breakdowns are, however, inconsistent with the purpose of an economic analysis. Cost breakdowns by donor and by year are, however, contained in Annex I, financial plan.

TABLE G-1

Least Cost Indicators, Parameters, and Variables

(a) Indicators for Least Cost Analysis

Each of the following four indicators is derived from the total present value cost of an alternative (the sum of present values of the stream of costs of the alternative over time).

1. Total present value cost (Total PV Cost) to combined sponsors
2. Total present value cost per B.S. level graduate retained in YAR; cost to combined sponsors.
3. Total present value cost per B.S. level graduate joining MAF; cost to combined sponsors

(b) Parameters in Analysis

1. AID Life of Project = 11 years.
2. Planning Horizon = 21 years.
3. Student population dynamics determined by cohort survival model with the same drop-out rate for each of four years in a typical student program.
4. Graduate equivalent function determines number of graduates "in pipeline" at the end o horizon.

(c) Variables in Analysis

	FOA	Arab University	U.S. University
1. Graduates at End of Project Life (as per EOPS)	480	480	480
2. Annual Rate of Graduates at End of Project Life	120	120	120
3. Four-Year Dropout Rate (percent)	20	10	10
4. Percentage Distribution of Graduates Through End of Project Life			
Year 6	6 %	6 %	6 %
7	9	9	9
8	14	14	14
9	20	20	20
10	24	24	24
11	27	27	27
5. Rate of Discount (percent)	2	2	2
6. Rate of Retention in YAR (percent)	100	90	80
7. Rate of Retention in MAF (percent)	80	60	30
8. Annual Cost per Student	Not Applicable	8,000	20,000
9. Schedule of Costs for FOA Alternative ($ thousand)	See Below	Not Applicable	Not Applicable

YEAR	FOA COST (EST.)[a]	YEAR	FOA COST (EST.)	YEAR	FOA COST (EST.)
1	$ 15,768,815	8	$ 2,665,713	15	$ 1,794,923
2	3,968,049	9	2,450,191	16	1,794,923
3	13,243,882	10	2,248,701	17	1,794,923
4	13,777,740	11	2,294,475	18	1,794,923
5	3,733,570	12	1,794,923	19	1,794,923
6	3,420,782	13	1,794,923	20	1,794,923
7	3,363,408	14	1,794,923	21	1,794,923

		FOA	Arab University	U.S. University
10. Salvage Value of FOA land and building		$ 10,000,000	Not Applicable	Not Applicable
11. Equivalent value of FOA faculty consulting services	- Beginning year	Not Applicable	12	12
	- Initial amount		$ 20,000	$ 20,000
	- Incremental amount		$ 5,000	$ 5,000

[a] Derived from Annex I, Financial Plan, Table I-1

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B. Parameters

The parameters for this analysis (shown in Table G-1 (b)) involve the selection of a project life and a planning horizon, and methods for determining total enrollment and total numbers of graduates.

1. The duration of the FOA Subproject has been fixed at 11 years.

2. Another parametric feature of the analysis concerns the transitioning of B.S. candidates through the educational systems of the FOA with resources from YARG alone (and with only Yemeni staff) over a period of time comparable to the project life. For this reason the planning horizon was set at 21 years.

3. Another parametric feature of the analysis concerns the transitioning of B.S. candidates through the education systems of the FOA, Arab Institutions, and U.S. institutions. Accounting for student population (like costs) is done on a calendar year. In this analysis, both the entering classes and finishing classes are present at the institution during the calendar year, and, therefore, are included in the annual student population. A simple 4-year cohort survival model is used to determine the population of each class in each year given the levels of the graduates assumed in the analysis. More complete models can be approximated by using the experiences of foreign B.S. candidates in the U.S. and Arab institutions as well as the proposed FOA. For example, these can be approximated by an appropriate value for the 4-year dropout rate.

4. Another parameter in the analysis is the function used to obtain the estimate of "B.S. equivalents" at the end of the planning horizon. Assuming this falls at the end of a calendar year (between semesters), the function specifies that 1/8, 3/8, 5/8, and 7/8 of the 1st, 2nd, 3rd, and 4th year of classes, respectively, will be "B.S. equalivents." Both this function and the population dynamics function become significant due to differences in dropout rates among the three alternatives.

C. Variables

In addition to indications and parameters, there are a number of key variables in the analysis (see Table G-1 (c)). Foremost are two principal items listed in the End of Project Status in the Logical Framework (see Annex B). During the project life, a target number of graduates (480) are anticipated. This figure is coupled here with an assumed percentage distribution of graduates over that time period. From the end of the project life to the end of the planning horizon, a target annual rate of graduates (120) is specified. The 4-year drop-out rates for FOA and training abroad are derived from statistics on Yemeni students at UOS and Yemenis training abroad.

There are a number of financial variables to be considered. Most important are the time series of costs for the FOA over the planning horizon derived from the proposed subproject budget in Annex I, Financial Plan. These costs include the actual projected costs and contingency costs, but not the inflation costs. In the period from the end of the project life to the end of the planning horizon, YARG is assumed to operate the FOA at the same "cost to YARG" that occurs in the last year of the project life. Under the FOA alternative, the building and land is assumed to have a salvage value at the

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end of the planning horizon. The present value of salvage is credited against the total present value of costs of the FOA alternative.

For the Arab and U.S. training alternatives, the key variables are cost per student per year. These figures are derived from actual USAID training program costs for Yemen in 1983. The U.S. and Arab alternatives are assigned extra costs deemed as necessary to approximate the value of professional services contributed to YARG by an indiginous FOA if it were to exist. One might envision these costs as those that would have to be incurred in purchasing an equivalent amount of consultants' time. A (linear) time-dependent cost function was used to incorporate these costs into the overall Arab and U.S. alternative costs.

The discount rate can be specified for each training alternative. It is assumed to be constant over the planning horizon. The selection of an appropriate discount rate for social investments such as education is a difficult task. It can be argued that costs should be discounted at say, the minimum level of observed rates of return on higher education in less developed countries. A recent World Bank study by Psacharopoulus suggests that minimum annual rates of return in higher agricultural education are about 6 percent.1/ On the other hand, it is contended that Yemen exhibits low productivity in agriculture, has a low per capita income from domestic enterprises and has a shortage of foreign exchange. It would be consistent with the granting of loans at concessionary rates to apply a similarly low level of discount rate to this project. Recent International Development Agency (IDA/IBRD) concessionary loans have been granted at annual rates of 1.5 percent to 2.5 percent.

There are key variables which indicate the percentages of graduates (1) retained in YAR and (2) choosing to join MAF for each of the training alternatives. These variables are inferred from experiences that USAID, CID, and MAF have had with trainee programs and from general references on manpower planning in YAR.

III. ANALYSIS

A. Procedure

As indicated initially, there are (in this study) three alternate means of training Yemeni to the B.S. level in general agriculture. One alternative, establishment of the FOA, entails a different pattern of expenditures to accomplish this output objective than do the other two alternatives (training in an Arab university and training in a U.S. university). Specifically, the establishment of an FOA involves significant investments prior to the beginning of any teaching activities with relatively lower costs in subsequent years. The other two alternatives call for relatively higher expenditures in later years in order to generate an equivalent number and timing of B.S. degrees.

Figure G-1 is a flowchart showing the computational procedures involved in deriving the least cost indicators discussed previously. The first task is to specify, empirically, the level and timing of graduates, entrants, and student populations per year as implied in the input variables derived from the projected End of Project Status. (See Logical Framework, Annex B). One facet of this procedure, student population per year, is

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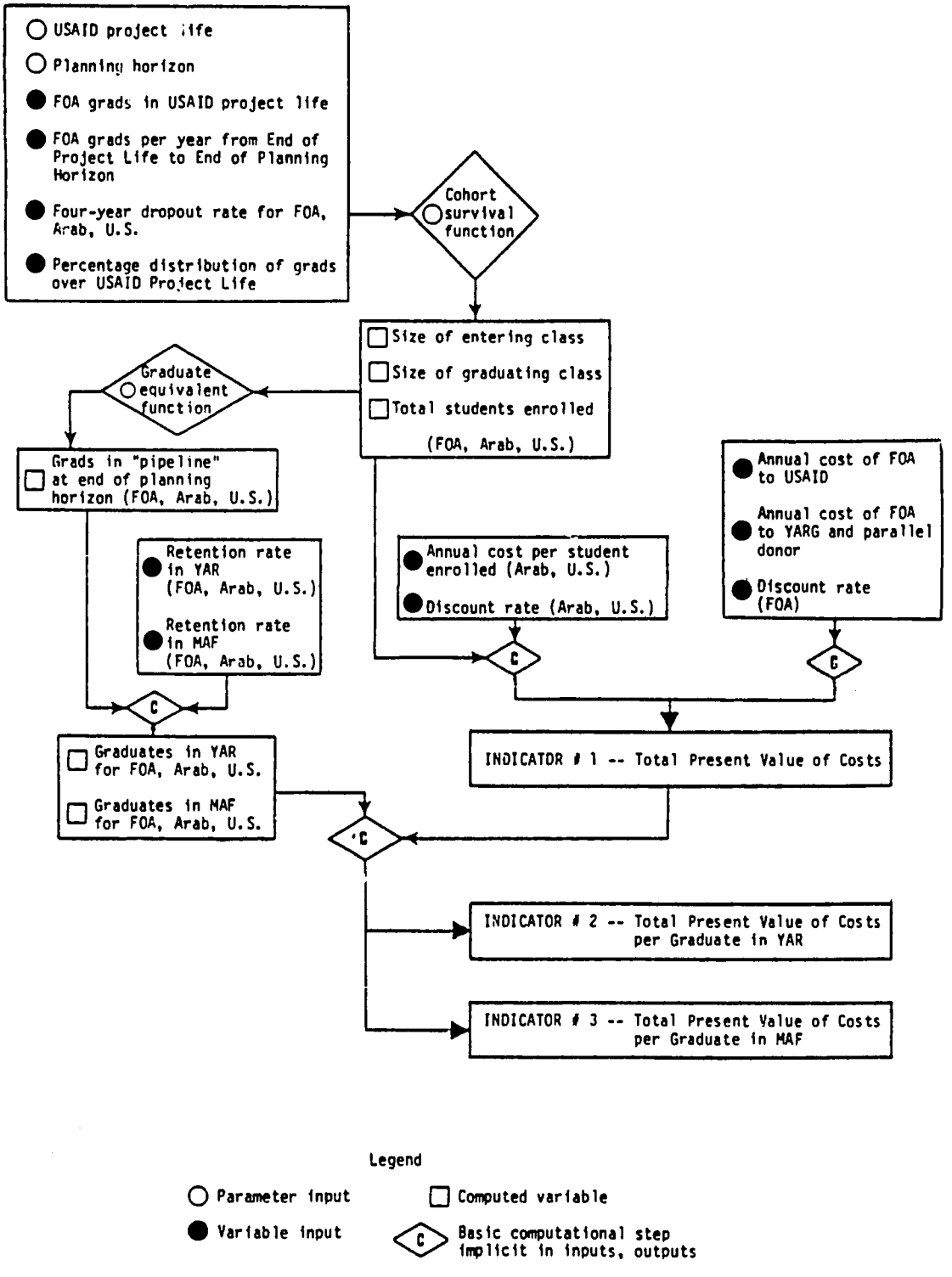
FIGURE G-1

Flowchart Indicating the Computation of Least Cost Indicators



incorporated in the computation of the annual costs of training Yemeni in the Arab and U.S institutions. Another facet of this computational step is to derive an estimate of the total number of actual graduate and "graduate equivalents". The latter reflects the number of students "in the pipeline" at the end of the planning horizon. Different assumptions about dropout rate for the different alternatives will cause the total number of "graduates plus equivalents" to be different.

The stream of costs for the FOA alternative are adapted from the Subproject Summary budget (Table I.1 Annex I). It is assumed that there will be no USAID participation after the end of the project life and that the YARG will continue to support the FOA. The resultant cost in each year is then converted to a PV figure using the appropriate rate of discount. For each alternative, the total of annual PV costs is calculated. The next step is to multiply the total graduates and graduate equivalents by the appropriate YAR and MAF retention factors. This yields an estimate of the number of graduates staying in YAR and the number joining MAF after receiving B.S. degrees in each of the training alternatives. The final step is to compute the least cost indicators by dividing the total PV cost for each alternative by (1) graduates retained in YAR, and (2) graduates joining MAF for each alternative.

B. Results for the Base Level Values of Parameters and Variables

A "base level" run of the least cost analysis was performed using most realistic values of the parameters and variables listed in Table G-1. The following tables and narrative discuss this run. Table G-2 shows the results (graduates, student population, actual costs, inflated costs, PV costs) for the FOA alternative. As shown, the total PV cost of the FOA is $69,576 to the combined sponsors.

Table G-3 shows a similar set of results for the Arab and U.S. alternatives. The total PV cost is $64,171 for the Arab alternative and $159,967 for the U.S. alternative.

Table G-4 indicates the results of the Graduate Equivalent Function in the analysis. The first three columns show the number of students in each class in the pipeline at the end of the planning horizon. The function determines the number of "B.S. equivalents" in these classes by multiplying them by an adjustment factor. Similarly, Table G-5 is included to show the number of graduates and graduate equivalents projected to (1) remain in YAR and (2) join MAF as derived by use of the appropriate retention rates for each alternative.

The least cost indicators for the base level run are shown in Table G-6. The principal findings are:

1. The U.S. alternative is financially untenable regardless of which least cost indicator is used. The cost per graduate retained in YAR is $103,472; the cost per graduate joining the MAF is $275,806.

2. Comparing the FOA alternative with the Arab alternative requires some caution:

TABLE G-2

Costs of Establishing and Operating a
Faculty of Agriculture at University of Sanaa:
Results of the Base Level Analysis

A. Construction and Operating Costs

Year	Number of Students			Costs in $US (thousands) Actual:	Present Values:[a]
	Entering	Graduating	Enrolled	Combined Sponsors	Combined Sponsors
1	0	0	0	15768	15768
2	36	0	36	3968	3890
3	54	0	88	13244	12730
4	90	0	173	13244	12982
5	126	0	290	3733	3449
6	144	29	417	3420	3098
7	150	43	518	3363	2986
8	150	72	600	2665	2320
9	150	101	673	2450	2091
10	150	115	668	2249	1882
11	150	120	673	2295	1883
12	150	120	673	1795	1444
13	150	120	673	1795	1415
14	150	120	673	1795	1388
15	150	120	673	1795	1360
16	150	120	673	1795	1334
17	150	120	673	1795	1308
18	150	120	673	1795	1282
19	150	120	673	1795	1257
20	150	120	673	1795	1232
21	150	120	673	1795	1208
TOTALS		1680			$ 76306

B. Salvage value for FOA land, buildings, and equipment

Assumed value at end of planning horizon = $ 10,000,000

Present value of salvage in year 1 [a] = $ 6,370,000

C. Total Present Value Cost for FOA

$ 76,306,000 - $ 6,370,000 = $ 69,576,000

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[a] Discounted at 2 percent (see discussion of variables)

TABLE G-3

Costs of Training Students Abroad
in Arab and U.S. Institutions

A. Basic Costs of Arab and U.S. Alternatives

Year	Number of Students			Project Budgets					
	Entering	Graduating	Enrolled	Actual Student Costs per yr. in $		Total Annual Cost in $ ('000s)		Present Value of Costs in $ ('000s) a/	
				Arab	U.S.	Arab	U.S.	Arab	U.S.
1	0	0	0	0	0	0	0	0	0
2	32	0	32	8000	20000	256	640	251	627
3	48	0	79	8000	20000	632	1580	607	1519
4	80	0	158	8000	20000	1264	3160	1191	2978
5	112	0	265	8000	20000	2120	5300	1959	4896
6	128	29	386	8000	20000	3088	7720	2797	6992
7	133	43	480	8000	20000	3840	9600	3410	8525
8	133	72	560	8000	20000	4480	11200	3900	9750
9	133	101	608	8000	20000	4864	12160	4151	10378
10	133	115	627	8000	20000	5016	12540	4197	10493
11	133	120	632	8000	20000	5056	12640	4148	10369
12	133	120	632	8000	20000	5056	12640	4066	10166
13	133	120	632	8000	20000	5056	12640	3987	9967
14	133	120	632	8000	20000	5056	12640	3908	9771
15	133	120	632	8000	20000	5056	12640	3832	9580
16	133	120	632	8000	20000	5056	12640	3756	9392
17	133	120	632	8000	20000	5056	12640	3681	9206
18	133	120	632	8000	20000	5056	12640	3610	9025
19	133	120	632	8000	20000	5056	12640	3540	8848
20	133	120	632	8000	20000	5056	12640	3471	8674
21	133	120	632	8000	20000	5056	12640	3403	8504
TOTALS	-	-	1680	-	-	-	-	63864	159660

B. Present value of consulting services equivalent to those provided by indigenous FOA faculty members (same for Arab and U.S.)

$$\text{PV services} = \frac{\$20{,}000}{(1.02)^{11}} + \frac{\$25{,}000}{(1.02)^{12}} + \frac{\$30{,}000}{(1.02)^{13}} + \cdots = \$\ 307{,}000$$

C. Total cost of Arab and U.S. alternatives

	Arab	U.S.
Basic cost	$ 63,864,000	$ 159,660,000
Services	307,000	307,000
Total	$ 64,171,000	$ 159,967,000

a/ Discounted at 2 percent

TABLE G-4

Results of the Graduate Equivalent Function -- Base Level Analysis

Class	Number of Students Enrolled Last Year of Planning Horizon			Adjustment Factor	B.S. Equivalents in Last Year of Planning Horizon		
	FOA	Arab	U.S.		FOA	Arab	U.S.
1st Year	150	133	133	.125	19	17	17
2nd Year	142	130	130	.375	53	49	49
3rd Year	134	126	126	.625	84	79	79
4th Year	127	123	123	.875	111	108	108

TABLE G-5

B.S. Level Graduates Retained by YAR and MAF: Base Level Analysis

	FOA	Arab	U.S.
B.S. Recepients	1680	1680	1680
B.S. Equivalents	267	253	253
Total	1947	1933	1933
Retained in YAR	1947	1742	1742
Retained in MAF	1559	1161	579

TABLE G-6

Present Value Costs per Retained Graduate: Base Level Run

Least Cost Indicator	Costs ($)		
	Alternative		
	FOA	Arab	U.S.
1. Total Present Value of Costs	$ 69,576,000	$ 64,171,000	$ 159,967,000
2. Total Present Value of Costs per Graduate Retained in YAR	$ 35,735	$ 36,880	$ 103,472
3. Total Present Value of Costs per Graduate Retained in MAF	$ 44,657	$ 55,320	$ 275,806

a. If the primary indicator is retention of graduates in the YAR, then the FOA alternative exhibits a very slight least cost advantage over the Arab alternative: $35,735 per graduate from FOA to $36,880 per graduate from an Arab institution.

b. If the primary indicator is retention of graduates by MAF, then the FOA exhibits a signficant least cost advantage over the Arab alternative: $44,657 to 55,320, respectively.

C. Discussion of the Base Level Analysis

The base level analysis calls attention to the need to examine more closely the FOA and Arab alternatives of training B.S. level graduates in Yemen. In terms of total PV cost, the Arab alternative exhibits a significant advantage. However, this advantage is diminished in deriving the other two least cost indicators. This can be attributed to the higher rates of retention of graduates in YAR and in MAF which are obtained for the FOA alternative. In a more fundamental sense, however, the basic relationship of FOA costs and Arab costs results more from the incidence of costs over time. The FOA has high costs in its early years whereas the Arab alternative is, in a relative sense, more costly toward the end of the planning horizon. This difference in the relative incidences of costs over time is in turn dependent upon parameters and variables used in the analysis. These values are derived from investigations under taken by the SPP team in Yemen or were arrived at on the basis of professional judgement.

The base level analysis is as valuable (if not more valuable) for what it can reveal about the response of this modeled system to changes in the variables and parameters as it is for the determination of absolute values as given above.

IV. A SENSITIVITY ANALYSIS

As noted above, the behavioral characteristics of the least cost model hinge largely on the timing and magnitudes of costs for the alternatives considered. There are also some very direct determinates of least cost ranking; for example, the costs per graduate retained in YAR and/or retained by MAF can be directly manipulated by changing the retention rates.

Methodological approaches to conducting sensitivity analyses are of two kinds: (1) the recording of percentage responses in outputs in response to. given percentage changes in the values of inputs, and (2) recording the amount of change in one input variable (done one variable at a time) necessary to effect a pre-specified change in one or more of the least cost indicators.

The latter approach was taken with respect to several input variables. In order to expedite the sensitivity analyses, only the values of the Arab and FOA variables were changed. The U.S. alternavite exhibited much too high of a cost to make it competitive. The results discussed here appear in Table G-7.

A. Response to Arab University Training Costs

The annual cost of training, per student, in Arab institutions is a direct determinant of the total cost of this alternative. The procedure was to change this training cost to a level where selected least cost indicator is

TABLE G-7

Summary of Sensitivity Analysis Findings

Response to	INDICATOR 1			INDICATOR 2			INDICATOR 3		
	Base Level Variable Value & New Value	Total Present Value of Costs		Base Level Value & New Value	Cost per Graduate Retained in YAR		Base Level Value & New Value	Cost per Graduate Retained in MAF	
		FOA	ARAB		FOA	ARAB		FOA	ARAB
(a) Arab University Training Costs ($ per student per year)	BASE= $8,000	$69,576,000	$64,171,000	BASE= $8000	$35,735	$40,321	BASE= $8000	$44,657	$55,320
	HI = $8,750	" "	$70,158,000	LOW = $7250	" "	$35,279	LOW = $6250	" "	$43,885
(b) Graduates (total # & annual rate at 11 years)	BASE = 480 & 120	$69,576,000	$64,171,000	BASE = 480 & 120	$35,735	$34,614	BASE = 480 & 120	$44,657	$55,320
	HI = 600 & 200	" "	$99,314,000	HI = 600 & 200	$22,849	$36,539	HI = 600 & 200	$28,562	$54,809
	MED = 520 & 133	" "	$69,286,000	MED = 520 & 133	$32,456	$35,876	MED = 520 & 133	$38,134	$55,105
	LOW = 200 & 80	" "	$38,436,000	LOW = 200 & 80	$59,013	$36,536	LOW = 200 & 80	$73,781	$54,841
(c) Rate of Discount (percent)	HIGH = 4 %	$64,935,000	$51,147,000	HIGH = 4 %	$33,361	$29,395	HIGH = 4 %	$41,690	$44,092
	BASE = 2 %	$69,576,000	$64,171,000	BASE = 2 %	$35,735	$36,880	BASE = 2 %	$44,657	$55,320
	LOW = 1 %	$72,139,000	$72,244,000	LOW = 1 %	$37,051	$41,520	LOW = 0 %	$46,302	$62,279
(d) Length of Planning Horizon (years)	BASE = 21	$69,576,000	$64,171,000	BASE = 21	$35,735	$36,880	BASE = 21	$44,657	$55,320
	NEW = 25	$74,688,000	$77,325,000	NEW = 25	$30,774	$35,601	NEW = 25	$38,459	$53,402
(e) Rate of Retention in YAR for Arab Institution Grads (percent)	------	------	------	BASE = 90	$35,735	$36,880	------	------	------
	------	------	------	LOW = 80	" "	$41,508	------	------	------
	------	------	------	HIGH = 93	" "	$35,766	------	------	------
(f) Rate of Retention in MAF for Arab Institution Grads (percent)	------	------	------	------	------	------	BASE = 60	$44,657	$55,320
	------	------	------	------	------	------	HIGH = 78	" "	$43,753
(g) Drop-out Rate in Arab Institution (percent over 4-year program)	BASE = 10	$69,675,000	$64,171,000	BASE = 10	$35,735	$36,800	BASE = 10	$44,657	$55,320
	HIGH = 22	" "	$68,743,000	LOW = 6	" "	$35,858	LOW = 0	" "	$48,583
(h) Salvage Value of FOA facilities ($)	BASE = $ 10M	$69,675,000	$64,171,000	BASE = $ 10M	$35,735	$36,880	BASE = $ 10M	$44,657	$55,320
	LOW = $ 0	$76,306,000	" "	LOW = $ 0	$39,136	" "	LOW = $ 0	$49,612	" "
	HIGH = $ 15M	$66,365,000	" "	HIGH = $ 15M	$32,793	" "	HIGH = $ 15M	$41,664	" "
(i) Value of Faculty initial year, base amt, increment)	BASE = 12th yr, $ 20,000, $ 5K/yr	$69,675,000	$64,171,000	BASE = 12 yr, $ 20,000 $ 5K/yr	$35,735	$36,880	BASE = 12 yr, $ 20,000 $ 5K/yr	$44,657	$55,320
	HIGH = 8th yr, $ 50,000, $ 20K/yr	" "	$64,984,000	HIGH = 8th yr, $ 50,000, $ 20K/yr	" "	$37,383	HIGH = 8th yr, $ 50,000 $ 20K/yr	" "	$56,024

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equal for both the FOA and the Arab university alternative. Based on information provided by the USAID/Yemen Training Office, it was established that the base level amount of $8,000 per student per year was somewhat conservative. Considerable sentiment has been expressed by USAID/Yemen and others that Arab institutions are "subsidized" resulting in an understated student training cost. Whether or not the differences in cost expressed here are in fact "subsidies" has no bearing on the outcome of this analysis, however. The results of simply varying the Arab training costs are:

1. Total PV cost for the two alternatives become equal when the Arab training costs are increased to $8,750 per student per year.

2. When the Arab student costs are lowered to $7,350, that alternative becomes competitive with the FOA on the basis of cost per student retained in the YAR.

3. A further decrease in the Arab student cost to $6,300 makes the Arab alternative competitive with the FOA on the basis of cost per student retained in the MAF.

It is more plausible that the Arab annual per student training costs are higher than $8,000 per year which would definitely make the FOA option at least as economically preferable to the Arab institution option on the basis of all indicators presented here.

B. Response to Number of Students

In the Logical Framework's EOPS, it is projected that by the end of year 11, there will be 480 graduates and there will exist the capability to graduate 80 to 120 degree recipients annually. As indicated above, the base level economic analysis was performed on the basis of 480 graduates at the end of year 11 and 120 graduates per year from year 12 through the end of the planning horizon (21 years in the base level analysis). It was also indicated above that the levels of graduation affect the economic analysis by directly affecting the basic costs of the Arab and U.S. alternatives. The basic cost of the FOA is probably invariant to the number of graduates from the FOA in the range of 200 to 500 graduates by the end of the project life and in the capability range of 80 to 120 per year at the end of the project life. Note, however, that the cost per graduate increases because there are fewer graduates and conversely, the FOA cost per student decreases when there are more.

Increasing the number of graduates in the first 11 years from 480 to 600 and the rate of 120/year to 200/year significantly increases the competitive cost advantage held by the FOA over the Arab alternative. Decreasing the presumed number of initial graduates from 480 to 410 (and rate from 120 to 105) has the expected effect of making the Arab alternative more competitive as far as total present value of costs and cost per graduate reatined in YAR. When the graduate figures are lowered to 340 and 100 per year, the Arab alternative becomes the least cost alternative in all three criteria.

C. Response to the Discount Rate

Gauging the effect of discounting is an important feature of an economic analysis. As noted above, however, it is far more important to be able to conceptually rationalize the choice of discount rate. The object of the sensitivity analysis is to determine the response of the findings as this real rate of discount is decreased to 1 percent and as it is increased to 4 percent per year and higher. In the first case (as shown in Table G-7 (c)), the lowered real rate of discount enhances the least cost position of the FOA. Conversely, increasing the real rate of discount enhances the least cost position of the Arab alternative. These findings are consistent with the fact that the costs of the FOA occur relatively early in the planning horizon whereas the converse is true for the Arab alternative. Choice of an appropriate real rate of discount for investment decision making is contingent on several issues including the nature of the benefits, the nature of capital markets, and economic conditions within the relevant countries. Given the long time horizon over which benefits from an FOA will emerge, imperfect capital market development in YAR, and the granting to YARG of development loans and operating funds at concessionary terms, it is not unreasonable to conduct the economic analysis at levels of the rate of discount used here.

D. Response to Length of Planning Horizon

Reflecting the difference in the relative incidence of costs over time between the FOA alternative and the Arab alternative, increasing the length of the planning horizon enhances the least cost position of the FOA. Table G-7 (d) shows that as the planning horizon is increased from 21 years to about 25 years in the base level analysis, the total PV cost of the FOA becomes equal to the total PV cost of the Arab alternative.

E. Response to Retention Rates

The retention rate assumptions used in the base level analysis are essentially qualitative estimates used to establish a relative index of each of the training alternatives in furthering the agricultural and general economic development of YAR. Given the projected staffing levels in MAF, projected staffing levels in other YARG agencies, emerging opportunities in the private sector, and the trend of returning graduates, the base level retention rates appear reasonable.

The rates for the FOA alternative deserve some discussion. The 100 percent YAR retention of B.S. graduates from the FOA is assumed to apply as long as an individual does not choose to continue graduate study. The 80 percent MAF retention rate for the FOA alternative is based on the projected needs of MAF and the projected close ties between the FOA and MAF.

While the rates for the FOA may reflect some optimism, there is probably a greater likelihood of a softening of the assumed YAR and MAF retention rates (90 and 60 percent, respectively) of the Arab alternative. This would enhance the least cost position of the FOA. Note that varying the retention rates has no effect on the total present value of costs of the alternatives.

F. Response to Dropout Rates

The FOA is expected to exhibit a 4-year dropout rate similar to what appears to occur at the UOS: 20 percent. This figure is subject to some ambiguity since it is not uncommon for some students (especially in the UOS Faculty of Commerce) to prolong college degree programs to 6, 7, 8, or more years. The Arab university 4-year dropout rate is set at 10 percent based on USAID records of trainees. The Arab dropout rate directly affects the cost of that alternative. An increase in the Arab dropout rate to 20 percent enhances the least cost position of the FOA so that the FOA has the lowest total present value costs.

G. Response to Salvage Value

The FOA structure, facilities, and land is assumed to have a salvage value of $10,000,000 at the end of the planning horizon. Decreasing this to $5,000,000 has the effect of making the FOA a lower cost alternative on the basis of only the "retained MAF" least cost indicator. Eliminating the salvage value altogether has the same effect.

H. Response to Value of Faculty Services

The total discounted cost of making up for contributed faculty time by extimates of what would have to be paid to consultants amounts to very little in the model. The issue is that a considerable amount of FOA time would have to be made available to MAF and the private sector in order for this to enter significantly into the analysis. It is likely that these amounts be increased, but stil do not capture the effect (benefit) of having the indignous faculty in the country at all times.

V. BUDGETARY ANALYSIS

A. YARG Development and Recurrent Budget 2/

The economy of the YAR is characterized by a very significant external component. The remittances of workers living abroad is balanced, perhaps even more that, offset by the drain of import expenditures, an important category of which is remittances of relatively high paid teachers and trainers out of Yemen. The internal economy exhibits a relatively small level of gross transactions, most of which takes place in local or sub-regional trade centers.

Remittance economies have become increasingly common over the last decade, yet there is little in the way of theoretically sound planning tools to help guide future development in these countries. For the most part, the flood of remittances have greatly accelerated development of such countries with both desirable and undesirable side effects. In Yemen, fast growing cash incomes opened new markets and provided funds for private investment in housing, transport equipment, agriculture and industry. This coincided with a vigorous expansion of public development expenditures.

The past 10 years, however, have seen some wide swings in domestic and external finance. From the early 1970s gross national savings increased dramatically, peaking in 1979-80. Due to the rapid influx of remittances and a delayed consumer expenditure response, this phenomena was bound to be

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reversed when remittances stablized or declined and more lavish spending habits developed, as has happened in the early 1980s. The external financial position of YAR is also experiencing the same kind of swings. Foreign exchange was in short supply in the early 1970s, but by 1979-80 there was a substantial balance of payments surplus on the current account. Recently, however, the upswing in expenditures on imports and the remittance inflows have caused a swing toward the negative in the balance of payments current account. In 1983, there have been tighter controls on imports in order to counteract this emerging economic situation.

These developments have important ramifications for the YAR's public sector operations. YAR has received substantial amounts of foreign assistance in the form of grants and loans offered at very concessional terms. While the capital formation growth rate has remained in the range of 35 to 40 percent per annum, debt service on new loans had remained low until 1980. To sustain the same level of capital formation in the 1980s, debt service payments will invariably have to increase, thus exacerbating an already tenuous overall balance of payments situation. Additional concern has been raised about the allocation of investment expenditures in YAR:

> ...officials feel that the economic and social benefits of many projects in infrastructure, industry and agriculture are so obvious, that they need not be demonstrated in studies... Priority is, therefore, being given to specific engineering projects on which much progress has been made in the past...3/

There is a certain appeal to making tangible investments and the YARG has logically made investments in transportation and public utilities. It has also, however, launched a vigorous "mixed sector" program involving several industrial undertakings. There is concern that these "mixed sector" projects exhibit a less financially stringent operating strategy than would be found in the purely private sector. One unfortunate outcome of this phenomena is a tendency to not adequately budget for the maintenance of projects. In the FFYP period (1976-1981), effective allocations for maintenance-related items grew at a rate of only 10 percent annually, far below the growth rate for capital formation. The consequences of this budgeting issue are predictive of serious reinvestment decisions in the future.

The issue of inadequate maintenance funds is one manifestation of government current expenditures shackled by an inadequate, historically and culturally, revenue collection system. Other evidence includes the inability of the public sector to match (on a continuing basis) compensation for talented individuals that is now offered in selected (import-related) industrial and commercial sectors. During the FFYP, the YARG current account has fluctuated between minor surpluses and minor deficits (see Table G-8). Grave concern has been voiced about the current budgetary situation in YAR (see, for example ASA, pp. 48-49, 52-53, 59-60). Moreover, in November 1983, Work Bank officials report that an official IBRD financial report to the YARG entails a recommendation for a 12 percent reduction in current expenditures in 1984. In the intermediate term, it is expected that alternative sources of current revenues will be sought by YARG. Implementing new tax measures (taxing irrigated land or qat land, for example) is a possibility.

TABLE G-8

Summary of YARG Current Operations; Financial Condition (YR millions)[a]

	75/76	76/77	77/78	78/79	79/80	80/81	1981[b]	1982 (est.)	1983 (proj.)
1. Domestic Revenue	604	1284	1954	2147	2674	3132	4204	3850	4080
a. Tax Revenues	492	1077	1583	1732	2079	2786			
(1) Import Duties	394	929	1305	1386	1610	2037	2248		
(2) Income and Profit Taxes	23	40	101	139	211	296	347		
(3) Other	75	108	177	207	258	453	483		
b. Other Revenues	122	207	371	415	595	347	1126		
2. Current Expenditures	616	841	1249	1847	2427	3367	3627	4100	4460
a. Defense	304	430	545	794	1018	1332	1333		
b. Health and Education	74	93	200	365	496	718	847		
c. Other	238	318	504	688	913	1317	144		
3. Balance	-11	443	705	300	247	-235	577	-250	-380

[a] Source: Agricultural Sector Analysis, p. 68-69, 1982(est.) and 1983(proj.) figures, see fn. 3.

[b] Calender year accounting period begins in 1981.

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Solicitation of foreign aid from neighboring countries, to bolster the YARG operating budget, cannot be ruled out.

B. Budgetary Allocations to Higher Education (UOS)

In Table G-8, the current expenditures on Health and Education in YARG for the period 1975-76 to 1981 are shown. These expenditures (in real terms) increased at an average annual rate of 28 percent compared to a 15 percent average annual growth rate for all government expenditures. About two-thirds of this line item is devoted to education. About 80 percent of the education operating budget is allocated to current expenditures on primary, secondary, and miscelleanous training programs. Using the 1981 Health and Education current expenditure figure, YR 847 million, it is estimated that higher education was operated that year on a budget of about YR 113 million. An independent estimate of the YARG share of the operating budget of the UOS was YR 58 million in 1981. It is uncertain, however, whether this figure, supplied by university officials, excludes some capital expenditures in 1981. It is believed that the total annual expenses of the UOS is significantly larger since the Kuwait Fund provides a budget for recurring expenditures of the General Administration, Faculty of Sharia and Law, FOS, and the Faculty ofArts. The Kuwait Fund has allocated significant capital expenditure funds to the univerisity since 1975, and plans to support additional capital and operating funds necessary for the establishment of faculties of medicine and law. The SFYP indicates that the planned capital investment for the UOS will total about YR 750 million over the period 1982 to 1986. This is about 32 percent of the planned capital investment for education and 16 percent of the total planned capital investment for YAR over that period. Although there is risk in inferring support for operating budgets from the level of planned capital spending, there is reason to believe that YAR endorses teaching capability as a necessary complement to the construction of education facilities. In order to support the amitious YAR program to upgrade education, the government is allocating YR 770 million annually to pay expatriate teachers (at all levels), most of which is remitted abroad with significant consequences. Drawing upon these figures and assurances from YARG officials, the SPP team is convineced that the UOS will remain as an indispensible element of the educational sector.

C. Operating an FOA at the UOS: Recurring Costs

The proposed FOA budget was reviewed with officials of the UOS. The first 10 years annual project operating costs assigned to YARG fall within a range of 1 percent to 2.6 percent of the reported YARG allocations for university operations in 1981 (YR 58 million). Will the simultaneous implementation of the Faculties of Engineering and Medicine affect operation of the FOA? Indication are that with liberal external donor support for these programs, recurrent costs burdens caused by these other programs on YARG are less constraining than is the FOA. Hence, the SPP team believes the effect will be minimal.

VI. SUMMARY AND CONCLUSIONS

A. Economic Analysis

1. Basic Findings

A least cost analysis of the FOA and two alternatives for training Yemeni to the B.S. level in general agriculture was performed. Two

least cost indicators (each derived from the total PV cost for each alternative) were chosen as the criteria for the analysis. The results of the analysis using base level (most likely) parameters and variables are as follows.

a) The FOA alternative is the least cost alternative on the basis of two least indicators defined in the analysis:

(1) The FOA has the lowest cost per student retained in YAR;
(2) The FOA has the lowest cost per student retained in MAF;

b) The Arab alternative, however, has the lowest total present value of costs.

c) The U.S. training alternative is the most costly alternative on the basis of both least cost indicators.

2. Sensitivity Analysis

In order to investigate the nature of the least cost advantage enjoyed by the FOA, a sensitivity analysis of the model was performed. The FOA would have a <u>greater</u> least cost advantage if the following conditions prevailed.

a) Arab institution training costs increased from $8,000 to at least $8,750 per year per student. At this level, total present value costs of the FOA and the Arab alternative are equal.

b) Discount Rate decreased from 2 percent to 1 percent. This also has the effect equating the total present value costs of the FOA and the Arab alternative.

c) Planning horizon increased from 21 years to 25 years. This reflects the difference in the incidence of costs over time betwen the FOA and Arab alternatives. The FOA has relatively lower costs in the last years of the planning horizon.

d) Four-year dropout rate in Arab institutions increased from 10 percent to 20 percent. Experience indicates, however, that this is higher for observed dropout rates at Arab institutions.

The FOA would have a <u>less</u> advantageous least cost position if:

a) The discount rate was increased to levels reflecting the observed rates of return to higher education in LDCs; and

b) The analysis did not stipulate that there will be a salvage value for the FOA building, facilities, and land.

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3. Conclusion

a) Economic Analysis: The FOA alternative has a decidedly major advantage over the U.S. institution alternative. The comparison of the FOA with an Arab institution alternative leads to the same conclusion but with a closer margin of comparison. However, close examination of quantitative assumptions in the analysis lead to the conclusion that FOA has an advantage considering the selected least cost indicators. Chief among those considerations is the sensitivity of the results to the Arab institution training costs ($ per student per year). Specifically, a 10 percent increase in the Arab training cost would result in the FOA alternative being the least cost alternative based on all three indicators used in the analysis. There are, in addition, qualitative features of the FOA alternative (above and beyond the requisite output of B.S. level graduates) which significantly add to the economic viability of establishing this subproject. Chief among these is the Yemen-specific (and U.S. model) training given to B.S. students which should contribute significantly to the generation of tangible benefits from having implemented the FOA.

b) Budgetary Analysis: It is known that fiscal conditions prevailing in the YARG in the early 1980s and likely through the end of the decade will require careful budgeting of operating expenditures and a continued search for ways of augmenting public revenues. In spite of these tightened financial conditions, there is evidence from data through 1982 that plans to enhance the educational capability in YAR at all levels are continuing to be carried out in full. Although there is considerable foreign donor support for operating expenditures (at educational institutions) as well as for capital investments in education, it is expected that the YARG will fulfill its resolve to fund whatever is necessary to deliver the educational opportunities to its citizens. The current operations of the UOS reflect this strategy. The addition of the FOA recurring costs represent a minor (perhaps 1 to 3 percent) increase in the overall annual UOS operating budget. From YARG's point of view, the recurring costs are reasonable. Assurances have been provided at various levels in YARG (CPO, MOE, UOS) that YARG's share of the FOA costs will be disbursed in full and on schedule.

FOOTNOTES

1/ Psacharopoulos, George, Higher Education in Developing Countries, World Bank Working Paper WP-0440.

2/ Reference sources for this section include:

1. AID/Yemen, Agricultural Sector Assessment, Yemen Arab Republic, 1982.

2. IBRD, Agricultural Sector Study, November 17, 1981.

3. IBRD, Yemen Arab Republic, Report of a Traditional Economy, World Bank Country Study, January 1979.

4. YARG, First Five Year Plan, 1976.

5. YARG, Second Five Year Plan, 1981.

3/ IBRD, Manpower Assessment for Yemen Arab Republic, 1982.

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ANNEX H

SELECTED MANPOWER ISSUES

ANNEX H

SELECTED MANPOWER ISSUES

I. OVERVIEW 3

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ANNEX H

SELECTED MANPOWER ISSUES 1/

I. OVERVIEW

The purpose of this annex is to report on the situation concerning professional and para-professional level personnel in the YAR with special attention to personnel planning in the agricultural sector. Although a review of professional and managerial personnel in YAR might appear to be a fairly narrow study, it is vital to cast it in light of the overall labor demand and supply situation in the country. While studies of a country's professional personnel system usually involve the educational system, it is noted that a complete discussion of the latter issue in this SPP is presented in Annex F, Social Soundness Analysis. This annex, however, addresses other issues important for understanding the ultimate role of the FOA in developing a modern agricultural sector in Yemen. One of these issues, for example, is the nature of professional level personnel and effective staffing in the YAR. Another addresses the issue of effective demand for professional personnel in the private sector.

II. THE REMITTANCE ECONOMY AND PROFESSIONAL PERSONNEL

A. The Remittance Economy

There are both positive and negative consequences to the emergence of a remittance economy in a developing economy. In a society with strong cultural cohesion such as YAR, it provides a stable source of foreign exchange. Moreover, remittances have greatly accelerated the pace of economic growth in YAR which has, in turn, required an enlargement of the public sector responsibilities (provision of services, regulation, dealing with foreign donors, etc). These responsibilities, in turn, have outstripped the public sector's finance capability of YAR.

Sustaining the role of the public sector in YAR depends significantly upon generating public revenues which, in turn, may depend heavily on keeping Yemeni employed abroad, at least in the short to intermediate run. There is a signficant need for more information on the characterics tics of the Yemeni worker's skills, earnings, savings, motivations and aspirations. More information is needed on the current availability of jobs, particularly jobs abroad, which might lead to some insights on how to encourage Yemeni workers to remit more earnings in the form of foreign exchange and to increase the rate of saving.

Another manpower issue related to the remittance economy is the potential for YAR to encourage more productive use of returning workers who may have a variety of highly perfected skills. While this may result in net benefits to the national economy, it might also result in worsening the availability of semi-skilled and skilled workers to the agricultural sector. One of the adverse effects of developing an information base for matching Yemeni workers with foreign jobs would be to entice skilled and professional workers to foreign jobs when, in fact, they are desperately needed at home.

B. Wage Levels in the YAR

The overall manpower situation in YAR can also be examined from the point of view of the structure of wages. The exodus of Yemeni laborers to the oil-rich states has created a deficiency in the supply of workers for domestic employment. This has resulted in wages being bid up. In addition, workers returning from abroad tend not to want to work at the older prevailing wage rates.

The impact of higher wage levels has been for the general price level to increase as firms pass along cost increases to consumers. In agriculture, producer prices have increased as higher costs are absorbed. While the total value of production of agricultural commodities in YAR appears to be increasing, it should be noted that most, if not all, of the increase is due to wage-induced inflation.

III PROFESSIONAL AND PARA-PROFESSIONAL PERSONNEL ISSUES IN THE YAR ECONOMY

A. Definitions

There are several approaches to describing and analyzing this upper strata of the labor market in YAR. First, there is a matter of definition. Professional personnel are defined as college graduates or those who have received 1 or more years of post-secondary school training. Para-professional personnel are primarily skilled office workers with 9 to 12 years of general education.

The YAR CPO has used the following classification scheme:

Class	
A1	Professional occupations requiring science and math-based university degrees
A2	Professional occupations requiring an arts-based university degree
B1	Subprofessional and technician occupations requiring 1 to 3 years science and math training beyond the secondary school diploma
B2	Subprofessional and technician occupations requiring 1 to 3 years arts-based training
C	Skilled office-type occupations requiring 9 to 12 hours of general training plus job training.

The 1975 YAR Census used a different scheme for occupational descriptions. In the professional and para-professional categories, three categories would be included: (1) professional and technical, (2) administrative and managerial, (3) clerical workers. Table H-1 (a) and (b) shows the estimated number of Yemeni in these skill level and occupational groups in 1975. This table (part b) also shows the small number of professionals and paraprofessionals associated with the agricultural sector in 1975.

TABLE H-1

Estimates of the Number of Professionals and Paraprofessionals in YAR, 1975

(a) CPO Organizational Scheme

Class	Public Sector	Private Sector	Total
A1	515	226	741
A2	2,357	268	2,625
B1	102	57	159
B2	1,202	696	1,908
C	7,359	24,116	31,475
TOTAL	11,545	25,363	36,908

(b) YAR Census of Population

Occupation	Agri-culture	Mining Manufacturing Utilities Construction Transport	Trade Finance Services	TOTAL
Professional and Technical	268	630	10,395	11,293
Administrative and Managerial	15	219	4,482	4,716
Clerical	32	838	8,399	9,269
TOTAL	315	1,687	23,276	25,278

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From 1975 on, however, one must infer the numbers of professionals and paraprofessionals from the various sources. The UOS has been graduating about 300 students per year over the last 7 years since 1975. The number of Yemeni graduates (B.S., M.S., and Ph.D.) from foreign universities who have returned to YAR are difficult to measure with any accuracy. A report of the CPO shows that 2,314 Yemeni were enrolled in foreign universities in 1976/1977. Unfortunately there has not been a more recent country-wide tabulation of students abroad, nor any records of graduates retained in YAR. Some individual agencies (e.g. MAF) and some individual donors (e.g. USAID) have records pertaining to their own programs.

The number of Yemeni who have received training in the Soviet Union and other Eastern Bloc countries is now estimated to total 2,700 with about 200 undergraduate and 120 graduate fellowships being granted per year. USAID, by means of two projects now elapsed and a third newly started successor project, focused initially on special non-degree training. In the first program there were approximately 68 degrees granted, but only 12 from U.S. institutions. The others were largely from Arab institutions. At the end of the second project some 327 trainees had either completed programs or were in progress with 258 in the U.S. and 69 in Arab institutions. Many of these trainees are affliated with major university-related programs such as CID/Yemen, and Eastern Michigan University. In summary, it may be estimated that there are 5,000 to 7,500 Yemeni who have completed college degrees since 1971. If this estimate could be verified, then manpower distributions such as the one in Table H-1 could be estimated for a more recent year.

B. Analytical Issues Concerning Professional Level Personnel in YAR

One of the key analytical issues addressed elsewhere in the SPP, particularly Annex G, Economic Analysis, is the rate at which Yemeni degree-program trainees are repatriated upon completion of their programs. Evidence in several World Bank publications indicated that the attrition rate was sufficiently high in the early to mid-1970 to warrant special government consideration of the problem. One report concluded that:

> ...more recently, an increasing number of educated Yemeni have started to leave for neighboring Arab countries in response to the high incomes that they can obtain abroad. While the absolute number of these skilled and professional level emigrants is low, the country can ill-afford this brain "drain". . . 2/

On the other hand, the SPP team was advised by YARG and USAID officials that the "brain drain" issue was not significant in YAR. Consequently, the SPP team concurs with the recommendation of the World Bank which concluded that this issue should be examined to, first, develop basic records, and second, determine the underlying causes of "brain drain" (e.g. monetary or socio-cultural amenities) if it does exist.

The issue of monetary compensation plays a key role in any discussion of manpower issues. With respect to the public sector, it should be remembered that YAR civil service is still evolving from the formative years of the government. YARG has three times (1971, 1977, and 1979) adopted

civil service codes to streamline the system and standardize salary scales. On the average, the salary levels in YARG were more than doubled in 1977 and increased approximately 40 percent in 1979. There has not been any comprehensive salary adjustments since then. There are five types of additional allowances for civil servants. They involve nature of work, specialty, receipt of degree, rural location, and concessionary food prices.

In the private sector, salary and wage levels respond far more rapidly to supply and demand conditions in the market for professional and para-professional staff. No clear pattern has been identified concerning the structure of private sector salaries. Most respondents believed they could secure a higher salary in some private sector firm, usually involving management duties. It is also well-known that securing a position as a Yemeni counterpart to a foreign donor-supported project provides the means to make a significant gain in one's salary. Little is known about what happens to career civil servants who take up such opportunities and then attempt to return to positions within the public sector. A more comprehensive examination of salary and perquisite incentives could reveal more definitive answers as to the ultimate destination of university-trained professionals in YAR. Table H-2 gives a general range of salaries received by holders of B.S. and advanced degrees.

IV. PROFESSIONAL AND PARA-PROFESSIONAL PERSONNEL ISSUES IN THE MAF

A. Description

The administrative structure of the MAF is described in the section of the SPP dealing with administrative linkages (see Annex E. Technical Analysis). The MAF has grown from a skeletal organization of less than 500 technical people in 1974 to a total force of 1,350 in 1982. This figure includes some 600 extension service personnel who are affiliated primarily with donor-assisted rural development projects.

There were about 187 professional level employees (B.S. degree or higher) at the MAF in 1982. Of these, 148 were classified as general agriculturalists, with the rest divided among specialties (veterinary, fisheries, engineering, etc.). This total roughly conforms with the total number of employees in civil service grades 11, 12, and 13 in the MAF, those generally assumed to be degree holders. This figure is deceptive since it includes a significant number of expatriate staff. One estimate indicates that only 22 of 106 Yemeni in the top three ranks at the MAF were degree holders 3/.

B. Requirements for Graduate Level Personnel

A fully functional MAF is needed to help develop the agricultural potential of the YAR. The MAF, in turn, requires personnel trained to at least the B.S. level in agricultural fields to plan, carry out, and evaluate the mission of this ministry. Projections of professional level manpower needs in MAF have been prepared as a consequence of the FFYP and the SFYP. The MAF probably needs 300 B.S. level graduates just to fulfill the needs of the FFYP which ended in December 1981. The SFYP (ending in 1986) stipulates a requirement for 600 more B.S. level personnel. Note that these requirements are above and beyond the roughly 200 B.S. level personnel employed at MAF as of November 1983. Only about 50 Yemeni can be counted in this latter figure.

TABLE H-2

Comparison of Representative Salary Levels for Professionals and Paraprofessionals in YAR, 1983

Place of Employment/Title	Monthly Salary (YR)
University of Sanaa	
Full Professor (Ph.D.)	11,000
Housing	3,000
Assistant Professor (Ph.D.)	8,000
Instructor (M.S.)	5,000
Assistant Instructor (M.S.)	3,000
Ministry of Agriculture & Fisheries	
Base Salary	2,100
With B.S.	3,100
With M.S.	4,400
With Ph.D.	5,900
Salary Increase Every 3 Years	+300
Extension Agent, Secondary Certificate	1,800
Rural Village Allowance	+500
Counterpart for Donor-Assisted Project	10,000
Ministry of Education	
With B.S.	3,500
With M.S.	4,000
With Ph.D.	5,000
Mixed Public/Private Sector	
Mid-level Manager in Commercial Firm	9,000
Journeyman in Skilled Labor Trades	8,000

[a] Source: UOS, MAF, MOE. Except where noted, these estimates do not include fringe benefits.

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In the period 1984 through 1987 it may be possible for the MAF to retain 200 to 250 more Yemeni B.S. level agriculturalists if current trends are continued. This still leaves a significant number of positions (850 to 900) unfilled when the first class of FOA students graduate.

C. Employer Attitudes at the MAF

While it is difficult to report on the operational capability of a governmental agency without thorough study, it is appropriate to report on responses of both individuals employed at the MAF and those similarly employed by other agencies in regard to position and career choice. In general, there is perceived by professional level personnel to be some general malaise in the MAF (Sana'a headquarters) which inhibits their actively pursuing their areas of specialization. Entering degree holders have, in significant, numbers attempted to affiliate with donor assisted projects, join other agencies, or join private sector firms in that order of importance. Some donor-assisted project positions permit continued affiliation with the MAF while others do not. It is unclear whether continued affiliation permits an employee's salary to be "topped-off" by the foreign assistance donor. The MAF would like to discourage "topping-off" arrangements.

The number of graduate level professionals who have left the MAF for other agencies was not estimated due to time constraints. With regard to certain disciplines, however, some inferences can be drawn. Agricultural economists are found in significant numbers in other agencies: CPO (4), Agricultural Credit Bank (ACB) (3), Confederation of the Yemeni Development Association (2) compared to the MAF (4). In at least one instance, an agricultural economist left the MAF for a comparable job, but with a drop in salary. Agricultural engineers are reported to leave the MAF for the Ministry of Public Works in order to be better situated for outside consulting work. It is not clear, however, whether general agriculturalists have opportunities outside the MAF. One can only infer that situation from the training and retention experience at the MAF as discussed below.

The attrition of graduate level personnel from the MAF for positions in commerce and industry is believed to be minimal. The individuals who do make this sort of career change probably leave agriculture due to the (currently) small number of opportunities available in commercial agri-business. Large agri-business concerns (food processing, poultry production, commercial orchards and vineyards) which could conceivably require such personnel are few in number.

D. Training of MAF Graduate Level Personnel.

Of the central ministries, the MAF has one of the largest out-of-country training programs for Yemeni staff. Table H-3 gives an indication of the numbers of degree candidates who have been sent abroad beginning in 1974. The numbers of students expected to return from 1979 (or through 1983) indicates that at least the large numbers of expatriates in the MAF could be replaced by Yemeni degree holders. However, the devastatingly low rate of retention (about 15 percent) leaves doubt that this can be accomplished soon.

TABLE II-3

YEMENI STUDENTS SENT ABROAD FOR UNIVERSITY TRAINING IN AGRICULTURAL FIELDS FROM 1974 THROUGH 1980, MAF PROJECTIONS OF EXPECTED RETURNS OF SUCH STUDENTS, AND ACTUAL RETURNS TO MAF THROUGH JUNE 1982

YEAR	NO. STUDENTS SENT ABROAD					EXPECTED STUDENT RETURN				ACTUAL RETURN TO EMPLOYMENT BY MAF
	4 YR. AGRI	5 YR VET	4 YR FISH.	5 YR AG ENG	TOTAL	AGRI	VET	IRRIG. ENG	TOTAL	
1974	41		5	2	48					
1975	86	1	2	2	91					
1976	172		10		182					
1977	77	18		2	97					
1978	85	2		2	89					
1979	131	34		3	168	7			7	5
1980	63	10			73	108			108	5
1981						73			73	13
1982						130		2	132	·30
1983						115	17	2	134	
1984						109	16		125	
1985						23	7	3	33	
1986						90	15		105	
TOTAL	655	65	17	11	748	655	55	7	717	53

Source: Ministry of Agriculture and Fisheries, June 30, 1982.

There are three major training avenues being used at the MAF. The World Bank's program is geared to supporting the MAF's capabilities in the Yemen Rural Development Projects. A number of MAF employees take advantage of opportunities to train in the Soviet Union or Eastern Bloc countries. The USAID/CID subprojects are currently training about 65 agriculturalists at the B.S., M.S., and Ph.D. levels. About two-thirds of these are training in Arab countries.

V. MANPOWER PLANNING

Manpower assessments in the YAR generally do not address the economic demand and supply and non-economic incentives concerning different classes of labor due to the paucity of such data. Assessments generally fall back on census figures (the latest conducted in 1975) and official projections. Where do these projections come from and how valid are they? Very detailed and technical requirements were made of the development projects expected to operate during the FFYP period (1976-1981). There was, however, scarcely any monitoring of the accuracy of those projections or any policy directives enacted to work toward accomplishment of the plan. The FFYP was deficient with respect to anticipating the needs for trained managerial personnel to supervise the long-range and day-to-day functioning of the ministries. The SFYP was prepared in the CPO's Human Resources Planning Department which is also envisioned to have the capability to monitor the manpower situation in the YAR, including a comprehensive training grant management system. There is recognition, at least, that better linkage of manpower planning projections and training requirements to the selection and monitoring of training grant recipients will lead to the more certain placement of graduates upon the receipt of degrees or certificates. Such a planning capability will also have to recognize the important economic and other incentives that influence trained personnel to take the career options that are observed.

VI. CONCLUSIONS

In the YAR generally, and in the MAF in particular, there is a justifiable need for employing B.S. level agriculturalists. By 1987, there will be a requirement for at least 850 such professionals in the MAF on the basis of official projections at the rate at which requirements are being met. Were it not for the problem of "effective fulfillment" of requirements at the MAF, the estimate above would not be so large. The staffing situation at the MAF is one of more than passing interest since it could have an effect on the overall purposes of the FOA Subproject if not monitored and evaluated carefully. On one hand, the economic incentives facing employees of the FOA are no less attractive than in other ministries. On the other hand, non-pecuniary incentives and disincentives at the MAF may be relevant to understanding why the ministry is unable to effectively retain professional staff. The mixed public sector and private enterprise firms in agriculture are currently too few in number to constitute an important element in the overall requirement for B.S. level agriculturalists. Firms which are suppliers to agricultural production are growing in number, but have not achieved the level of size or sophistication at which they would rquire B.S. level agriculturalists. There appears to be no serious obstacles to the supplying of B.S. degree program entrants and graduates in sufficient numbers when there is an operational FOA in place. The first 5 years of the FOA Subproject allow ample time for professional manpower issues to be evaluated more thoroughly. Results from such evaluations could be used to better ensure the accomplishment of the FOA Subproject purposes. It is strongly recommended that such activities be included in the overall program evaluation strategy.

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FOOTNOTES

1/ References for this section include:

1. IBRD, Manpower Assessment in the Yemen Arab Republic, 1982.
2. YARG, First Five Year Plan, 1976.
3. YARG, Second Five Year Plan, 1981.
4. YARG, Census of the Yemen Arab Republic, 1975.

2/ IBRD, Manpower Assessment in the Yemen Arab Republic.

3/ Ibid.

ANNEX I

FINANCIAL PLAN

ANNEX I

Financial Plan

I. Summary Financial Plan for Faculty of Agriculture Subproject (Table I-1) I-3

II. AID Dollar Budget, Faculty of Agriculture I-4

A. Summary of Detailed Worksheets (Table I-2) I-4
B. Detailed Worksheets of AID Dollar Budget (Table I-3) I-5

III. AID Local Currency Budget, Faculty of Agriculture I-9

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B. Detailed Worksheets for AID Local Currency Budget (Table I-5) I-10

IV. YARG Budget, Faculty of Agriculture I-12

A. Summary of Detailed Worksheets (Table I-6) I-12
B. Detailed Worksheets for YARG Budget (Table I-7) I-13

Table I-1 ,Summary Financial Plan for Faculty of Agriculture Subproject
(Dollars)

SOURCE/CATEGORY	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	TOTAL
I. AID BUDGET												
A. AID Dollar Budget												
1. Pre-Cont./Infl. Subtotal	520695	1215266	1239576	1432596	1402367	1056472	1000992	620283	485498	368230	384200	9726174
a. Contingency, 5%	26035	60763	61979	71630	70118	52824	50050	31014	24275	18412	19210	486309
b. Inflation, 8%, (Cmpd.)	0	102082	221264	391099	530095	520259	616961	465026	433816	386255	467552	4134411
2. Participant Trng., A/E, CORE Repayment Subtotal	1471100	1426000	1144250	1330220	934830	903320	758835	437835	259605	96915	0	8762910
Subtotal	2017830	2804111	2667069	3225544	2937410	2532875	2426837	1554159	1203194	869812	870962	23109803
B. AID Local Currency Budget												
1. Pre-Cont./Infl. Subtotal	82500	105580	337935	391310	429860	286440	288985	155895	126965	91760	91270	2388500
a. Contingency, 5%	4125	5279	16897	19566	21493	14322	14449	7795	6348	4588	4564	119425
b. Inflation, 8% (Cmpd.)	0	8869	60321	106828	162487	141057	178116	116874	113450	96252	111071	1095325
2. Instructional Farm	1158080	1009140	0	0	0	0	0	0	0	0	0	2167220
a. Contingency, 10%	105280	91740	0	0	0	0	0	0	0	0	0	197020
3. Inflation, 10% (Cmpd.)	0	110088	0	0	0	0	0	0	0	0	0	110088
Subtotal	1349985	1330696	415153	517703	612840	441819	481550	280564	246763	192600	206905	6077578
TOTAL AID BUDGET	3367815	4134807	3082222	3743248	3551250	2974694	2908387	1834723	1449957	1062412	1077866	29187381
II. YARG BUDGET												
A. Pre-Cont./Infl. Subtotal	0	52570	670690	756040	833240	1054670	1190570	1345610	1473810	1589330	1709450	10675980
1. Contingency, 5%	0	2629	33535	37802	41662	52734	59529	67281	73691	79467	85473	533799
2. Inflation, 8% (Cmpd.)	0	4416	119718	206399	314965	519372	733808	1008804	1316923	1667128	2080315	7971847
B. Facilities Development	12400000	0	0	0	0	0	0	0	0	0	0	12400000
TOTAL YARG BUDGET	12400000	59614	823943	1000241	1189867	1626776	1983906	2421694	2864423	3335924	3875238	31581626
III. OTHER DONOR PARALLEL FIN.												
A. Pre-Cont./Infl. Subtotal	0	0	9049910	9049910	0	0	0	0	0	0	0	18099820
B. Contingency, 10%	0	0	689110	689110	0	0	0	0	0	0	0	1378220
C. Inflation, (10%/yr. to midpoint constr.), 33%	0	0	3213876	3213876	0	0	0	0	0	0	0	6427752
TOTAL OTHER DONOR FINANCING	0	0	12952896	12952896	0	0	0	0	0	0	0	25905792
GRAND TOTAL (AID, YARG, OTHER)	15767815	4194422	16859060	17696384	4741117	4601470	4892294	4256417	4314380	4398336	4953104	86674799

Table I-2 Summary of Detailed Worksheets for USAID Dollar Budget, FOA
(Dollars)

BUDGET ITEM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	TOTAL
I. SALARIES AND WAGES	225349	211512	412043	548294	527141	387608	385121	205971	146592	122875	155873	3328278
II. INDIRECT COSTS	103780	91219	202083	228472	239171	161184	179711	97657	76181	58616	71651	1509725
III. ALLOWANCES	82580	88405	240970	262680	320280	200740	157180	83105	71735	29850	37250	1574775
IV. TRAVEL AND TRANSPORTATION	68485	308530	192980	180650	161275	131440	163480	112150	93490	81390	69925	1563795
V. EXP. EQUIP. & MATERIALS	1500	12500	23500	31500	29500	27500	23500	21500	18500	16500	13500	219500
VI. NON-EXP. EQUIP. & MAT.	30000	30000	168000	172000	125000	139000	92000	91000	79000	59000	36000	1021000
VII. INSTRUCTIONAL FARM	0	464100	0	0	0	0	0	0	0	0	0	464100
VIII. OTHER DIRECT COSTS	9000	9000	0	9000	0	9000	0	9000	0	0	0	45000
SUBTOTAL	520695	1215266	1239576	1432596	1402367	1056472	1000992	620283	485498	368230	384200	9726174
CONTINGENCY, 5%	26035	60763	61979	71630	70118	52824	50050	31014	24275	18412	19210	486309
SUBTOTAL	546730	1276029	1301554	1504226	1472485	1109295	1051041	651297	509773	386642	403410	10212482
INFLATION, 8% (Cmpd.)	0	102082	221264	391099	530095	520259	616961	465026	433816	386255	467552	4134411
SUBTOTAL	546730	1378111	1522819	1895324	2002580	1629555	1668002	1116324	943589	772897	870962	14346893
IX. PARTICIPANT TRAINING	163100	558000	730750	916720	934830	903320	758835	437835	259605	96915	0	5759910
X. A/E CONSTR. & SUPERVISION	1208000	868000	413500	413500	0	0	0	0	0	0	0	2903000
XI. CORE REPAYMENT	100000	0	0	0	0	0	0	0	0	0	0	100000
SUBTOTAL	1471100	1426000	1144250	1330220	934830	903320	758835	437835	259605	96915	0	8762910
TOTAL AID DOLLAR BUDGET	2017830	2804111	2667069	3225544	2937410	2532875	2426837	1554159	1203194	869812	870962	23109803

Table I-3 Detailed Worksheets of USAID Dollar Budget, FOA
(Dollars)

BUDGET ITEM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	TOTAL
I. Salaries & Wages												
A. On-Campus												
1. Home Office												
a. Proj. Dir.	37500	50000	50000	50000	50000	37500	37500	25000	25000	25000	25000	412500
b. Secretary/Accountant	11250	15000	15000	15000	15000	15000	15000	15000	15000	15000	15000	161250
2. TDY												
a. Proj. Consult.	26400	6600	13200	6600	6600	6600	6600	6600	6600	6600	6600	99000
b. Grad. Stud. Superv.	32340	0	50820	23100	46200	13860	50820	23100	13860	13860	0	267960
c. Proj. Eval.	0	0	0	39600	0	0	39600	0	0	0	39600	118800
Total On-Campus Sal. & Wages	107490	71600	129020	134300	117800	72960	149520	69700	60460	60460	86200	1059510
B. Off-Campus												
1. Proj. Mgr./Team Leader	35000	35000	35000	35000	35000	35000	35000	35000	35000	35000	35000	385000
2. Faculty Advisor	0	25000	50000	50000	50000	50000	25000	0	0	0	0	250000
3. Co-Mgr., Farm	33000	33000	33000	33000	33000	33000	16500	0	0	0	0	214500
4. Co-Librarian	0	0	0	27000	27000	0	0	0	0	0	0	54000
5. Expt. Fac., TCN	0	0	74000	148000	148000	111000	74000	55500	18500	0	0	629000
Total Off-Campus Sal. & Wgs.	68000	93000	192000	293000	293000	229000	150500	90500	53500	35000	35000	1532500
C. Fringe Benefits												
1. On-Campus (Acad.,28.2%)	27140	15961	32154	33643	28990	16345	37935	15425	12820	12820	20078	253309
2. On-Campus (Class.,31.5%)	3544	4725	4725	4725	4725	4725	4725	4725	4725	4725	4725	50794
3. Off-Campus (Acad.,28.2%)	19176	26226	54144	82626	82626	64578	42441	25521	15087	9870	9870	432165
Total Fringe Benefits	49859	46912	91023	120994	116341	85648	85101	45671	32632	27415	34673	736268
TOTAL SALARIES & WAGES	225349	211512	412043	548294	527141	387608	385121	205871	146592	122875	155873	3328278
II. Indirect Costs												
A. On-Campus, 30%	68178	47006	110281	93163	103069	57493	105925	53768	48801	39996	52066	779746
B. Off-Campus, 19.5%	27915	37456	76833	118386	118386	91751	60474	36655	21737	14278	14278	618148
C. CID G & A, 8%	7687	6757	14969	16924	17716	11940	13312	7234	5643	4342	5308	111832
TOTAL INDIRECT COSTS	103780	91219	202083	228472	239171	161184	179711	97657	76181	58616	71651	1509725
III. Allowances												
A. Post Diff., 25%	17000	23250	48000	73250	73250	57250	37625	22625	13375	8750	8750	383125
B. COLA, 6%	4080	5580	11520	17580	17580	13740	9030	5430	3210	2100	2100	91950
C. Sunday Pay, 5%	3400	4650	9600	14650	14650	11450	7525	4525	2675	1750	1750	76625
D. Educ. Allow., $1570/fm.	31500	39375	78750	126000	126000	94500	63000	39375	23625	15750	15750	653625
E. Move In, $11800/fm.	23600	11800	70800	11800	47200	0	11800	0	11800	0	0	188800
F. Move Out, $7400/fm.	0	0	14800	7400	29600	14800	22200	7400	14800	0	7400	118400
G. Storage, $1500/fm.	3000	3750	7500	12000	12000	9000	6000	3750	2250	1500	1500	62250
TOTAL ALLOWANCES	82580	88405	240970	262680	320280	200740	157180	83105	71735	29850	37250	1574775

Table I-3 (Continued), Page 2, Detailed Worksheets of USAID Dollar Budget, FOA
(Dollars)

IV. Travel and Transportation												
A. Per Diem												
1. Domestic												
a. Proj. Dir.	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	24750
Total Domestic Per Diem	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	2250	24750
2. International												
a. Proj. Dir.	6300	9450	6300	6300	6300	6300	6300	6300	6300	6300	6300	72450
b. Proj. Consults.	0	3150	6300	3150	3150	3150	3150	3150	3150	3150	3150	34650
c. Grad. Stud. Superv.	15435	0	24255	11025	22050	6615	24255	11025	6615	6615	0	127890
d. Proj. Eval.	0	0	0	9450	0	0	9450	0	0	0	9450	28350
Total Internl. Per Diem	21735	12600	36855	29925	31500	16065	43153	20475	16065	16065	18900	263340
Total Per Diem	23985	14850	39105	32175	33750	18315	45405	22725	18315	18315	21150	288090
B. Travel												
1. Domestic												
a. Proj. Dir.	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	22000
b. Proj. Consults.	0	500	1000	500	500	500	500	500	500	500	500	5500
c. Grad. Stud. Superv.	3500	0	5500	2500	5000	1500	5500	2500	1500	1500	0	29000
d. Proj. Eval.	0	0	0	1500	0	0	1500	0	0	0	1500	4500
Total Domestic Travel	5500	2500	8500	6500	7500	4000	9500	5000	4000	4000	4000	61000
2. International												
a. Proj. Dir.	5000	7500	5000	5000	5000	5000	5000	5000	5000	5000	5000	57500
b. Proj. Consults.	0	2500	5000	2500	2500	2500	2500	2500	2500	2500	[illegible]	27500
c. Grad. Stud. Superv.	17500	0	27500	12500	25000	7500	27500	12500	7500	7500	0	145000
d. Proj. Eval.	0	0	0	7500	0	0	7500	0	0	0	7500	22500
Total International Travel	22500	10000	37500	27500	32500	15000	42500	20000	15000	1500	15000	252500
Total Travel	28000	12500	46000	34000	40000	19000	52000	25000	19000	[illegible]	19000	313500
C. Transportation												
1. Commodities	16500	277805	104500	111100	84150	90750	62700	61050	52800	40700	26400	928455
2. Air Freight	0	3375	3375	3375	3375	3375	3375	3375	3375	3375	3375	33750
Total Transportation	16500	281180	107875	114475	87525	94125	66075	64425	56175	44075	29775	962205
TOTAL TRAVEL & TRANSPORTATION	68485	308530	192980	180650	161275	131440	163480	112150	93490	81390	69925	1563795
V. Exp. Equipment & Materials												
A. On-Campus												
1. Staff Office	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	11000
2. Staff Orientation	500	500	500	500	500	500	500	500	500	500	500	5500
Total On-Campus Exp. E & M	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	16500
B. Off-Campus												
1. Vehicle & Equip. Parts	0	0	0	4000	4000	4000	4000	4000	4000	4000	4000	32000

Table I-3 (Continued), Page 3, Detailed Worksheets of USAID Dollar Budget, FOA
(Dollars)

2. Office Supplies	0	8000	15000	20000	18000	16000	14000	12000	10000	8000	6000	127000
3. Teaching Materials	0	1000	2000	1000	1000	1000	1000	1000	1000	1000	1000	11000
4. Miscellaneous	0	2000	5000	5000	5000	5000	3000	3000	2000	2000	1000	33000
Total Off-Campus Exp. E & M	0	11000	22000	30000	28000	26000	22000	20000	17000	15000	12000	203000
TOTAL EXP. EQUIP. & MATERIALS	1500	12500	23500	31500	29500	27500	23500	21500	18500	16500	13500	219500
VI. Non-Exp. Equip. & Materials												
A. On-Campus	0	0	0	0	0	0	0	0	0	0	0	0
B. Off-Campus												
1. Teaching Materials	0	4000	8000	7000	7000	6000	6000	5000	5000	5000	4000	57000
2. Library Resources	0	5000	50000	50000	40000	40000	30000	30000	30000	20000	10000	305000
3. Teaching Equipment	0	4000	50000	50000	40000	40000	30000	30000	30000	20000	10000	304000
4. Office Equipment	0	0	50000	40000	30000	30000	20000	20000	10000	10000	10000	220000
5. Misc. Equipment	0	2000	10000	10000	8000	8000	6000	6000	4000	4000	2000	60000
6. Vehicles	30000	15000	0	15000	0	15000	0	0	0	0	0	75000
TOTAL NON-EXP. EQUIP. & MATER.	30000	30000	168000	172000	125000	139000	92000	91000	79000	59000	36000	1021000
VII. Instructional Farm												
A. Irrigation Equipment	0	93900	0	0	0	0	0	0	0	0	0	93900
B. Crop Science Equipment	0	82200	0	0	0	0	0	0	0	0	0	82200
C. Livestock Equipment	0	99300	0	0	0	0	0	0	0	0	0	99300
D. Poultry Equipment	0	15000	0	0	0	0	0	0	0	0	0	15000
E. Farm Shop Equipment	0	22200	0	0	0	0	0	0	0	0	0	22200
F. Farm Machinery/Equipment	0	151500	0	0	0	0	0	0	0	0	0	151500
TOTAL INSTRUCTIONAL FARM	0	464100	0	0	0	0	0	0	0	0	0	464100
VIII. Other Direct Costs												
A. Arabic Language Training	9000	9000	0	9000	0	9000	0	9000	0	0	0	45000
TOTAL OTHER DIRECT COSTS	9000	9000	0	9000	0	9000	0	9000	0	0	0	45000
SUBTOTAL (For Cont./Inflation)	520695	1215266	1239576	1432596	1402367	1056472	1000992	620283	485498	368230	384200	9726174
IX. Participant Training												
A. Degree Training												
1. Grad. Scholarships	163100	522000	730750	916720	934830	903320	758835	437835	259605	96915	0	5723910
B. Non-Degree Training												
1. Internships	0	36000	0	0	0	0	0	0	0	0	0	36000
TOTAL PARTICIPANT TRAINING	163100	558000	730750	916720	934830	903320	758835	437835	259605	96915	0	5759910
X. A/E Design & Constr. Superv.												

Table I-3 (Continued), Page 4, Detailed Worksheets for USAID Dollar Budget, FOA
(Dollars)

A. Faculty Building												
1. Program of Requirements	43000	0	0	0	0	0	0	0	0	0	0	43000
2. Site Inventory	25000	0	0	0	0	0	0	0	0	0	0	25000
3. Schematic Design	401000	0	0	0	0	0	0	0	0	0	0	401000
4. Design Development	444000	0	0	0	0	0	0	0	0	0	0	444000
5. Contract Documents	0	665000	0	0	0	0	0	0	0	0	0	665000
6. Bid Analysis	0	144000	0	0	0	0	0	0	0	0	0	144000
7. Construction Supervision	0	0	413500	413500	0	0	0	0	0	0	0	827000
Total Faculty Building	913000	809000	413500	413500	0	0	0	0	0	0	0	2549000
B. Instr. Farm Buildings												
1. Final Design	236000	0	0	0	0	0	0	0	0	0	0	236000
2. Construction Supervision	59000	59000	0	0	0	0	0	0	0	0	0	118000
Total Instr. Farm Buildings	295000	59000	0	0	0	0	0	0	0	0	0	354000
TOTAL A/E DESIGN & SUPERVISION	1208000	868000	413500	413500	0	0	0	0	0	0	0	2903000
XI. Repayment to CORE for Subproject Development	100000	0	0	0	0	0	0	0	0	0	0	100000
TOTAL AID DOLLAR BUDGET	1991795	2641266	2383826	2762816	2337197	1959792	1759827	1058118	745103	465145	384200	18489084

Table I-4, Summary of Detailed Worksheets for USAID Local Currency Budget, FOA
(Dollars)

BUDGET ITEM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	TOTAL
I. SALARIES AND WAGES	0	0	0	0	0	0	0	0	0	0	0	0
II. OPERATIONS	59500	74375	148750	236750	238000	178500	119000	74375	44625	29750	29750	1233375
III. TRAVEL AND PER DIEM	3000	19005	15985	21360	66660	23740	86785	45320	28140	29810	11320	351125
IV. TRAINING	20000	0	22000	4000	24000	4000	24000	4000	24000	4000	24000	154000
V. EXP. EQUIP. & MATERIALS	0	0	19000	17000	15000	14000	13000	11000	10000	8000	6000	113000
VI. NON-EXP. EQUIP. & MATERLS.	0	0	20000	20000	14000	14000	14000	9000	8000	8000	8000	115000
VII. OTHER DIRECT COSTS	0	12200	112200	92200	72200	52200	32200	12200	12200	12200	12200	422000
SUBTOTAL	82500	105580	337935	391310	429860	286440	288985	155895	126965	91760	91270	2388500
CONTINGENCY, 5%	4125	5279	16897	19566	21493	14322	14449	7795	6348	4588	4564	119425
SUBTOTAL	86625	110859	354832	410876	451353	300762	303434	163690	133313	96348	95834	2507925
INFLATION, 8% (Cmpd.)	0	8869	60321	106828	162487	141057	178116	116874	113450	96252	111071	1095325
SUBTOTAL	86625	119728	415153	517703	613840	441819	481550	280564	246763	192600	206905	3603250
VIII. INSTRUCTIONAL FARM	1158080	1009140	0	0	0	0	0	0	0	0	0	2167220
CONTINGENCY, 10%	105280	91740	0	0	0	0	0	0	0	0	0	197020
SUBTOTAL	1263360	1100880	0	0	0	0	0	0	0	0	0	2364240
INFLATION, 10% (Cmpd.)	0	110088	0	0	0	0	0	0	0	0	0	110088
TOTAL AID LOCAL CURRENCY BUDGET	1349985	1330696	415:53	517703	613840	441819	481550	280564	246763	192600	206905	6077578

Table I-5 Detailed Worksheets for USAID Local Currency Budget, FOA
(Dollars)

BUDGET ITEM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	TOTAL
I. Salaries and Wages	0	0	0	0	0	0	0	0	0	0	0	0
II. Operations												
A. Housing												
1. Rent	45000	56250	112500	180000	180000	135000	90000	56250	33750	22500	22500	933750
2. Utilities	5000	6250	12500	20000	20000	15000	10000	6250	3750	2500	2500	103750
3. Maintenance	7000	8750	17500	28000	28000	21000	14000	8750	5250	3500	3500	145250
4. Retro Fitting	2500	3125	6250	8750	10000	7500	5000	3125	1875	1250	1250	50625
TOTAL OPERATIONS	59500	74375	148750	236750	238000	178500	119000	74375	44625	29750	29750	1233375
III. Travel and Per Diem												
A. Travel												
1. Domestic												
a. Faculty Advisor	0	300	600	600	600	600	300	0	0	0	0	3000
b. Farm Co-Manager	0	150	300	300	300	300	150	0	0	0	0	1500
c. Co-Librarian	0	0	50	100	100	0	0	0	0	0	0	250
d. Team Leader/Proj. Mngr.	0	600	600	600	600	600	600	600	600	600	600	6000
Total Domestic Travel	0	1050	1550	1600	1600	1500	1050	600	600	600	600	10750
2. International												
a. Dean	0	0	0	0	2500	0	0	0	0	0	2500	5000
b. Grad. Students (U.S.)	0	0	0	0	17500	0	27500	12500	7500	7500	0	72500
c. Local Grad. Adv. (U.S.)	0	0	0	0	17500	0	27500	12500	7500	7500	0	72500
d. Intern. Participants	0	5000	0	0	0	0	0	0	0	0	0	5000
Total International Travel	0	5000	0	0	37500	0	55000	25000	15000	15000	2500	155000
Total Travel	0	6050	1550	1600	39100	1500	56050	25600	15600	15600	3100	165750
B. Per Diem												
1. Domestic												
a. Team Leader/Proj. Mngr.	0	3780	3780	3780	3780	3780	3780	3780	3780	3780	3780	37800
b. Faculty Advisor	0	1890	3780	3780	3780	3780	1890	0	0	0	0	18900
c. Farm Co-Manager	0	945	1890	1890	1890	1890	945	0	0	0	0	9450
d. Co-Librarian	0	0	315	630	0	0	0	0	0	0	0	945
Total Domestic Per Diem	0	6615	9765	10080	9450	9450	6615	3780	3780	3780	3780	67095
2. International												
a. Dean	0	0	0	0	0	1440	0	0	0	0	1440	2880
b. Graduate Students	0	0	0	0	6720	0	10560	4800	2880	2880	0	27840
c. Local Grad. Advisor	0	0	0	0	6720	0	10560	4800	2880	2880	0	27840
Total Internl. Per Diem	0	0	0	0	13440	1440	21120	9600	5760	5760	1440	58560
Total Per Diem	0	6615	9765	10080	22890	10890	27735	13380	9540	9540	5220	125655
C. R & R Travel	0	3340	1670	6680	1670	8350	0	3340	0	1670	0	26720

Table I-5 (Continued), Page 2, Detailed Worksheets for USAID Local Currency Budget, FOA
(Dollars)

D. Medical Evacuations	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	33000
TOTAL TRAVEL AND PER DIEM	3000	19005	15985	21360	66660	23740	86785	45320	28140	29810	11320	351125
IV. Training												
A. English Language	20000	0	20000	0	20000	0	20000	0	20000	0	20000	120000
B. In-Service Training/Plan.	0	0	2000	4000	4000	4000	4000	4000	4000	4000	4000	34000
TOTAL TRAINING	20000	0	22000	4000	24000	4000	24000	4000	24000	4000	24000	154000
V. Exp. Equipment & Materials												
A. Office												
1. Supplies	0	0	6000	5000	5000	4000	4000	3000	3000	2000	1000	33000
2. Equipment	0	0	8000	7000	6000	6000	5000	5000	4000	4000	3000	48000
Total Office Exp. E & M	0	0	14000	12000	11000	10000	9000	8000	7000	6000	4000	81000
B. Instructional Farm	0	0	4000	4000	3000	3000	3000	2000	2000	1000	1000	23000
C. Training	0	0	1000	1000	1000	1000	1000	1000	1000	1000	1000	9000
TOTAL EXP. EQUIP. & MATERIALS	0	0	19000	17000	15000	14000	13000	11000	10000	8000	6000	113000
VI. Non-Exp. Equip. & Materials												
A. Equipment	0	0	15000	15000	10000	10000	10000	5000	5000	5000	5000	80000
B. Materials	0	0	5000	5000	4000	4000	4000	4000	3000	3000	3000	35000
TOTAL NON-EXP. EQUIP. & MATER.	0	0	20000	20000	14000	14000	14000	9000	8000	8000	8000	115000
VII. Instructional Farm												
A. Establishment Costs	260200	0	0	0	0	0	0	0	0	0	0	260200
B. Perimeter Fencing	102900	0	0	0	0	0	0	0	0	0	0	102900
C. On-Farm Water Distr.	135800	0	0	0	0	0	0	0	0	0	0	135800
D. Water System to Farm	553900	0	0	0	0	0	0	0	0	0	0	553900
E. Crop Sci. Field Lab./Equip.	0	181500	0	0	0	0	0	0	0	0	0	181500
F. Livestock Field Lab./~~Equip.~~	0	133100	0	0	0	0	0	0	0	0	0	133100
G. Poultry Field Lab./Equip.	0	450000	0	0	0	0	0	0	0	0	0	450000
H. Farm Shop	0	35300	0	0	0	0	0	0	0	0	0	35300
I. Site Development	0	117500	0	0	0	0	0	0	0	0	0	117500
J. Int. During Constr., 10%	105280	91740	0	0	0	0	0	0	0	0	0	
TOTAL INSTRUCTIONAL FARM	1158080	1009140	0	0	0	0	0	0	0	0	0	2167220
VIII. Other Direct Costs												
A. Instr. Farm Recurring Costs	0	0	100000	80000	60000	40000	20000	0	0	0	0	300000
B. Local CORE Support	0	12200	12200	12200	12200	12200	12200	12200	12200	12200	12200	122000
TOTAL OTHER DIRECT COSTS	0	12200	112200	92200	72200	52200	32200	12200	12200	12200	12200	422000

Table I-5 (Continued), Page 3, Detailed Worksheets for USAID Local Currency Budget, FOA

TOTAL AID LOCAL CURRENCY BUDGET	1240580	1114720	337935	391310	429860	286440	288985	155895	126965	91760	91270	4555720

Table I-6 Summary of Detailed Worksheets for YARG Budget, FOA
(Dollars)

BUDGET ITEM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	TOTAL
I. SALARIES AND WAGES	0	40500	475000	482500	527500	712500	823500	934500	1045500	1156500	1267500	7465500
II. OPERATIONS	0	0	174000	252000	278000	304000	320000	341000	347000	343000	349000	2708000
III. TRAVEL AND PER DIEM	0	12070	21690	21540	27740	38170	47070	70110	81310	89830	92950	502480
SUBTOTAL	0	52570	670690	756040	833240	1054670	1190570	1345610	1473810	1589330	1709450	10675980
CONTINGENCY, 5%	0	2629	33535	37802	41662	52734	59529	67281	73691	79467	85473	533799
SUBTOTAL	0	55199	704225	793842	874902	1107404	1250099	1412891	1547501	1668797	1794923	11209779
INFLATION, 8% (Cmpd.)	0	4416	119718	206399	314965	519372	733808	1008804	1316923	1667128	2080315	7971847
SUBTOTAL	0	59614	823943	1000241	1189867	1626776	1983906	2421694	2864423	3335924	3875238	19181626
IV. FACILITIES DEVELOPMENT	12400000	0	0	0	0	0	0	0	0	0	0	12400000
TOTAL YARG LOCAL BUDGET	12400000	59614	823943	1000241	1189867	1626776	1983906	2421694	2864423	3335924	3875238	31581626

Table I-7 Detailed Worksheets for YARG Local Currency Budget, FOA
(Dollars)

BUDGET ITEM	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	TOTAL
I. Salaries and Wages												
A. Faculty Building												
1. Dean, FOA, 1.0 FTE	0	24000	48000	48000	48000	48000	48000	48000	48000	48000	48000	456000
2. Faculty Members, 5-20 FTE	0	0	0	0	0	185000	296000	407000	518000	629000	740000	2775000
3. Librarian, 1.0 FTE	0	0	0	0	27000	27000	27000	27000	27000	27000	27000	189000
4. Adm. Asst., Fiscal, 1 FTE	0	0	23000	23000	23000	23000	23000	23000	23000	23000	23000	207000
5. Adm. Asst., Pers., 1 FTE	0	0	23000	23000	23000	23000	23000	23000	23000	23000	23000	207000
6. Purchasing Agent, 1 FTE	0	0	14000	14000	14000	14000	14000	14000	14000	14000	14000	126000
7. Budg./Fin. Analyst, 1 FTE	0	0	20000	20000	20000	20000	20000	20000	20000	20000	20000	180000
8. Sec./Typist, 3 FTE	0	0	51000	51000	51000	51000	51000	51000	51000	51000	51000	459000
9. Translator, 1 FTE	0	0	22000	22000	22000	22000	22000	22000	22000	22000	22000	198000
10. Janitor, 2 FTE	0	0	13000	13000	13000	13000	13000	13000	13000	13000	13000	117000
11. Bldg. Maint., 1 FTE	0	0	20000	20000	20000	20000	20000	20000	20000	20000	20000	180000
12. Groundskeeper, 1 FTE	0	0	0	7500	7500	7500	7500	7500	7500	7500	7500	60000
Total Fac. Bldg. Sal. & Wgs.	0	24000	234000	241500	268500	453500	564500	675500	786500	897500	1008500	5154000
B. Instructional Farm												
1. Manager, 1.0 FTE	0	16500	33000	33000	33000	33000	33000	33000	33000	33000	33000	313500
2. Senior Mechanic, 1.0 FTE	0	0	16000	16000	16000	16000	16000	16000	16000	16000	16000	144000
3. Maint. Man, Bldgs., 1 FTE	0	0	20000	20000	20000	20000	20000	20000	20000	20000	20000	180000
4. Maint. Man, Grnds., 1 FTE	0	0	17500	17500	17500	17500	17500	17500	17500	17500	17500	157500
5. Drivers, 4.0 FTE	0	0	46000	46000	46000	46000	46000	46000	46000	46000	46000	414000
6. Janitor, 1.0 FTE	0	0	6500	6500	6500	6500	6500	6500	6500	6500	6500	58500
7. Guards, 2.0 FTE	0	0	12000	12000	12000	12000	12000	12000	12000	12000	12000	108000
Total Instr. Farm Sal. & Wages	0	16500	151000	151000	151000	151000	151000	151000	151000	151000	151000	1375500
C. Technicians												
1. Animal Tech., 1.0 FTE	0	0	18000	18000	18000	18000	18000	18000	18000	18000	18000	162000
2. Field Crop Tech., 1 FTE	0	0	18000	18000	18000	18000	18000	18000	18000	18000	18000	162000
3. Horticulture Tech., 1 FTE	0	0	18000	18000	18000	18000	18000	18000	18000	18000	18000	162000
4. Poultry Tech., 1 FTE	0	0	18000	18000	18000	18000	18000	18000	18000	18000	18000	162000
5. Food Sci. Tech., 1 FTE	0	0	18000	18000	18000	18000	18000	18000	18000	18000	18000	162000
6. Agric. Media Tech., 1 FTE	0	0	0	0	18000	18000	18000	18000	18000	18000	18000	126000
Total Tech. Sal. & Wages	0	0	90000	90000	108000	108000	108000	108000	108000	108000	108000	936000
TOTAL SALARIES AND WAGES	0	40500	475000	482500	527500	712500	823500	934500	1045500	1156500	1267500	7465500
II. Operations												
A. Faculty Buildings												
1. Utilities	0	0	50000	50000	50000	50000	50000	50000	50000	50000	50000	450000
2. Communications	0	0	40000	40000	40000	40000	40000	40000	40000	40000	40000	360000
3. Maintenance & Repair	0	0	0	20000	20000	20000	20000	20000	20000	20000	20000	160000
4. Printing	0	0	15000	25000	30000	30000	30000	30000	30000	30000	30000	250000
Total Fac. Bldgs. Operations	0	0	105000	135000	140000	140000	140000	140000	140000	140000	140000	1220000
B. Vehicles and Tractors												
1. Gas. & Petro. Products	0	0	40000	65000	65000	65000	65000	65000	65000	65000	65000	560000

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Table 1-7 (Continued), Page 2, Detailed Worksheets for YARG Local Currency Budget, FOA
(Dollars)

2. Insurance and Licenses	0	0	4000	6000	6000	6000	6000	6000	6000	6000	6000	52000
3. Spare Parts & Tires	0	0	2000	3000	4000	5000	6000	7000	8000	9000	10000	54000
4. Outside Services	0	0	1000	1000	1000	1000	1000	1000	1000	1000	1000	9000
Total Veh. & Trac. Operations	0	0	47000	75000	76000	77000	78000	79000	80000	81000	82000	675000
C. Instr. Farm & Motorpool												
1. Road & Yard Maintenance	0	0	20000	20000	20000	20000	20000	20000	20000	20000	20000	180000
2. Bldgs. & Shop Renovation	0	0	0	0	0	5000	0	0	5000	0	5000	15000
3. Exterior Lighting	0	0	2000	2000	2000	2000	2000	2000	2000	2000	2000	18000
4. Recurring Costs	0	0	0	20000	40000	60000	80000	100000	100000	100000	100000	600000
Total Instr. Fm. & Mtrpl. Op.	0	0	22000	42000	62000	87000	102000	122000	127000	122000	127000	813000
TOTAL OPERATIONS	0	0	174000	252000	278000	304000	320000	341000	347000	343000	349000	2708000
III. Travel and Per Diem												
A. Travel												
1. Domestic												
a. Dean	0	300	600	600	600	600	600	600	600	600	600	5700
b. Farm Manager	0	150	300	300	300	300	300	300	300	300	300	2850
c. Librarian	0	0	100	100	100	100	100	100	100	100	100	900
d. Faculty Members	0	0	0	0	0	4200	4200	10800	13800	15600	17400	66000
e. Technicians	0	0	1500	1500	1800	1800	1800	1800	1800	1800	1800	15600
f. ESL Specialist	0	0	0	0	300	300	300	300	300	300	300	2100
Total Domestic Travel	0	450	2500	2500	3100	7300	7300	13900	16900	18700	20500	93150
2. Internl., Middle East	0	9100	4700	3500	7000	0	8900	3500	3300	3300	0	43300
Total Travel	0	9550	7200	6000	10100	7300	16200	17400	20200	22000	20500	136450
B. Per Diem												
1. Domestic												
a. Dean, 30 days	0	1575	3150	3150	3150	3150	3150	3150	3150	3150	3150	29925
b. Farm Manager, 18 days	0	945	1890	1890	1890	1890	1890	1890	1890	1890	1890	17955
c. Librarian, 6 days	0	0	0	0	630	630	630	630	630	630	630	4410
d. Fac. Membrs., 18 dys/FM	0	0	0	0	0	13230	13230	34020	43470	49140	54810	207900
e. Technicians, 18 dys/T	0	0	9450	9450	11340	11340	11340	11340	11340	11340	11340	98280
f. ESL Specialist	0	0	0	0	630	630	630	630	630	630	630	4410
Total Domestic Per Diem	0	2520	14490	14490	17640	30870	30870	51660	61110	66780	72450	362880
2. Internl.,Dean	0	0	0	1050	0	0	0	1050	0	1050	0	3150
Total Per Diem	0	2520	14490	15540	17640	30870	30870	52710	61110	67830	72450	366030
TOTAL TRAVEL AND PER DIEM	0	12070	21690	21540	27740	38170	47070	70110	81310	89830	92950	502480
IV. Facilities Development:												
Land, Bldg. & Farm	12400000	0	0	0	0	0	0	0	0	0	0	12400000

Table I-7 (Continued), Page 3, Detailed Worksheets for YARG Local Currency Budget, FOA
(Dollars)

TOTAL YARG BUDGET	12400000	52570	670690	756040	833240	1054670	1190570	1345610	1473810	1589330	1709450	23075980

ANNEX J

INSTRUCTIONAL FARM ANALYSIS

A Demonstration Farm Study for The University of Sana'a Faculty of Agriculture

a proposal designed by a
CID/USAID special study team
for the University of Sana'a

Team Members

James A. Vomocil, Professor of Soil Science,
Oregon State University

LeRoy Daugherty, Professor of Agronomy
New Mexico State University

John Leffel, Professor of Animal Science and
Agronomy, Oregon State University

CONSORTIUM FOR INTERNATIONAL DEVELOPMENT
Tucson, Arizona Corvallis, Oregon Sana'a, Yemen

CID/CORE Report 1983-1
February 1983

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PREFACE

In October, 1981, representatives of the University of Sana'a suggested that a study should be made to determine the attributes of a demonstration and research farm for the proposed Faculty of Agriculture. The committee designated to design the faculty concurred. CID/USAID was asked to provide the expertise from CID universities for this task since the Land Grant University system of the United States bears similarity to the model suggested by the Faculty Design Committee.

Core/OSU provided the following individuals for the project:

Dr. James Vomocil; Professor of Soil Science and Extension Specialist, Oregon State University - Team Leader, with expertise in Soil Physics and Irrigation.

Dr. LeRoy Daugherty; Professor of Agronomy, New Mexico State University, with expertise in Crops and Soils.

Mr. John Leffel; Professor of Animal Science and Agronomy and Extension Specialist, Oregon State University, with expertise in Animal Science, Pasture Management, and Range Management.

The study team consulted officers of the University of Sana'a, the YARG Ministry of Agriculture and Fisheries (MAF), the YARG National Water and Sewage Authority, Food and Agriculture Organization of the United Nations, the World Bank, and representatives of various consulting firms with offices in Sana'a.

The team toured Y.A.R. to familiarize themselves with the agricultural industry and food systems of the nation. Research and extension sites of MAF at Dhamar, Yarim, Taiz, Jaruba, and Surdud were visited. The Ibb Secondary Agricultural Institute (MAF/MOE) was also visited. CID/USAID is involved as a cooperator in the activities at the Jaruba Horticultural Station and the Ibb Secondary Agricultural Institute. With this background, the team deliberated upon a plethora of alternatives and devised the suggestions contained in this report.

EXECUTIVE SUMMARY

University of Sana'a Demonstration Farm Plan

A CID/USAID study team was brought to Sana'a for one month on TDY and given the charge of developing a proposal for a demonstration farm facility to be used by the proposed Faculty of Agriculture at the University of Sana'a. The plan evolved was to contain sufficient detail and be sufficiently specific to become the basis for a proposal to be submitted for funding.

The modus operandi of the study team was to consult with national, local and university authorities, representatives of the World Bank, and various consultants working in YAR province. The team made an analysis of their findings and on the basis of this analysis, developed this plan.

The needs of the faculty and future students of the Faculty of Agriculture at the University of Sana'a were a prime consideration. Of principle concern was the development of an appropriate sized facility to accomodate a sufficient range of interests to meet the needs of a faculty charged with the responsibility of training the future agricultural leaders for YAR. The procedure has two long-term approaches:

First, it was our intention to seek the appropriate level of technology, to put the emphasis on the future, not the past. The significance of the level of technology was demonstrated to us by many references to the current and pending shortage of agricultural labor in the food system of this nation. The second principle was to guarantee an adequate level of flexibility in the use of land and water resources, and the need for physical arrangements to best meet the needs of students, the needs of the Province of Sana'a from the point of view of agricultural extension, and the needs of the future faculty with regards to their activities in research.

The availability of land and water were important factors in generating the attributes of the final system. Land is scarce and expensive. A special effort was made to determine the possibilities of developing an on-campus, rather than an off-campus, farm. Also, it would be desirable to accomodate students with a minimum of transport. There are some concerns about the prospect of water development on the farm site. Alternative proposals and projections which could guarantee the university farm a sufficient quantity, sufficient dependability and long-term security of water supply were appraised.

A projected enrollment of about 800 students in agriculture would require a faculty of about 80 scientists. Twenty-one hectares of land suitably apportioned for teaching and research among the various disciplines in agriculture should suffice.

Given sufficient water (at least 14 liters per second), one possible pattern of land use would be to assign approximately 3.0 hectares for use in demonstration plots and trials with agroeconomic crops, cereals, pulses, forages, oil seed, and fiber crops. An allocation of 5.3 hectares of land would be available for horticultural crops. The horticultural activities to be considered would include fruits, vegetables, and forestry and landscaping. Approximately 11.0 hectares of land would be available for animal husbandry work with sheep, goats, cattle and poultry. An additional 0.7 hectare of land could be used for student and faculty activities in soil and water management, for trials and demonstrations in tillage and irrigation methods. Approximately 1.0 hectare would be allocated for buildings, principal roads, ponds, yards, etc. Less available water would mean a proportionally smaller farm and a different distribution of land (see Table 4-1).

In the horticultural section, it was considered appropriate to partition the area three ways, establishing a zone for fruit involving approximately ten different kinds of trees, a vegetable section with about 30 different species of shade trees, fire wood trees, ornamentals, flowers, shrubs and turf.

The livestock section would be comprised of a flock of sheep of approximately 25 ewes, 15 goats involving both dairy and meat, and a cattle herd of about 8 milk cows. The poultry flock should have both egg and meat production using a flock of 250 layers and 250 broilers.

The teaching to be undertaken in the livestock section would involve breeding trials and effort on production efficiency and animal nutrition. Close cooperation with the MAF veterinarian service should be developed. The animal science section should provide opportunities for the students to make observations on pasture management and utilization with emphasis on labor-saving methods. Some range management demonstrations should be arranged on leased land, if available adjacent to the university campus.

Some land within the agronomic and horticultural plots as well as outside of those plots should be used for soil management and irrigation demonstrations. Demonstrations in tillage, tillage intensity, depth, and equipment are recommended. There should be demonstrations and trials in irrigation engineering to compare flood, rill, basin, furrow, drip, sprinkler, etc. The students should also have some opportunity to work with irrigation plumbing: pumps, valves, pipes, siphon tubes, open ditches, drop structures, flumes, weirs and so forth. The student should have some exposure to irrigation requirements of crops and to irrigation efficiency with an overall strong emphasis on energy and resource conservation.

For the benefit of the students, for extension activities, and for research activities by the faculty, the farm facilities should include the following buildings:

(a) Crops laboratory building and offices
(b) Shop and equipment barn
(c) Livestock barn and handling facility
(d) Poultry building
(e) Feed storage building
(f) Completely equipped weather station
(g) Two pump houses
(h) Water impoundment

It would be most appropriate if the facility could retain planning flexibility to be used for future research needs. This proposal needs strong support from the administration, faculty and from other faculties in the University. Looking toward the future, we would visualize the need for additional facilities - perhaps at Mabar, Dhamar, or Yarim and possibly a development at the Sana'a airport.

At the airport, use of chlorinated stabilized effluent may be considered. This should be an inexpensive source of water but it must be used with care.

Below is a Summary of the Budget. Cost estimates are given by category. Details on budget items can be found in the Appendix.

Proposed University Demonstration Farm Cost Estimate Summary

Water System to Farm	-	$ 457,800
On-Farm Water Distribution System	-	112,200
Irrigation Equipment	-	42,900
Irrigation Measurement Equipment	-	34,720
Office and Crop Science Building Equipment	-	217,950
Livestock Center and Feed Building, Equipment	-	192,100
Poultry Building and Equipment	-	25,400
Farm Shop	-	58,310
General Farm Machinery and Equipment	-	125,175
Perimeter Fencing	-	85,000
Establishment Cost	-	215,000
TOTAL COST IN U.S. DOLLARS		1,566,555

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Mr. Mohammed Ayub, P.E., Senior Hydrologist, Yemen Oil and Mineral Resources Corporation.

CID	Consortium for International Development
ISAI	Ibb Secondary Agricultural Institute
MAF	Ministry of Agriculture and Fisheries
MOE	Ministry of Education
MOH	Ministry of Health
NWSA	National Water and Sewage Authority
SURDP	Southern Uplands Rural Development Project
TDA	Tihama Development Authority
UNDP	United Nations Development Program
USAID	United States Agency for International Development
WMO	World Meteorological Organization
YAR	Yemen Arab Republic

DISCLAIMER: The CID/ USAID special study team made every effort to make this list complete. We apologize for any omissions and attest that they were inadvertent.

1. PURPOSE OF STUDY

1.1 Background

Agriculture is the most important production economic sector in the Yemen Arab Republic. According to the World Bank (1979), agriculture accounts for approximately 40 percent of the gross domestic product (GDP). Agricultural practices are undergoing major changes. After centuries of subsistence farming through the efficient utilization of a meager resource base and employment of traditional cultivation techniques, farmers are now faced with new markets, labor shortages, high wages, relatively easy access to capital, and changing consumer tastes. These changes offer new opportunities for agricultural development, especially with respect to the high value crops and livestock.

Table 1-1 shows the relative importance of agriculture to the Yemeni worker. Table 1-2 shows the importance of agriculture to the gross domestic product. The role of agriculture is changing. Much of the change is due to the dynamics of other sectors, to emigration of rural labor, and to structural changes within agriculture itself. The relative share of the GDP for agriculture has fallen from an estimated 53 percent in the years 1969 and 1970 to a 1979 level of 40 percent. These changes do not reflect a stagnation or even a decline in the agricultural output. In the first half of the 1970's agricultural production increased by approximately 50 percent even though the labor force employed in agriculture declined significantly during the same period. Much of the change can be attributed to an improvement in weather conditions and in a shift from traditional subsistence farming to the production of high-valued cash crops. An increased use of modern inputs such as improved seeds, fertilizers, and pesticides caused the yields of some crops to rise. In some areas there have been substantial investments in irrigation. Increased use of female labor and mechanization partially compensated for the emigration of male labor from rural areas to other countries such as Saudi Arabia. These changes were further stimulated by a generally favorable economic climate with rising farm prices reflecting increased demand. The government is also providing increased institutional support. Agriculture is adapting quickly to the changing structure of the economy.

Commodities grown in the Yemen Arab Republic are significantly more expensive than imports and comparable commodities on the world market even though quite often the Yemeni products are lower in quality (Pratt, 1976). Substantial advances will need to be made in increasing yields coupled with decreasing production costs if local goods are to retail at realistic prices while maintaining returns for farmers. Currently, local commodities are becoming increasingly vulnerable to foreign competition on internal markets.

Even though there are substantial physical constraints, the present low level of agricultural productivity suggests potential for development even with limited and erratic rainfall. The World Bank (1979) considers significant increases in crop yields possible. Better techniques in animal husbandry and animal health care will most likley increase weight gains of animals and increase milk production.

Table J-1: Percentages of the 1,127,572 economically active Yemeni engaged in various occupations in 1975. (CPO, 1981)

Employment Area	Percent
Agriculture	73.6
Mining	0.1
Manufacturing	3.0
Electricity	0.1
Construction	4.7
Trade	6.1
Transport	2.2
Finance	0.2
Social Services	7.6
Not Stated	2.4
TOTAL	100.0

Table J-2: Comparison of agricultural and total industrial output for YAR in 1979-80. (COP, 1981)

	Agriculture (million YR)	Total Industrial
Gross output at producer prices	4024	13,591
Gross domestic product at market prices	3458	8,721
Net domestic product at market prices	3416	8,442

In planning for increases in agricultural production through the introduction and development of new techniques, it must be kept in mind that the existing systems of agriculture have evolved through more than 3,000 years of experience. Suggestions for change should be carefully considered. It should be noted that there have been rapid changes in resource availability and in the relative prices for products. Many, if not most, of the existing farm systems have not sufficiently adjusted to new technological opportunities. Many of these new opportunities have not been sufficiently demonstrated to the farmers.

In order to meet the changing needs of a developing agriculture, the Yemeni people must be better educated. According to the Central Planning Office (CPO, 1981), the literacy rate in Yemen is very low (see Table 1-3). There is a serious shortage of trained professionals and technicians required to staff the new agricultural institutions and provide needed services. In information compiled by the World Bank (1979), the Ministry of Agriculture and Fisheries (MAF), in 1976, had only 72 university-trained agricultural specialists, which included veterinarians, and 219 agricultural technicians. There was a projected need for 288 professionals and 876 technicians by 1981, or four times the 1976 complement. This additional staff could not be provided each sufficient speed by present educational arrangements. Rapid increases must be made in the output of universities and other training institutes. Unless this is accomplished, the manpower in agricultural administrations and agricultural public institutions will be in short supply. Table 1-4 shows the estimated requirements for university-trained people in the agricultural sector from 1977 to 1981. It also shows the projected supply of university graduates during the same period and the projected shortfall. Table 1-5 and 1-6 show the educational structure and the number of students in Yemen from the primary level through the university level. Table 1-7 shows the number of students on grants in other countries in various specializations.

The University of Sana'a is the only institution of higher learning in the Yemen Arab Republic. It was established in 1970. It was opened with an enrollment of 61 students and a staff of 15 in three colleges: law, science, and arts (Nyrop et al., 1977). It has since added faculties of commerce and education. It has been determined that there is a critical need for the development of a Faculty of Agriculture at the University of Sana'a (Aulaqui et al., 1981). When established, the Faculty of Agriculture will provide YARG with the technological, scientific, and academic resource base for development of research programs to meet the needs of the Yemeni farmers, to increase agricultural production, to make more efficient use of Yemeni soil and water resources and a curriculum and teaching program to meet the needs of academically qualified Yemeni students interested in pursuing a career in agriculture. Initially, the Faculty of Agriculture will most likely provide program specialization in four departments: (a) animal production, (b) plant production, (c) soil, irrigation and mechanization, and (d) agricultural economics (farm management, marketing, cooperatives, extension and vocational agriculture).

Table J-3: Education status (1975) for the Yemeni population over 10 years of age. (CPO, 1981)

Illiterate	Read Only	Read & Write	Primary	Preparatory	Secondary	University	Not Stated	Total
			- - -	Percent	- - -			
				Male				
65.0	10.8	21.6	1.0	0.6	0.4	0.2	0.4	100
				Female				
97.3	0.7	1.3	0.1	0.1	0.03	0.02	0.02	100

Table J-4: Estimated number of university trained people for agriculture compared to estimated need for the four-year period 1977-1980 (World Bank, 1979).

Specilization	Estimated need	Estimated supply	Deficit
Crops	16	5	11
Livestock	15	4	11
Fisheries	27	5	22
Forestry	10	-	10
Horticulture	19	4	15
Plant Protection	23	9	14
Ag Statistics	26	-	26
Extension	27	3	24
Mechanization	8	-	8
General	24	100	+76
Irrigation Eng.	15	2	13
Veterinary	25	-	25

Table J-5: Distribution of pre-university students in 1979/80 (CPO, 1981).

Type School	Students			Classrooms	Schools
	Female	Male	Total		
Primary	41,707	293,542	335,249	9,650	2,543
Preparatory	2,795	17,969	20,764	655	197
Secondary	1,046	7,183	8,229	249	55
Technical Secondary	1	355	356	16	2
TOTAL	45,549	319,049	364,598	10,570	2,797

Table J-6: Students and faculty at the University of Sana'a during 1979/1980 (CPO, 1981).

	Students					
	Year					
Faculty	1	2	3	4	Total	Staff
Commerce & Economics	616	322	231	205	1,374	25
Law	513	155	108	136	912	17
Arts	546	164	81	47	838	60
Science	272	46	24	14	356	67
Education	284	183	142	131	740	12
Total	2,231	870	586	533	4,220	181

Table J-7: Students on grants in foreign countries in various specializations during 1979/80 (CPO, 1982)

	Speciality								
Country	Tech.	Educ.	Com.	Vet.	Agr.	Sci.	Phar.	Eng.	Med.
Egypt	-	43	29	5	18	14	2	-	-
Iraq	-	-	-	7	33	10	2	17	15
Syria	13	-	6	10	59	12	7	39	4
Libya	-	-	-	-	4	-	-	3	2
Kuwait	-	-	-	-	-	-	-	1	2
Sudan	-	1	-	-	-	-	-	-	-
Saudi Arabia	-	-	-	6	9	-	4	61	-
U. of Beirut	-	-	-	-	-	-	-	62	-
China	-	-	-	-	-	-	-	4	-
Romania	-	-	-	-	-	-	-	2	4
Pakistan	-	-	-	6	8	-	18	39	37
Total	13	44	35	34	131	36	33	228	64

It is presumed that the agricultural program will begin with 30 entering students. It is hoped that after approximately 15 years, as many as 150 students would enter the program each year. A general program is planned which would allow students to enter any area of specialization after four years.

Professional agriculturalists trained in extension techniques are probably the most critical need. The Yemeni farmers are highly industrious and skillful in their traditional ways of cultivating crops and caring for livestock. However, they are not knowledgeable or experienced in modern agricultural practices. Even when new techniques are successfully demonstrated, the farmers are not always ready to take the risks involved in the adoption of new practices. To move from subsistence agricultural systems to a market-oriented system based on cash crops, continuing extension guidance will be necessary.

1.2 Purpose

The University of Sana'a administration has determined that a Demonstration Farm should be designed to serve the Faculty of Agriculture. A design team from the Consortium for International Development (CID) was designated to plan the demonstration farm. The farm should be mainly for demonstration of existing technology. It will serve research needs of the Faculty of Agriculture.

1.3 Objectives

The Demonstration Farm could be located on the new campus of the University of Sana'a at the intersection of Ring Road and Wadi Dhar Road. Up to 25 hectares should be available for the farm. The farm should serve the needs of the disciplines planned for the Faculty of Agriculture: agronomy, horticulture, irrigation and mechanization, and animal husbandry.

In general, the demonstrations should represent as much diversity as possible. The climatic conditions of YAR are diverse; thus local conditions pose some limitations since Sana'a is on a high mountain plain. Most of the demonstrations should have widespread, immediate application. The physical and economic resources available to the farmers should be considered in designing demonstrations.

A Demonstration Farm at Sana'a campus cannot totally represent the diversified agriculture of the entire country. A network of demonstration and research farms throughout the Yemen Arab Republic is planned for the future. The planned demonstrations on the Sana'a campus should show optimum and deficit irrigation and simulated rainfed agriculture.

1.4 Significance

The students of the Faculty of Agriculture need "hands-on" exposure to the technology of modern agriculture. The farm background of most students will not be in modern agriculture. Eventually, as many as 300-400 students will need access to the demonstration each year. They will do many of the demonstrations themselves, providing much of the labor. Most of the demonstrations should have immediate practical significance so that the students can carry the knowledge to the farmer for direct application. Some of the demonstrations, however, will introduce new concepts not immediately acceptable to the producer. Some demonstrations will show problem situations. As far as possible, all crop and horticultural commodities produced in the Yemen Arab Republic should be demonstrated.

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1.5 Study team procedure

The Faculty of Agriculture will have an organizational structure similar to that used in the Land-Grant System of the United States. Teaching, research, and extension components are planned. Members of a design team familiar with the U.S. Land-Grant System are the authors of this report. Interviews with University officials, Ministry of Agriculture Officials, local agriculture officials, National Sewage and Water Authority representatives, Food and Agriculture Organization United Nations representatives, World Bank representatives, and numerous consultants for agriculture, hydrology, and engineering were conducted. Well drilling companies were also interviewed. Field trips were taken to gain perspective of YAR agriculture.

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2. GEOGRAPHY OF YAR AND THE STUDY AREA

2.1 Location

The Yemen Arab Republic is located in the southwestern corner of the Arabian peninsula between 12° 40' and 17° 26' north latitude and 42° 3' to 46° 31' east longitude. This country of nearly 8.5 million people is bounded on the west by the Red Sea, on the north and east by the Kingdom of Saudi Arabia and on the south by the Peoples Democratic Republic of Yemen, commonly called South Yemen. Some of the boundaries of the country toward the east with both Saudi Arabia and south Yemen have not been officially demarcated. Depending on the reference cited YAR has an area of between 135,200 square kilometers (Bernhardt, 1980) and 200,000 square kilometers (CPO, 1980). The study center for this report is located in Sana'a, the Capital of the Yemen Arab Republic.

There are at least three principal geographic regions in the YAR: The Tihama, which is a 400 kilometer long narrow coastal plain, the high mountain plains, and the eastern high desert.

The coastal lowlands of the Tihama cover an area 30 to 60 kilometers wide along the Red Sea. The elevation ranges from sea level to approximately 200 meters at the foothills. It ranges from a plain to slightly undulating foothills and is intersected by dispersed wide, shallow wadis draining from the central mountain range toward the sea. This narrow, hot, semi-arid, almost waterless strip extends along the entire sea coast from Maydi on the northern frontier with Saudi Arabia to the Bab Al Mandab at the country's southern limit and occupies approximately 10 percent of the country. Seven major wadis permit limited agricultural activity (Nyrop, et al., 1977).

The high mountain plains have been formed as a result of block faulting along a north-south axis parallel to the Red Sea and along an east-west axis parallel to the Gulf of Aden. The resultant uplift has formed a central mountain range starting around Taiz. The mountainous area can be divided into three regions, each with distinct climatic and vegetational characteristics. These are the foothills and middle elevations of the central mountain range, the central highlands, and the eastern semi-desert plateau.

The foothills and middle elevations of the central mountain region are situated between the Tihama and central highlands within the elevation range of 200 to 1500 meters. The landscape is very rugged, cut by deep wadis running through narrow gorges with very steep and long slopes.

The central highland regions comprise the higher reaches of the central mountain range exceeding 1500 meters in elevation. This area extends from Ibb in the south, into Saudi Arabia in the North. A chain of the high mountains is found between Ibb and Sana'a with several peaks exceeding 3,000 meters. Yemen's highest peak, Nabi Shu'Ayb (3,760 meters) also the hignest peak on the Arabian peninsula is located in this zone. Topography to the west of the range is very rugged. The eastern slopes

of these mountains are more gentle and terminate at the high mountain plains of Sana'a, Mabar, Dhamar, and Yarim. These high plateaus are all above 2,000 meters in elevation. The central highlands, especially the area around Ibb, were in the past referred to as Felix Arabia or happy Arabia because of the moderate temperatures and the large amount of precipitation. This area has more cultivatable acreage than any other part of the peninsula. It should be remembered, however, that the description "happy" is applied relative to the general aridity of the rest of Arabia. The highlands, like most mountain areas, exhibit substantial ecological diversity (Swanson, 1979).

The eastern semi-desert plateau slopes gently toward the east and forms rolling country dropping in elevation to approximately 1,000 meters. It borders the "empty quarter", Rub El Khali of Saudi Arabia.

The geology of the YAR is quite varied. The country lies over a complex of igneous and metamorphic rock, consisting mainly of micas, schists, gneisses, quartzite, and marbles across which run massive intrusions of granitic and basaltic dikes. There are Jurassic beds and Tertiary rocks consisting of Cretaceous sandstones, volcanic tuffs, and basalts. There are also several quaternary volcanic lava flows. The more recent deposits are alluvial formations on the plains in the central part of the country and the coastal plains of the Tihama. Also of recent origin are the sand dunes of the edge of the empty quarter (Al-Thoor and Dewan 1978; Nyrop et al., 1977; CPO , 1981).

2.2 Climate

The climate in YAR is determined by the country's location and topography, with mountains rising from sea level along the Red Sea to an elevation of more than 2,700 meters within a distance of only 100 kilometers. Rainfall depends upon its position on the northern rim of the Indian Ocean monsoon system. Rainfall occurs at two maxima, one during March through April, and the second lasting from July through September. This summer rainfall is mainly influenced by moist air masses of the monsoon circulation systems which flow from the southwest against the Yemen highlands and cause heavy precipitation on the mountain slopes exposed to the west, mainly above 1500 meters. During the period October through February, the dry air masses originating with the central Asian anti-cyclone, are the main reason for the rainless season. Because the rains are borne on southwesterly winds, the amount of rainfall in the highlands decreases as one moves north.

Ibb in the south is known as the green province. It receives more than one meter of rain each year. Further north in Sana'a, however, rainfall averages only one-tenth to one-third as much as in Ibb. Tables 2-1 and 2-2 illustrate the rainfall distribution for Yemen. Most of the rainfall occurs as very heavy localized showers in the afternoon which are usually confined to limited areas. The frequency and intensity of rainfall decreases on the lee side of the western highlands, towards the central highlands and the eastern semi-desert plateau.

Climatic records for Yemen are limited. Data available indicate that rainfall is quite variable for a single location as illustrated in

Table J-8: Precipitation for four areas of YAR (World Bank, 1979).

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
							Rainfall						
							---------- mm ----------						
Taiz													
Mean	1.3	11.8	15.9	73.6	97.6	83.9	60.9	66.8	83.7	60.9	14.3	9.7	580.4
Max	15.2	84.6	60.9	138.6	213.4	149.8	134.7	141.7	137.1	130.0	53.9	36.5	831.4
Min	0.0	0.0	0.0	0.0	30.4	22.8	10.2	25.4	25.4	5.6	0.0	0.0	308.9
Zabid Camp													
Mean	5.0	0.7	5.4	21.9	29.1	4.4	35.7	80.7	128.4	36.9	2.4	1.6	352.2
Max	22.0	3.0	17.0	80.0	51.1	15.0	102.0	206.0	281.0	124.0	10.0	11.0	546.0
Min	0.0	0.0	0.0	0.0	0.0	2.0	12.0	68.0	0.0	0.0	0.0	0.0	226.0
Yarim													
Mean	2.0	16.3	51.3	66.0	65.0	45.2	65.5	132.9	35.1	4.9	9.7	3.8	497.6
Max	9.1	37.2	104.6	202.1	178.3	109.5	114.5	242.36	65.2	23.4	48.6	14.5	667.9
Min	0.0	0.0	2.4	10.7	2.4	4.3	4.3	69.7	5.3	0.0	0.0	0.0	356.8
Ibb													
Mean	10.1	17.1	46.3	124.7	219.2	246.2	246.7	250.0	193.5	68.9	35.8	9.9	1,468.4
Max	43.4	42.9	76.6	291.0	402.0	367.0	414.3	426.3	335.9	174.8	120.5	33.6	2,228.6
Min	0.0	0.0	0.0	44.6	77.5	185.5	174.2	199.2	109.8	15.5	0.0	0.0	1,050.1

Table J-9 Precipitation for Sana'a from 1963-1981. (World Bank, 1979).

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
							Rainfall mm						
1963	14.3	3.8	10.6	13.0	128.0	80.8	20.9	81.5	0.0	0.0	47.2	14.5	414.6
1964	2.2	4.0	1.7	38.3	12.5	8.0	39.9	8.2	5.0	0.0	1.6	10.9	132.4
1965	0.0	0.0	25.9	56.4	0.0	0.6	28.5	88.9	0.0	0.0	11.7	0.0	212.0
1966	3.9	11.3	9.5	35.3	7.2	0.0	24.3	65.6	4.3	0.2	1.1	0.0	162.7
1967	-	-	-	-	-	-	-	-	-	-	-	-	nd
1968	0.0	0.0	8.4	84.1	11.1	14.9	0.0	0.0	1.0	0.0	3.0	0.0	122.5
1969	9.0	16.4	1.1	25.2	13.5	0.0	19.4	28.5	0.0	1.5	0.0	0.0	114.6
1970	4.1	0.0	1.0	1.7	1.0	1.0	0.0	136.7	12.5	0.0	0.0	0.0	158.0
1971	23.9	0.0	23.8	21.5	4.9	0.0	17.3	9.0	0.0	0.0	10.2	0.7	111.3
1972	0.0	3.0	10.3	83.1	6.0	0.5	0.0	6.9	0.5	0.0	6.0	0.5	116.5
1973	0.0	0.0	0.5	5.6	10.0	3.0	36.0	101.0	5.0	0.0	0.0	2.0	163.1
1974	0.0	0.0	34.8	44.2	89.1	0.0	1.5	45.8	0.0	0.0	0.0	0.0	215.4
1975	1.0	2.0	35.8	109.4	0.2	1.9	84.5	102.0	13.8	0.0	0.0	0.0	350.6
1976	0.0	1.1	27.7	32.0	36.6	0.0	18.5	3.7	0.0	0.0	31.5	3.0	154.1
1977	-	-	-	-	-	-	-	-	-	-	-	-	nd
1978	1.0	7.5	15.2	29.9	10.4	10.0	16.6	0.0	0.5	0.0	5.4	0.0	96.5
1979	18.5	1.0	21.5	0.2	20.3	4.0	9.5	20.9	0.0	0.0	0.0	0.0	95.9
1980	0.0	14.1	36.3	42.4	0.0	0.0	0.0	0.0	0.0	5.8	0.0	0.0	98.6
1981	0.0	0.0	112.9	18.9	7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	139.7
Min	0.0	0.0	0.5	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-
Max	23.0	16.4	112.9	109.4	128.0	80.8	84.5	136.7	13.8	5.8	47.2	14.5	-
Mean	4.6	3.8	22.2	37.7	21.1	7.3	18.6	41.1	2.5	0.4	6.9	1.9	168.1
On-1	7.4	5.3	26.6	30.6	34.8	19.4	21.4	45.4	4.44	1.4	13.0	4.2	89.0

Source: World Bank (1979); Sana'a Airport; Central Planning Office.

Table J-10 Temperature for Sana'a

Jan	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ave.
--Degrees Centigrade--												
Mean Temperature 1971-1976												
12.7	14.5	16.3	17.4	18.6	20.0	20.5	19.8	17.7	14.2	14.2	13.0	16.5
Minimum Temperature 1979-1980												
0.0	0.0	4.0	7.0	7.0	11.0	10.5	12.0	9.8	4.0	-1.0	0.0	-
Maximum Temperature 1979-1980												
27.0	28.6	30.0	31.0	29.8	31.2	32.0	30.2	31.4	29.0	28.0	36.0	-
Soil Temperature at 100 cm Depth 1976												
19.9	20.5	21.4	21.5	21:5	23.4	23.9	23.7	24.1	22.8	21.8	20.5	22.0

Source: CPO; Zschintzch (1978).

Table J-11 Land Use in the Yemen Arab Republic (CPO, 1981)

---- Land Use ----				
Cultivated land	Marginal area	Forest & shrub	Other	Total
---Hectares---				
1,515,000	2,000,000	1,600,000	14,885,000	20,000,000

Table J-12 Type of agricultural land (CPO, 1981)

---- Type Water Application ----				
Rainfed	Flood	Perennial	Well	Total Ag Land
		---Hectares---		
		Sana'a		
3,728,000	-	20,000	7,200	400,000
		Yemen		
1,265,800	120,000	73,000	56,200	1,515,000

Table J-13 Production of the main crops in YAR and in the Province of Sana'a for 1979/80 (CPO, 1981)

Crop	Yemen			Sana'a		
	Prod. 1000T	Yield T/H	Area 1000H	Prod. 1000T	Yield T/H	Area 1000H
Sorghum & millet	692.1	0.9	790.6	109.9	0.7	191.0
Legumes	79.6	1.1	71.5	14.8	0.8	19.0
Maize	99.4	1.6	63.7	2.9	1.4	2.0
Barley	57.2	1.0	58.1	27.5	0.9	30.0
Wheat	52.6	1.0	51.5	17.1	0.8	20.9
Vegetables	253.7	9.6	26.4	49.5	8.2	6.1
Fruits	75.1	5.3	14.2	6.8	4.8	1.4
Grapes	55.0	4.8	11.5	43.5	4.8	9.0
Potatoes	127.2	12.0	10.6	4.7	7.9	0.6
Sesame	6.0	0.6	10.1	0.1	0.5	0.2
Tobacco	7.0	1.1	6.1	-	-	-
Cotton	2.8	0.9	3.0	-	-	-

Table J-14 Major plant commodities consumed in YAR (CPO, 1981, Pratt, 1976)

*Alfalfa
Almonds
*Apricots
Banana
*Barley
*Beans (white, red, broad)
*Cabbage
*Carrots
Chickpeas
Chilies
Citrus
Coffee
Coriander
Courrat
Dates
*Eggplant
*Fenugreek
*Grapes (raziky, assimi, white, black)
*Green Beans
Ground fenugreek
Jaw's mallow
Kahtah
*Lentils
*Lettuce
*Linseed
*Maize
Mint
*Mustard
*Okra
Olives
*Onions (red, white, green)
Parsley
*Peas
Peanuts
*Pomegranates
*Potatoes
*Quince
*Radish
*Sorghum (red, white, yellow, shami)
*Spinach
*Squash
*Sweet Melon
*Tomato
*Watermelon
*Wheat

*Commodities grown on highland plateau.

Table 2-2 for Sana'a. Varying data have been reported for any given year depending on the location of the rain gauge within a small geographic area (Berhardt, et al., 1980; Nyrop, et al 1977: Swanson, 1979; CPO, 1981). The rainfall data for Sana'a indicate that it would be very risky to attempt rainfed agriculture or surface water harvesting for a demonstration farm in that area.

Table 2-3 indicates the temperature for Sana'a. Although temperatures rarely get much below freezing, local frosts do occur during the winter months. Low winter humidity and low pressure in the highlands causes rapid evaporation which in turn results in surface frost even when atmospheric temperatures are above freezing (Swanson, 1979). The incidence of frost, therefore, varies considerably with altitude and exposure. In any given village, some fields may freeze while adjacent ones do not. These microecological differences play an important role in determining cropping strategy.

2.3 Agriculture of Yemen

The following is summarized from Bernhardt et al. (1980), World Bank (1979), U. of A. (1981), Swanson (1979), Pratt (1976), and the CPO (1981). Yemen is not richly endowed in agricultural resources. Labor intensive and sophisticated agricultural techniques have been practiced for centuries on the slopes of steep and rugged mountains. The Yemeni farmers have spared no effort to gain maximum profit from the scanty rainfall, even on difficult terrain. Out of the total land area of approximately 20 million hectares, only 1.5 million hectares or seven percent of the total area are regularly cultivated (see Table 2-4). An additional two million hectares of marginal agricultural land is cultivated only during high rain fall years. Woody vegetation or scrub growth covers approximately 1.6 million hectares. The rocky mountainous semi-arid to arid rangelands with very sparse vegetation cover about 15 million hectares.

The rainfed agricultural land comprises about 1.2 million hectares (see Table 2-5). The spate irrigated and spring-irrigated areas are estimated to cover 120,000 hectares and 73,000 hectares respectively. The area of pump-irrigated land has been increasing in recent years and occupies 50,000 to 60,000 hectares. The actual amount of cultivated land varies from year to year depending on rainfall.

Much of the agricultural land is on highland landforms of basically two types: (1) rugged mountain areas with relatively steep slopes and meadow valleys which are typically bisected by wadis and (2) broad highland plains. In the mountain valleys there is the invariably extensive terracing with step-like agricultural fields climbing from the valley floors up the slopes. Such terraces maximize the absorption of precipitation while minimizing soil erosion. Irrigation is likely in the valleys from water diverted to the lower terraces by damming the wadi upstream. On the highland plateaus, terracing is practiced to a far lesser degree or sometimes not at all.

A variety of agricultural crops is grown in the YAR. Table 2-6 lists the major crops and the production values. Table 2-7 lists the main commodities consumed in YAR and the main commodities produced on the highland plateau. Wheat, barley, maize, and sorghum are the main crops. Potatoes, vegetables, and fruits are also grown. The grains occupy about 90 percent of the total cultivated land in the country.

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Of the grains, sorghum is by far the crop of preference. Maize produces approximately 50 percent more grain than does sorghum but the unreliable rainfall in most of the country makes maize a risky crop. The advantages of sorghum are that it is highly resistant to drought while at the same time producing grain for human consumption and fodder for animals. Its major disadvantages are that it requires six months to mature and grain yields are low. Of the other grain crops grown, only wheat produces less grain than sorghum. Barley has a far shorter growing season than sorghum, slighly over two months, and produces significantly more grain. As in the case of wheat, however, barley does not provide animal fodder. This is a major consideration in an economy where animals play an important role. Maize produces both fodder and slightly more grain than sorghum provided it receives ample water. Barley is usually limited to the higher terraces with poorer soils. The terraces are planted with sorghum after the first significant rain of the monsoon season. If, however, as sometimes happens, these rains do not materialize, barley is planted during the next summer maxima of rainfall.

Pulses are important crops but do not account for a large percentage of the agriculture. The most important are lentils, fenugreek (hilba), peas, and beans.

Commercial market-oriented agricultural production is limited to a few enterprises such as cotton, hides, skins, coffee, qat, vegetables, fruit and livestock. Although subsistence agriculture predominates in the highlands, a limited number of these cash crops are grown. In the highlands, the cash crops are generally leeks, radishes, alfalfa, and qat. Aside from chilies and green tomatoes, these are the only vegetables consumed in rural areas.

In order of importance, the common domestic animals are cattle, sheep, goats, chickens, donkeys, camels, cats and dogs. Cattle are a source of milk, draft animals, and meat. Most bull calves are butchered shortly after birth to conserve milk and fodder although a few are castrated and allowed to mature into oxen which are the principal agricultural draft animals in the highlands. Camels are often used as draft animals in the Tihama. Cows, on the other hand, are more highly prized for their milk which is almost never drunk fresh but is transformed into clarified butter and buttermilk.

Sheep and goats are reared for their wool and hair, meat and milk. In general, they play a less central role in that agricultural regime than do cows. It appears that the decreased sheep and goat production are a result of migration-induced labor shortage.

3. PREMISES FOR DEMONSTRATION FARM

3.1 Assumptions

3.11 Uses and Objectives

In order to develop a working premise of the University of Sana'a Demonstration Farm, the CID study team found it essential to make certain assumptions about the University of Sana'a Faculty of Agriculture. It was visualized that the University of Sana'a will be the intellectual center for the training of future leaders of the agricultural industry in Yemen. These leaders will be responsible for the decisions affecting the growth of agriculture and changes in the agricultural industry, changes in the products of the nation, and the entire fabric of the agro-industrial complex underlying the food system of Yemen. Thus these individuals should be trained in the basic sciences and principles not only to understand current research, but to analyze new ideas, new perspectives, and inventions for their significance and usefulness in the agricultural complex of YAR. The Demonstration Farm needs a level of sophistication and complexity which allows it to look to the future.

It was assumed that the University of Sana'a will be the educational and cultural center of the nation for many decades to come. We thus felt that the agricultural faculty of this university would engage in both basic and applied research. The Demonstration Farm should provide opportunities for research, teaching, extension, and demonstration in agronomy, horticulture, animal science, agricultural economics, and the associated sciences of plant protection, soil science and agricultural engineering.

It was considered important that all of the students have hands-on experience at an appropriate technology level. As we toured YAR and spoke with agricultural leaders, we were reminded constantly that a shortage of agricultural labor currently exists and that, as educational opportunities in arts, sciences, and industries in the nation develop, this shortage of agricultural labor would likely persist for some decades in the future. Thus we felt that there was an appropriate level of technology which should be introduced into Yemen agriculture with the university agricultural faculty asisting and promoting the process of appropriate mechanization of the industry.

3.12 Water Supply

Observations on land use in the vicinity of Sana'a as well as consultation with municipal, national, and agricultural leaders indicated that a reliable supply of water may be one of the limiting factors for the development of the Demonstration Farm. Our impressions are that the ground water supply in the vicinity of the new university campus is limited, so the drilling of new wells is not promising. Harvesting of surface water is not considered sufficiently reliable for the purposes of the Demonstration Farm. We were forced to consider the advantages and disadvantages of locations for the University Farm near or somewhat removed from Sana'a. The possibilities of piping water to the University Farm were also considered. These considerations and deliberations are discussed under the appropriate headings in the report.

3.2 Consultary Evidence

Our conferences with the faculty representatives from the University of Sana'a provided a framework for the structuring of the institution.

3.21 Faculty of Agriculture

3.211 Long Range Plans

Discussions with the President of the University of Sana'a and several staff members indicated to us some long range plans. It is likely that the ultimate size of the College of Agriculture, the student body working under the direction of the Faculty of Agriculture, would comprise 800 to 1,000 students. In addition to this teaching load, the Faculty of Agriculture, in order to keep themselves abreast of the latest developments in their particular sciences, should participate in both basic and applied research activities. They will also engaged in consultation with the Ministry of Agriculture as well as other branches of federal and provincial governments. The faculty should, on occasion, consult with various private institutions of the emerging agricultural industry. They should participate in extension, address audiences of farmers and agro-business leaders, and work with extension workers from their own institutions and from the Ministry of Agriculture.

With this work load, it is reasonable to expect that the ultimate Faculty of Agriculture would consist of 80 to 100 professional scientists.

3.212 Short Range Plans

During the early formative years of the faculty, the student body would range from perhaps 50 to 200 students. The initial faculty would probably have one individual specialist in one of the plant sciences, either an agronomist or a horticulturalist; one professional responsible for the area of animal science and maintenance care in animal health; one individual with a mechanical orientation responsible for student instruction in soils, irrigation and agricultural engineering; and a fourth faculty member, a professor in agricultural economics and extension.

This faculty would be capable of handling 100 to 150 students and operating, with appropriate staff, a small demonstration farm appropriate to the needs of a student body that size.

With the passage of time and growth of enrollment in the College of Agriculture, the Faculty of Agriculture, would grow. Additions to the faculty would be needed and a second professor in plant science should be added. Very early, faculty members should be added in the area of plant protection and in entomology or plant pathology. Also, one of the early additions should be a professor of agricultural extension.

3.213 Faculty Research Demonstration Farm Facility

It is essential that the Faculty of Agriculture stay abreast of agricultural science and technology for optimizing production in the nation's food system. The Demonstration Farm must provide opportunity for faculty research in plant breeding, animal breeding, plant protection, crop fertilization, animal nutrition, irrigation, mechanization, and other aspects of appropriate technology.

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The long range plans for the University of Sana'a call for the development of a School of Veterinary Medicine. The School of Veterinary Medicine should have close rapport with the Faculty of Agriculture.

3.22 Considerations from Topographic Maps and Soils Information

The study team consulted with authorities and solicited their assistance in finding information about soils and relief of the land available for the University Farm. This information was needed to make judgments about the appropriate location, shape, size, and positioning of individual portions of the operation. It was noted that the soils information, information on the location and characteristics of the terraces, the location and size of the various land units that could be cultivated, irrigated and operated was available. Adequate information was found to develop our recommendations.

3.23 Climatic Information

Climatic information was gathered to make decisions with an appropriate margin of safety, taking into account the observed level of variability. We noted, as is typical for regions of low rainfall, especially those which lie close to the equator, that there were large spatial and temporal variations in air temperature, length of growing season, precipitation, pan evaporation, relative humidity, soil temperature and other kinds of climatic data (see Chapter 2). As will be indicated in the following sections, adjusted means were used in making recommendations with respect to irrigation requirements. We considered it important for the Demonstration Farm to be in a position to operate every year irrespective of the weather conditions. Each year a new group of students will have to be instructed. It was judged to be appropriate to be conservative rather than to risk the prospects that some students would be denied a crucial opportunity to learn due to lack of water.

3.24 Water Information

Consultation with the National Water and Sewage Authority, representatives of the Yemen Oil and Mineral Resources Corporation, representatives of American and British water development consultants, representatives of the Ministry of Agriculture, and representatives of the Province of Sana'a Department of Agriculture indicated concerns about ground water status in the Sana'a basin, especially on and around the site of the new campus. When information regarding the ground water recharge rate is combined with the projected population growth in the basin, questions arise with respect to the appropriate allocation of the ground water resources. Demographic projections indicate that by 1995, the population of YAR will probably be on the order of 8,000,000 with some 20 percent of the population living in the Sana'a basin. The projected population for the basin is 1,600,000 compared to an estimated population of 900,000 in 1980 (World Bank, 1979). Considering this prospect of population growth, it is important that the development of the Demonstration Farm be done very carefully with respect to the future water supply. It is our judgment that while other agricultural use of water in the basin might be denied in the future, the utilization of water by the Demonstration Farm should have a very high priority. The reasoning for this will be further emphasized in a later section of this report.

3.25 Crops Information

Consultation with agricultural authorities for the YARG as well as with consultants and agricultural officials of the Province of Sana'a indicated that dietary trends, assuming an increasing affluence of the Yemeni, will find increased emphasis on fruit and vegetables, meat, milk products, and eggs and decreasing emphasis on cereals in the food system. This dietary trend will become economically feasible with increasing affluence and is nutritionally a reasonable development. This change will require shifts in agricultural land use. Associated with this will be an emphasis on increased productivity, a shift toward horticultural crops and pulses, and the need for more livestock feed. Coupled with this must be greater utilization of fertilizers, particularly nitrogen and phosphorous, and an increased in efficiency of water utilization. This may be available through modification of water management techniques.

3.3 Analysis of the Agricultural Scenario

A cadre of professional agriculturalists is one of the most pressing needs of YAR. The professional leaders who will comprise the Ministry of Agriculture as it grows and the current leadership retires and the analysts and decision-makers who will influence the growth of the Yemeni food system to the point of diminishing dependence on foreign sources must be trained by experts. This faculty should be located where it is best able to use its talents, where it has access to some of the best thinking in the nations, and the collegial atmosphere of a full-fledged university. The development and appropriate and efficient use of such a faculty is a very significant concern to the YAR.

3.31 University Farm Location

Many factors become significant in the evaluation of where the agricultural faculty and the associated Demonstration Farm should be located. It is not our intent to dwell on this subject but observations by some of the leaders of the YAR will be stated. The collegial atmosphere and the association with the influential and articulate members of the existing University of Sana's faculty is important during growth and strengthening of the posture of the developing Faculty of Agriculture. Furthermore, the agriculture in the vicinity of Sana'a is itself not insignificant. There is a very significant agriculture on soils and with climate not too different from that available at the University of Sana'a.

Because of the combination of the arguments cited above, the Demonstration Farm study team made a serious effort to design the most practical and best possible Demonstration Farm facility on the new campus of the University of Sana'a. It would be most appropriate to develop a major facility there. Other secondary facilities might be added later at other locations as needed.

3.32 Water Supply

One of the most limiting factors in planning a Demonstration Farm at the Sana'a campus is the problem of finding an appropriate water supply to irrigate an adequate area for demonstration of the multitude of crops and to provide students, perhaps as many as 800, with the opportunity to maintain and operate a parcel of land to obtain experience in irrigation, fertilization, crop selection, plant protection, and animal care, feeding, and health.

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The study team considered a number of alternatives with respect to the development of water supply. This will be more fully elaborated on in Chapter 5.

The concept of water harvesting was seriously considered and reviewed with respect to local rainfall probabilities. Runoff was considered not sufficiently dependable to be source of water for the Demonstration Farm. The possibility of drilling a new well on the new campus of the University was also considered. People familiar with the local water supply discouraged us from counting on any large supply of water from an on-campus well.

After consultation with a large number of firms and individuals in and outside YARG, we concluded that an on-campus well was not likely to produce more than one or two liters per second. This is far less than the amount of water needed for the irrigation of the University Demonstration Farm.

A third alternative was moving the University Farm to another location. This was rejected because of problems of logistics. In addition, the cost of land was a consideration in appraising alternate sites.

A fourth possibility examined as a water supply the development of a well about ten kilometers from the campus and transport of water through a pipeline. This has a certain appeal although the cost of this project is high. It was identified and considered by the study team to be an option worthy of detailed consideration.

Finally, there is the possibility of a combination of an on-campus well providing a small amount of the water with supplement water from a nearby well. This would provide the opportunity to enlarge the farm to its optimum size as the faculty and student body grow in number. This last consideration appears to be the most promising of various sources of water considered. It has the added attraction of offering a reserve supply of water in case of the failure of one well or pump. Both sources of water should be proven before development of the Demonstration Farm begins.

3.33 Climatic Representativeness

The climate at Sana'a is highly variable and representative of only some areas of YAR. These factors have to be taken into account as one plans a University Demonstration Farm. Adequate information about air and soil temperature, rainfall, relative humidity, and pan evaporation was available to make reasonable estimates of means and variances to provide a margin of safety appropriate for an institution like the University Demonstration Farm. The team was conservative in the selection of options of utilization of the farm as will become clear in chapters following.

3.34 Topographic Information

Examination of the site of the University Farm indicates that the present terraces should remain in place. The consequence of leveling them could be insufficient soil depth in some portions of the area. Pipelines or open channels are needed to conduct irrigation water to the various terraces from a single outlet. The topography in the vicinity of the Demonstration Farm and within the boundaries of the University

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property lends itself to the development of an impoundment for storage of water to provide a buffer between the well capacity, pump capacity, and the intended use of the irrigated area. The demonstration of the use of a buffer in the water system could be a relatively important part of the students education, particularly in soil and water management and agricultural engineering.

The shapes and sizes of the existing terrace units will have some effect on the size and location of individual plots and the development of modules for an arrangement of these plots. This is a design consideration, the details of which can be worked out later.

3.35 Soil Descriptions

Significant attributes of soils are the texture and the depth. The combination of soil texture and depth are governing factors in the development of the water storage capacity which in turn is an important variable in the design of the appropriate irrigation program. Thus, this information should be used in the design of the irrigation system and in the design of water control practices. The soil was found to be at least 75 cm deep at all locations tested on the chosen site.

3.36 Crop Information

In the proposal which the study team has developed, an effort was made to assure that no significant crop was left out. In the general organization of the farm there will be an agronomic section comprised of a production and a research section. In the horticultural section it is believed desirable to have subsections for vegetable crops, fruit orchards, and ornamental crops. A livestock section would also incorporate some development of forages and possible rotation of fodder cereals. In the planning of land allocations for the different programs, the study team made both short-term and long-term projections and made suggestions with respect to the potentially usuable crop rotations and soil management practices.

4. THE DEMONSTRATION FARM PLAN

4.1 Constraints

Before going into the details of the proposed farm plan, some of the conditions which limit the size and flexibility of the proposed agricultural operation must be considered. It is important that the readers develop an appreciation for the perspective which evolved during the deliberations about the possible Demonstration Farm.

The Demonstration Farm design team assumed that the growth of the farm will be synchronized with the growth of the Faculty of Agriculture and of the student body. It would be an excessive load on a faculty of four or five members to operate a farm of 21 hectares. Thus, the development of plots can be postponed until a larger faculty and student body is present. However, the land and water should be available immediately. The land could be irrigated in larger blocks to establish a partitioning in an appropriate fashion and to appraise the best use of the available water. The land use patterns should remain flexible.

4.11 Water Flexibility

As has been already mentioned, one of the considerations in the evolution of the farm plan was the concept of minimizing risk. Risk reduction was deemed necessary to assure fair and impartial treatment for each of the successive groups of students who will use the facility. It would be unfair to burden random groups of students with the impact of a drought, for instance. Therefore, adequate water supply must be assured for teaching and demonstration purposes year after year. It is also important that the water utilization efficiency be maximized, that is, that the maximum amount of land is appropriately irrigated with a minimum amount of water. It is important that the students develop an appreciattion for maximizing efficiency of the utilization of the precious water resource. The farm should also have land for rainfed agriculture to be randomly irrigated as runoff or rainstorms create an adequate supply of water. These dry land areas could be used for management of grazing areas. They could be used for areas in which to study the action of tillage implements and other trials related to soil and water management. If excess water becomes available, these areas could occasionally be irrigated and operated with induced vegetation and limited utilization of the organic residues in efforts to develop varying levels of soil organic matter content to demonstrate the effect of this variable on soil tilth and management practices.

4.12 Land Availability

The detailed map of the new University of Sana'a campus indicates that the total area of the proposed campus is approximately 170 hectares (Figure 4-1). Our projection for the ideal farm area requires a maximum of 21 hectares. This farm area provides adequate space for a wide variety of agronomic crops, horticultural crops including fruit, vegetables, and landscaping and ornamental materials. Trees for firewood or construction materials could also be grown. Such an area would require a relatively

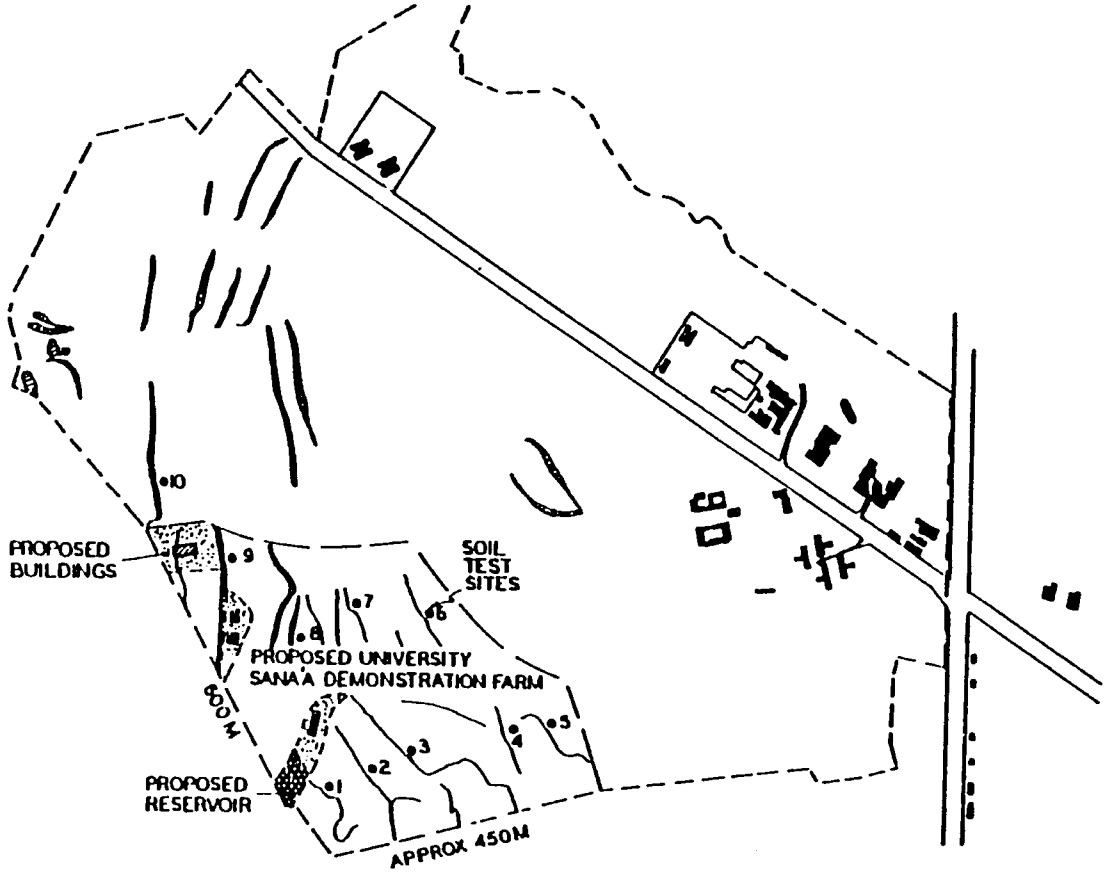

Figure J-1: Map of Demonstration Farm

large well, one which should produce at a rate of at least 14 liters per second (14 l/s). A combination of two wells which would produce about 14 liters per second would be acceptable. Twenty-one hectares would provide opportunities for research plots in plant and animal breeding, plant and animal protection, and plant and animal cultures as well as in irrigation and fertilization practices in addition to student plots and demonstration plots.

Another constraint on available land area might be soil depth or stoniness. The study team did not have sufficient time to make a detailed examination of the proposed site in the southwest corner of the campus (Figure 4-1). Cursory examination indicated that all terraces had soils at least 75 cm deep. Some portion of the area may prove too stony or too shallow for successful utilization. Manifestations of this constraint or further details of this constraint are in Chapter 6.

The proposed Demonstration Farm area has a series of existing terraces. The study team deemed it appropriate that these existing terraces remain in place. Plots should be arranged to fit the parcels delineated by the existing terraces. This approach is consistent with the characteristics of agricultural land use in the central highlands.

The Sana'a climate precludes the utilization of certain crops on the Demonstration Farm. For others, the climate is marginal. The design team suggests that the number of species and varieties demonstrated on the farm be maximized to the limits of the climatic constraints.

There will be other constraints on the farm plan. The area must be organized in relatively small plots to allow for the very large number of plots necessary for the many kinds of crops, the various conditions for their growth and development, and numerous agricultural practices associated with their culture. This means that special arrangements must be made for water control. It is important to make every effort to maximize the flexibility of the system and to allow relatively small plots to be irrigated individually while other plots in the vicinity are kept waterless. Simultaneously, it is important that access be provided for individual plots. Some significant fraction of the total available area will have to be allocated to roads and paths.

4.2 Analysis of Constraints

The constraints of water availability, soil quality (depth, texture), topography; climatic, parcel size must be accounted for in the farm plan. The most limiting constraint is that of water availability. If the farm is located on the new campus of the University of Sana'a, as recommended by the study team, an understanding will have to be developed between the University and the National Water and Sewage Authority (NWSA) with respect to the water rights and the priorities of the University. As the asin population increases, this constraint, if not pre-negotiated in a satisfactory and binding fashion, will become more limiting and more serious. This is one of the reasons it is important that the Demonstration Farm be developed in conjunction with the new campus so that it can have articulate spokesmen among its defenders. The battle for water will be difficult but must be concluded with vigor on behalf of the future agricultural leaders of YAR.

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The agricultural Demonstration Farm requires approximately one-seventh of the total campus. This appears to be reasonable in a country where agriculture is the number one industry. The development of effective and intelligent stewards of the nation's land resources and continuing food supply must be assured.

Living with the constraints due to soil depth and/or rockiness and the constraints associated with the existing terraces is a matter of appropriate and judicious placement of individual plots and/or related clusters of plots. The placement should be left to the implementation of the farm and should not be fixed at the present time. The study team cautions the developers to exercise great care in the selection of terraces for certain plots so as to minimize the constraints due to unsuitable soils on the existing terraces.

4.3 Basic Recommendations

The design of the Demonstration Farm depends totally on the development of a water supply. Therefore the study team recommends that the detailed design of the Demonstration Farm be postponed until after an adequate, dependable, secure water supply has been developed.

4.31 Well Development

The first step in the development of the University Farm must be the drilling, testing, and pumping of a well on the university property. The university should proceed immediately with the drilling of a well at a location on the university property identified by a competent practicing hydrologist. The site should preferably be near the southwest corner of the property.

The university should develop a second well north of the campus. The land area to be irrigated by each well can be judged on the basis of the production of the well by using the relationship that a well production of one liter per second is, in the climate of Sana'a, adequate to irrigate an area of 1.5 hectares. After both wells are in production, the determination of farm size and land allocation can be made.

The size of the land area to be developed depends on the combined production of the two wells. The allocation of the land area to agronomic, horticultural, and livestock production should be done after the well production and thus the total farm area is known. Examples of allocations are in Table 4-1.

4.32 The Second Well

The second well should be several kilometers north of the campus in the vicinity of the NWSA well fields. (Figure 4-2). There is a good probability that a well developed in this location would yield from ten to fifteen liters per second. This water should be piped to the southwest corner of the University Farm site. Chapter 5 provides recommendations for the development of a pipeline and transport system to water from this second well to the farm.

– After the development and testing of a second well, it will be possible to proceed with the development of corresponding land areas which can efficiently utilize the production of both wells. Examples of allocations are in Table 4-1. It was concluded that approximately 21 hectares of farm area can be irrigated with water from the two wells at a production of 14 l/s. Of these only about 13 hectares are actual plot area. If the

Table J-15 Allocation of Demonstration Farm land (as hectares, underlined numbers) to various uses. Total area of the farm will depend on water supply. Differing allocations of land are recommended depending on the amount of water available. Water supply values are in liters per second, (l/s).

WATER SUPPLY	FARM* AREA	AGRONOMY REG.	AGRONOMY SPEC.	HORTICULTURE FRUIT	HORTICULTURE VEG.	HORTICULTURE F&L (1)	LIVESTOCK	SM & I (2)
(L/s)		(3)	(4)	(5)	(6)	(7)		
14	21	2.4	0.6	1.8	3.0	0.5	12.0; 50 sheep, 30 goats, 16 cows, 250 layers, 250 broilers	0.7
7	10.4	Yes	2.2 (8) Yes	1.0	1.3	0.3	5.2; No's ½ of above chickens same	0.4
3.5	5.2	Yes	2.0 Yes	Yes	2.2 Yes	Yes	1.0 Same proportion, reduce numbers	No
1.7	2.6	0.8	No	1.5	Yes	No	0.3 Reduced numbers	No
0.9	1.3	0.3	No	Yes 0.7	Yes	No	0.3 Reduced numbers	No

(1) Forestry and Landscaping
(2) Soil Management and Irrigation
(3) 14 crops, 18 plots/crop, 5x10m plots; cereals, pulses, forges, etc.
(4) 6 crops, 12 plots/crop, 5x10m plots; genetics, oilseed, fiber, etc.
(5) 10 crops, 12 plots/crop, 5x20m plots; grapes, almonds, etc.
(6) 30 crops, 12 plots/crop, 5x10m plots; salad, root, cole, fruit
(7) 10 crops, 6 plots/crop, 5x10m plots; shade, wood, shrubs, flowers, turf
(8) Written in this fashion means the number between arrows is split between adjacent columns. for example 2.2 means some kind of partitioning of this area (2.2 hectares) between regular agronomic crops and specialty crops.
Total area including plots, roads, paths, fences, ditches, etc. Some of the non-plot area could provide livestock feed.

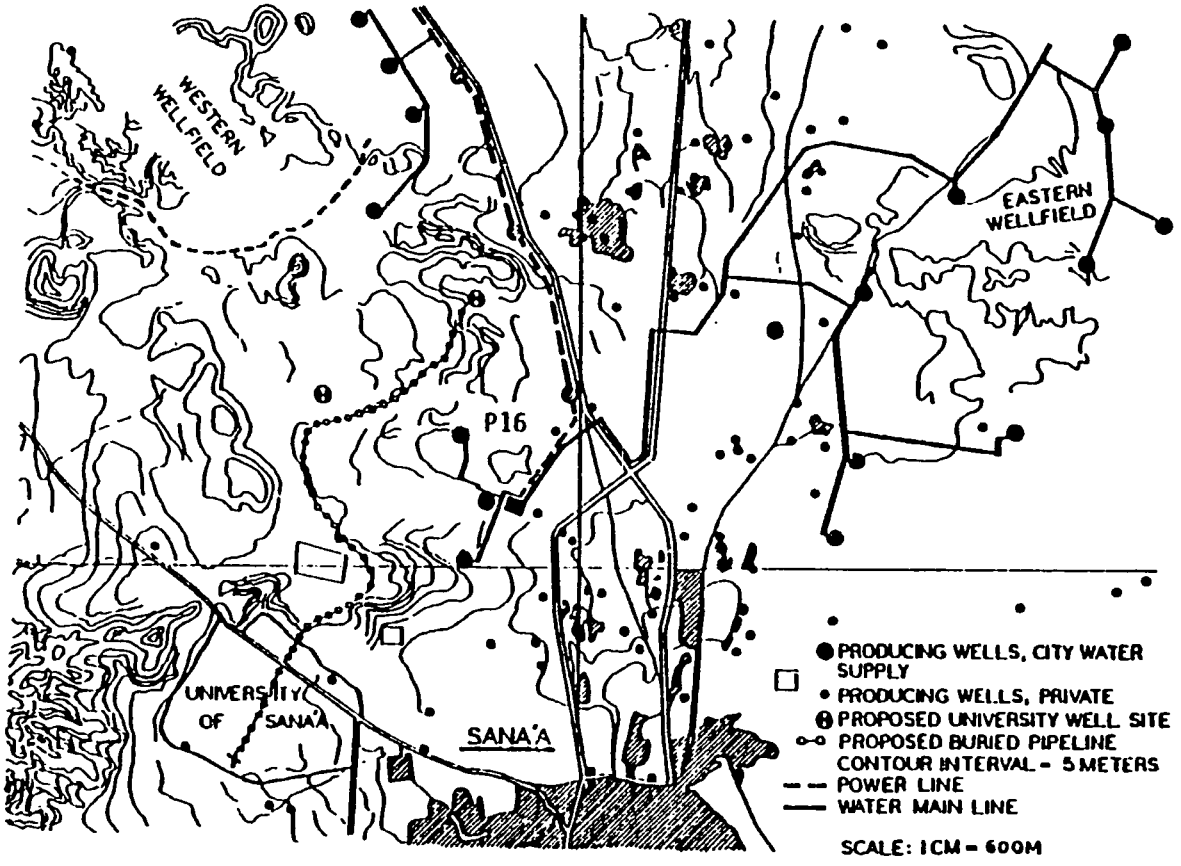

Figure J-2: Off Campus Well Location

combined well production is 7 l/s, the irrigated area could be approximately 10.4 hectares. This smaller area would be partitioned differently than the larger total farm area. Approximately half of the total area, about 5.2 hectares, would be allocated to various aspects of livestock production demonstrations. The other half would be devoted to the culture of agronomic and horticultural crops. A small irrigated area could be allocated to a soil and engineering practice area to provide students with the opportunities to study soil tilth and tillage and to examine various water management techniques; border check, basin, rill, furrow, flood, sprinkle, drip, trickle, etc. Additionally, this area might be used to demonstrate the effects of poor water quality on soil characteristics.

4.33 Water and Land Use Matrix

The relationship of land use to water supply is shown in Table 4-1. Farm sizes ranging from 21 hectarers down to 1.3 hectares are considered in a series of steps. The major emphasis is on horticultural crops when the water supplies are small.

The study team considers the 11 hectare farm to be the minimum size acceptable for an agricultural faculty enrollment of 800 to 1,000 students. The optimum size is the 20 to 22 hectare farm. It needs a water supply at the rate of 12 to 15 liters per second.

It is important to understand that these are suggestions. The Faculty of Agriculture should retain the maximum flexibility so that land use can be planned which is consistent with the needs of the students enrolled in their classes.

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5. THE WATER PLAN

5.1 The Highest Priority

All of the significant attributes of the Demonstration Farm depend upon the successful development of an appropriate supply of water. The water supply must be large enough to provide water to an area consistent with the needs of the faculty. The water supply must be assured for the long term. The faculty and administration must be prepared to defend the importance of the Demonstration Farm and must make sure that water is allocated to the University Farm on a priority basis.

Timing and sequencing of the various phases of the development of the University Farm is important. Both wells must be drilled, proven, and tested before money is spent for buildings, equipment, fences, and walls for the University Demonstration Farm. The size of this operation, the proportioning of the total land to the various kinds of uses, the equipment needs, animal population, building sizes and other attributes of the Demonstration Farm depend on the water supply which can be proproduced. The University Demonstration Farm on the Sana'a campus should be augmented with land and facilities for teaching and research at other locations such as Mabar, Dhamar or Yarim.

The campus farm should be 20 to 22 hectares in size provided a sufficient quantity of water can be produced to irrigate that much land. That much land should be reserved even if some of the area is going to be managed on a deficit irrigation basis. For example, it would be useful to demonstrate to the students the yield increases possible for sorghums or cereals by utilization of a single irrigation during the spring dry spell. This means that the land area could be slightly larger than the acreages calculated using the estimate that 0.8 l/s are needed to irrigate one hectare of land. While planning water allocation, it must be remembered that much of the area is outside the crop plots and that in a rotation, some areas may be bare or with stubble during the time of peak consumptive use rates.

The simultaneous development of two wells to supply water for the farm is recommended to provide security for the continuous operation of the farm. Should one engine or pump be down there would still remain a water supply to meet the needs of the livestock and to meet special emergency needs of crops which would be lost if an extended dry spell were to occur. The design team believes that this investment is needed. This security is necessary. Thus, suggestions below describe the development of two wells, both to be completed, developed, and proven before steps are taken to arrange for water utilization.

5.11 Water Requirement

Weather information for the Sana'a area indicates that during the month of June, the precipitation was 3.6 mm on the average for the past 15 years. This amount is negligible compared to the 152 mm pan evaporation during the corresponding time. The moisture balance is only slightly more favorable in May with 145 mm of pan evaporation and 20 mm of precipitation. It is probable that during at least half of the years, the precipitation in May can be ignored. If these premises are accepted, then the probability of having at least two consecutive dry months becomes high. Under these circumstances the water requirements for irrigation can

be calculated on the basis of consumptive use estimated for the peak rate of pan evaporation. This rate is the 152 mm of evaporation during the month of June.

Considering that the variance is large in this region, it becomes necessary to use a 20 percent average in order to achieve a reasonable certainty of having adequate water during eight years out of ten. For the purposes of calculating the probable consumptive use on which to base the size of irrigation water supply, a pan evaporation estimate of 180 mm per month was used for the peak period level.

The coefficient relating consumptive use to pan evaporation varies with crop. A pan coefficient of 0.70 may be used for the Demonstration Farm involving a variety of crops to be used. On this basis, the amount of water which must be applied at a water application efficiency of 100 percent would be 180 x 0.70, or 126 mm during June. If the irrigation efficiency, estimated as the mean for the various kinds of irrigation programs to be used is at 65 percent, then the gross irrigation requirement would be 126 divided by 0.65 or 194 mm for June, approximately 6.5 mm per day. This is equivalent to 0.8 liters per second per hectare.

5.2 Well Number One

Ideally, the first well to be drilled should be on university property. Its location should be chosen by a skilled ground water hydrologist. If options are available, it should be located near the southwest corner of the university campus. This particular site was chosen because of its proximity to good agricultural land and to a potential impoundment site. Near the southwest corner of the university campus is a location where an impoundment could be constructed with earthen dams and a plastic lining. An impoundment for 1,500 cubic meters would be approximately 4 meters deep and 20 meters long. It would provide the amount of water needed to irrigate 15 hectares to a depth of one centimeter of water, a one-day water supply. This impoundment would provide a useful level of flexibility. It would allow a combination of several plots which demand water at a rate exceeding the production capacity of the well to be irrigated. This would allow time for refilling at night when irrigation is not in progress or during other off-demand time periods. The flexibility added to the system by the construction of an impoundment would be worth its construction cost. The use and maintenance of an impoundment would be a training experience for the students using this facility.

5.21 Pumping System for Well Number One

The pumping system for well number one should be a deep well submersible turbine. At this time it would be unwise to specify the size and characteristics of the pumping system. This cannot be done until the well is proven and tested so that one can ascertain the dynamic head and the discharge rates. Well One is expected to be small, i.e. less that 3 l/s. An estimate of probable costs is in Appendix 1.

5.3 Well Number Two

Consultation with the NWSA has indicated that the appropriate location for university well number two, a well which hopefully would produce about 10 to 20 l/s would be someplace between the eastern well field and the western well field of the city system. The NWSA has a well which could be viewed as a landmark from which to locate the University well. Our suggestion would be that the University should attempt to develop a well 1 to 1.5

kilometers to the west and perhaps a kilometer to the north of city well No. P16 (see Figure 4-2). The prospects for good production at this location appear adequate. An effort should be made to secure a well permit for that region. It is likely that drilling in this region would be in fractured basalt, which would be an expensive operation. It is suggested that the well be drilled to a depth of 300 meters. A cost estimate for developing the water delivery system is given in the Appendix, page A-1.

5.31 Pipeline and Transport System

The study team has observed that much of the agricultural water transport in the vicinity of Sana'a is through galvanized steel pipe lying on the ground. The pipeline to the University Demonstration Farm should be buried. The pipeline can be a low pressure plastic pipe because there is no reason for pressures exceeding 2 or 2.5 bars to develop in this system if it is laid on the contour. If later examination indicates that it would be necessary to carry this pipeline over a topography which would require greater lifts, it would be necessary to use a high pressure plastic pipe which would be more expensive. An estimate is given for the cost of installing 7 kilometers of buried pipeline. Without knowing the exact location of the well relative to the impoundment on the University Demonstration Farm, the distance is not precisely known but it is believed that 7 kilometers is a reasonable estimate for indicating probable costs for this task.

It would be desirable to pump water from well number 2 into an impoundment to increase the flexibility of irrigation water management on the farm. The impoundment described for well number 1 could serve both wells. This impoundment has been described in Section 5.2.

5.32 Estimate of Irrigated Area

Using the same assumptions that were used in Section 5.1, it is possible to make estimates of irrigable areas which the combination of the two wells might service. Results of the calculations for a series for assumptions regarding well production levels are in Table 4-1.

Further details of water distribution systems to individual plots, for the irrigation of particular crops, or for the operation of different kinds of demonstrations of conservative and efficient water use are given in Chapter 9. The detailed discussion of water distribution systems follows a consideration of the agronomic, horticultural, and animal management units involved in the utilization of the water.

6. PLANT SECTOR PLAN

6.1 Premise of Plant Demonstrations

The plant sector of the Demonstration Farm should, as far as possible, have all economic plants and crops which will grow on the highland plateau. Table 2-7 lists most of the commodities produced in YAR. Because of size and space constraints, not all plants can be demonstrated. Most plants not grown on the farm can be seen by careful field trip planning around the country. Major crops should be present on the farm

Many treatments are possible for the crops or the farm. Simple and practical treatments will be used including yield tests on different varieties of plants, dates of planting and harvesting for optimum yield, planting densities, pesticide treatments (insecticide and fungicide) and herbicide treatments, fertilizer treatments, irrigation treatments (frequency and amounts), fertilizer/irrigation interaction treatments, crop rotation demonstrations, optimum cutting date for forage treatments, cultivation techniques with yield determinations, (types of equipment, frequency and timing of tillage, depth of plowing), and fallow and dust mulch practices to conserve water. This is only a partial list. Many of the treatments mentioned could be combined to create more trials. The possible combination of all the trials on all possible crops is prohibitively large.

Some of the plots must be large enough for mechanized management practice Some crops can readily be grown on small plots while others require large plots. The design team determined that an optimum plot size module is 5 x 10 meters with a 1 meter border. Each plot will therefore occupy a space of 7 x 12 meters. Many of the horticultural plots will most likely be subdivided when farm operations begin. Tree plots should be 5 x 20 meters with 1 meter borders. Modules can be subdivided or combined as needed.

Most treatments can be moved from location to location. However, herbicide treatments may limit future plot use. Plots heavily fertilized will not be useful for later low fertility tests. Some plant breeding demonstrations will need isolation due to cross-pollination potential.

6.2 Agronomy Plant Trials

Crops proposed for part of the agronomy demonstration are important in the country or have high potential for adaptation: alfalfa, sorghum, millet, maize, wheat, barley, 4 pulses, sweet clover, sub clover, rye grass, and bermuda grass. These 14 crops are proposed for initial development. Priorities will most likely change during operation. Trials proposed are six levels of irrigation, fertilization, and plant protection with three replications. This combination totals 252 plots requiring 2.4 hectares.

Part 2 of the agronomy demonstration will be used by advanced students and faculty for both demonstration and research. This area will be used for plant breeding trials and for demonstration of new crops such as Triticale, sunflowers, soybeans, and oilseed crops. Twelve crops are planned with six trails requiring an additional 0.6 hectares of land.

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6.3 Horticulture Plant Trials

Horticulture is divided into several aspects. The first area concerns orchard management and involves almonds, apricots, peaches, nectarines, pomogranates, dates, grapes (2 varieties), prunes and plums on 5 x 20 meter plots with the treatments of pruning, weed control, irrigation, fertilization, and interplanting. One hundred twenty plots are provided on 1.8 hectares.

A much larger area is proposed for vegetable crops. These will be on 5 x 10 meter plots with 1 meter borders. Some of these plots can be subdivided, creating more, smaller plots. Crops are listed on Table 2-7. Thirty vegetable crops are recommended, including tomatoes, chard, okra, onions, leeks, celery, sweet corn, squash, melons, potatoes, turnips, carrots, green onions, peas, green beans, popcorn, lettuce, radishes, cucumbers, watermelons, and egg plant. Suggested treatments are: cultural pest control, irrigation, and fertilization with three replications. Three hundred sixty plots are designed for this sector on 3.0 hectares.

An ornamental horticulture section is recommended. Trees, shrubs, turf, annual flowers and drought-tolerant perennials are planned. Some forestry components should be considered. Sixty plots on 0.5 hectares are suggested. One half of the area should be in trees and shrubs, 1/4 in turf and 1/4 in flowers. Ornamental horticulture students should be involved in landscaping the remainder of the campus.

7. LIVESTOCK AND LIVESTOCK PROTECTION

7.1 Introduction

Livestock and its importance to the people and the national economy of YAR is well documented and must play an important role in the university's Faculty of Agricultural teaching and research Demonstration Farm. Livestock is an important part of family subsistence by providing meat, milk, and work assistance.

Current development projects of the country aim at increased self-sufficiency in livestock production with emphasis on the economic production of meat, milk and eggs. Much of the rural country is farmed by traditional methods and these practices must be changed by education if agriculture is to progress and prosper.

According to the 1980 census data obtained from the Ministry of Agriculture Livestock Advisor, there are:

Cattle	840,000 head
Sheep and Goats	3,750,000 head
Poultry	4,100,000 birds
Camels	105,000 head

Most of the effort on the Demonstration Farm should be devoted to the first three species but consideration should also be given to donkeys and possibly horses if space and feed is available.

YAR is broken into four agricultural areas and the livestock husbandry techniques taught at the University of Sana'a should be easily adapted to each area. Present livestock reproductive information and observed production practices indicate that there are great needs for improved husbandry, management, and nutritional education. Increased understanding in these areas will greatly improve animal health and reduce diseases.

In addition to improved livestock management being demonstrated on the farm, an equal amount if not more time, should be spent demonstrating the importance of the grass (forage)-animal relationships. The shortage of feed is one of the main problems of the livestock industry. It restricts rapid development of the livestock industry.

The development of the farm livestock section must occur in two phases. Phase one should include construction of facilities (buildings and corrals) and the establishment of the pasture and forage base to support the livestock. Phase two should include the building of fences and the procurement of the livestock and poultry enterprises.

7.2 The Livestock and Poultry Enterprises

To effectively carry out teaching and research in animal and poultry husbandry, at least the following enterprises are recommended given the land restrictions and assuming a water supply of 7 liters per second.

(1) A flock of 25 ewes plus two rams
(2) A herd of 15 goats plus two billys
(3) A demonstration herd of 8 milk cows (dual purpose) plus one bull
(4) A flock of 250 laying hens
(5) A flock of 250 broilers

(6) Rabbits
(7) Aquaculture

If a water supply of more than 7 l/s is available, the numbers of livestock and the area used by the livestock can be increased proportionately up to double these numbers. The amount of pasture for grazing will be limited so that the animals may spend a large share of their time in a feedlot or drylot situation. However, the sheep and goats should be used for grazing other crop residues on the farm. Grazing techniques and forage production are vitally important and will be discussed in more detail in the land development section.

7.21 Sheep and Goats

The sheep and goat flock should initially be made of local types which appear adequately productive and well-suited. However, the local breeds have not been raised under the confined environment which they will encounter at the farm. Observation over time could indicate the need for other breeds.

In the future, cross-breeding with outstanding imported rams would be desirable. Such a program could increase the productivity of the sheep and goat industry. A promising breed to consider is the Chios from Cyprus. This breed has high milk production, a high rate of fertility and prolificacy, early maturity, and a long breeding season. Breeds from other middle east countries might also be considered.

Sheep have advantages over cattle in efficiency of meat production because of their greater prolificacy, early age of puberty, shorter gestation period, shorter growing period, and possibly somewhat greater feed efficiency with non-grain materials. Under good management, a ewe produces 100 percent of her body weight in marketable offspring per year whereas a cow produces only 55 percent of her body weight in marketable offspring per year. Sheep are also better converters of forage energy to food energy than are cattle. Sheep also produce wool which may become more valuable as petroleum products become less available for synthetic fiber manufacturing.

Initial programs which should be considered include: flock improvement and selection, improved management techniques, studies of nutrition, improved feeding methods, and flock health. The Veterinary Investigation Laboratory of MAF has identified severe mineral deficiencies throughout YAR. Liver flukes and gastro-intestinal parasites (stomach worms) in sheep are a problem. Training of students in recognition of symptoms and in care and treatment should be part of the educational program.

7.22 Cattle

The demonstration herd of milk cattle should mainly include the local zebu type, which appear to be well-adapted. Because they are small, they require a smaller feed base. However, the daily milk production is low and total lactation period is short (five months).

The herd should also include Frisian and Jersey cattle. These are the two imported breeds now in the country. It is important that the farm provide the opportunity to compare the advantages and disadvantages of these breeds.

One good bull will be necessary. The university should consider a dual-purpose type, for example, the milking shorthorn, which could improve their herds.

Artificial insemination is a program that should be considered as soon as possible. The large genetic pool that is available through this breeding scheme could greatly improve the local cattle, both from the standpoint of milk and meat production. The university should take the leadership of this program because of the advantage it would give their herd and also the country's cattle industry.

Educational programs should include production improvement, breed selection both within local cattle and cross-breeding, nutrition and feeding, and a herd health program. The MAF veterinary service project has identified mineral deficiencies, hoof and mouth diseases, and rinderpest as major problems with cattle. The prevention of tuberculosis and brucellosis along with methods of control of external and internal parasites, will need to be included in the livestock protection educational program.

7.23 Poultry

The poultry flock should include both layers and broilers. This industry is rapidly expanding and plays an important role by providing eggs and meat. Students need to be trained and have a basic understanding of poultry production techniques. A single house can be built and split into two parts so that both enterprises can be taught. The building to be constructed should be of the same style as those used in the government's Rawdah poultry project.

Officials of MAF poultry project have offered complete cooperation to the University. They indicated that both pullets and broilers can be purchased from them as well as feed which comes from Holland.

The pullets come from the MAF Hasaba farm and the broilers from the Rawdah farm. Day-old broilers should be purchased to give students training in brooding and rearing. Equipment may also be available through the Hasaba farm project.

7.3 Livestock Protection

Animal and poultry health are very important. Animal disease is one of the major restraints slowing industry progress. General animal health care and disease prevention and treatment should be included in the classes at the farm. Facilities should be constructed for the teaching of general treatment programs of the stock.

Co-managers of MAF veterinary service project have offered complete cooperation and support to the University in the development of its Demonstration Farm. The University should cooperate with the veterinary service project at the Sana'a training center to prevent costly duplication of facilities and technical equipment. Students would receive outstanding training from the veterinarians and also become familiar with services offered by MAF. This type of education should be advanced in nature and beyond the daily animal health program covered at the University. The training center is located just a few minutes (by car) from the University. A close working relationship should be established immediately with the veterinarians to help with the problems of livestock health protection. When a veterinary faculty is established at the University, it can take over this education responsibility.

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7.4 Land and Range Development

The livestock unit has been allocated approximately 5 hectares of land, assuming that wells with a flow rate of 7 l/s are available. The land should be divided as follows:

2	hectares of perennial forages	alfalfa, grasses
1.5	hectares of annual forages	sorghums, corn, small grain and sudan grasses
1.5	hectares of perennial grass and clover pastures	ryegrass, orchard and white clover

If more water is available, additional land to a maximum of 11 hectares should be divided in the same proportions.

This land allocation provides a large amount of feed, based on information from the Ministry of Agriculture (MOA) experiment farm at Dhamar. For example, they have been able to produce over 60 ton per hectare of fresh cut Moapa alfalfa. Even at a conservative yield of 50 ton per hectare, this provides over 16 tons of dry alfalfa hay per year. With a mixture of RVP Italian and Cooper perennial ryegrass, over 141 ton per hectare of fresh weight were obtained in five cuttings. This is equivalent to about 35 tons of hay per hectare. If these yields can be achieved, a large fraction of the feed requirement could be produced on the farm. The work at the Dhamar station should be closely reviewed when varieties are selected for seeding.

The 1.5 hectares of perennial pastures should be seeded to a mixture of ryegrasses, orchard grasses, and a white clover. These varieties respond well to irrigation and can provide a large amount of grazing for the livestock, thus reducing the amount of other fodder needed. The livestock should also be allowed to graze the stubble of the agronomy and horticulture plots and any excess forage or fodder cut from the plots should be made available to the livestock operation, either in the form of green or dry feed.

The livestock unit should work diligently to demonstrate productive pastures, good pasture management, and animal utilization. These efforts can demonstrate new techniques in grazing which are needed in the country and are also important as less manpower is available to herd the stock.

Use of the New Zealand flex netting fence attached to a solar powered battery (12V.) will make grazing of the plots very easy and reduce shepherd responsibility.

The 1.5 hectares of pastures should be subdivided into plots of 0.3 hectare each. This gives 5 paddocks for rotational grazing. If more irrigated land is available for pastures, individual paddocks should be 0.3 hectares.

Range management is very critical to the YAR and its study and teaching should be part of the Demonstration Farm. There is a small hill not far from the farm site, near the northwest corner of the university property, that should be considered for lease. Demonstrations of range management here could provide direction for future programs and experiment stations. Practices can be worked out for rebuilding ranges and preventing soil erosion. Once these practices are clearly defined and demonstrated soil erosion.

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One of the concepts that should be considered for demonstration at this range location, is the new grazing management approach known as the "savory grazing method" (Savory, 1981). It has been demonstrated in South Africa, Australia, and to some degree in America, that intensifying the number of livestock and grazing them in greater numbers for shorter periods and at higher densities under careful management, has improved the range.

This approach could be demonstrated on the suggested site and then expanded at the future research site being considered near Dhamar. An approach that should be considered would be to divide the hillside into three paddocks and show:

(1) where overstocking but no overgrazing is done;
(2) repeat practice number 1 and overseed some new grass varieties to improve the forage base; and
(3) use the present practice of understocking and over grazing now done in the country.

Using approach 1 and 2 would allow the natural forage selected through many years to prevail and possibly also add new highly productive legumes and grasses. This concept is also known as the "hoof and tooth" method of grazing. It allows the teeth of the animals to shock and graze the plants closely. The heavy concentration of hooves breaks the soil's surface, allowing better penetration of rainfall, and germinating seed.

The University of Sana'a Demonstration Farm can show this concept of range management because it can be done by the farm manager or livestock specialist who would have control of the grazing animals. They can accomplish this by working with the livestock in the program and by bringing in additional animals from cooperating farms in the Sana'a area if necessary. Livestock can be used as a reclamation tool of range through long term programs. If this recommendation is considered and the land leased, it must be remembered that it will require patience and considerable time to be successful.

7.5 Recommendations for Development of the Livestock Section of the Demonstration Farm

Development of the livestock section should occur slowly and be developed properly for maximum productivity. Development should be broken into two phases.

7.51 Phase 1

During the first phase, pastures and alfalfa should be established so that proper development can occur. At the same time, buildings and corrals should be constructed in preparation for bringing the livestock to the farm.

7.52 Phase 2

Livestock should be procurred at the beginning of this stage. By this time, an adequate forage base should have been established. One of the problems often observed in small producer livestock operations is the

procurement of the stock prior to obtaining a forage base. If possible, a reserve of forages should be amassed before any animal enterprise is procured. It may also be possible that as the land for the farm is developed, annual or perennial forages could be established to produce feed for the livestock operation until such time as all the land would be needed for the horticulture and agronomy sections. These forages could be stored for future consumption.

7.6 Future Needs

As the University of Sana'a looks to the future, it would be useful to consider additional teaching and research stations for livestock in the four different geographical areas. This would allow an additional research base for the faculty and other education and training sites for students and the country's farmers. These needs should be developed as the Faculty of Agriculture grows and student enrollment increases.

8. BUILDINGS AND EQUIPMENT

This chapter discusses buildings and equipment for the operation of the demonstration, teaching, and research farm. Additional equipment and buildings may be needed later depending on the faculty makeup and research being conducted.

8.1 Buildings

Eight buildings are recommended for the farm and descriptions of each follow. Building plans at the end of the chapter present concepts only. Detailed plans by an architect must be completed before construction can begin.

8.11 Building for Offices and Crops

This building (Figure 8-1) will house field offices and activities of the agronomy and horticultural departments. The building is 31 m x 12 m.

The facility includes a reception office and two co-manager offices, two restrooms, a lunch room for students and personnel working on the farm, and two large classrooms and work areas, divided by folding doors. Opening the folding doors allows the rooms to be joined into one large room when field days or other events of this type are held.

The area utilized by the agronomy section includes storage and a seed cleaning facility. The seed cleaning facility should be equipped with fans to remove dust and be vented to the outside. Also needed is a soils room and storage facility. This room should have work tables, equipment for weighing, an oven for moisture determinations, and an autoclave. The horticultural lab has a storage area with a walk-in cooler for horticultural products. There also needs to be a storage area for chemicals and fertilizers.

The building should have water piped into the restrooms, the soils room, the agronomy and hort lab, both classrooms, and the lunch room.

Compressed air lines should go to all three labs, the seed-cleaning facility and the two classrooms. Floor drains should be located in each of the laboratory rooms, the restrooms, the lunch room, the dry storage area, the open storage area, and the classroom. All rooms should have windows and ample electrical outlets of 110 V, and 220 V.

8.12 Greenhouse

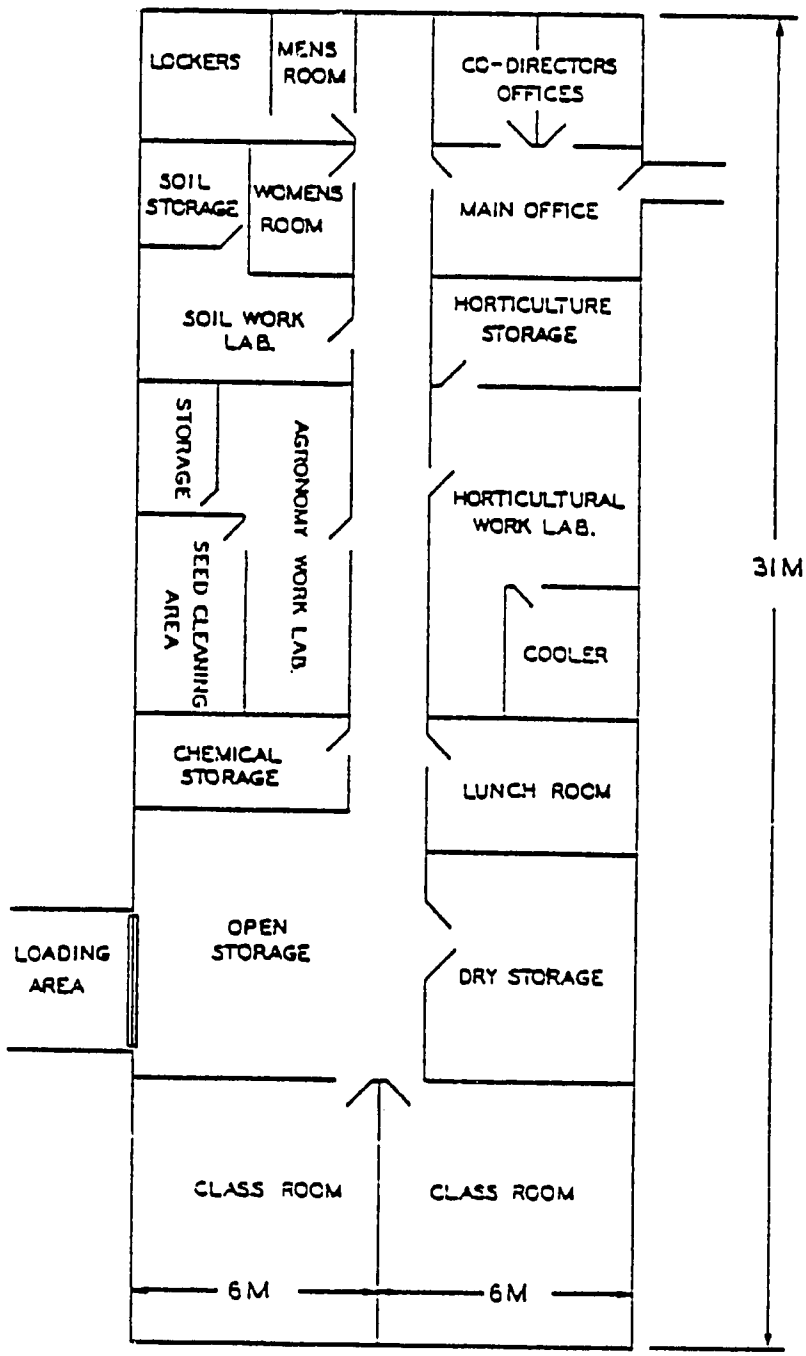
It is recommended that a greenhouse be constructed for use by the horticulture and agronomy departments. This greenhouse should be located near the classroom buildings for the faculty of agriculture rather than on the Demonstration Farm.

8.13 Livestock Center

The livestock center (Figure 8-2) will be a facility 26 m x 20 m with two wings. Sheep and goats will be located in one wing, cattle in the other. In addition to the livestock wings, the building has an office, student or caretaker housing, restrooms, an animal protection lab and treatment classroom, milking facilities, and storage areas.

Water and floor drains should be provided in the bathroom, the animal protection lab and treatment room, the milk parlor and milk room. The storage facilities joining the office and the two livestock wings only need water. The building should have concrete floors, except the area where the livestock are housed. The floor of the livestock area

DEMONSTRATION FARM OFFICE & CROPS LABORATORY BUILDING



FIGUREJ-3: Schematic drawing of Demonstration Farm Office and Crops Laboratory Building, University of Sana'a, Yemen Arab Republic.

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DEMONSTRATION FARM LIVESTOCK CENTER

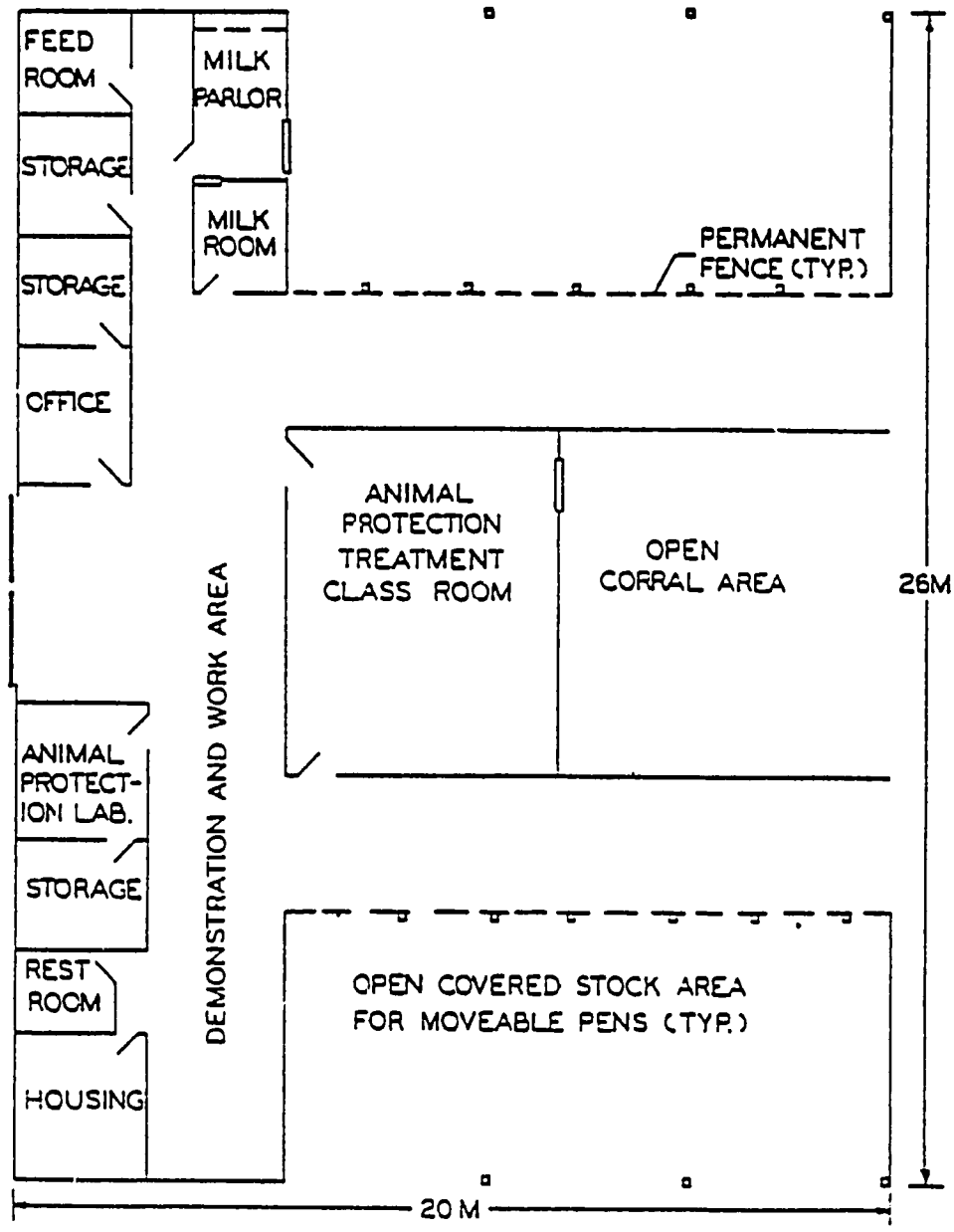

FIGURE J-4 Schematic drawing of Demonstration Farm Livestock Center, University of Sana'a, Yemen Arab Republic

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should be packed clay. The open lot corrals should have 20 cm of sand. Refrigerators should be located in the animal protection lab and office storage area. The classroom should be built with bleachers. There will need to be sufficient electrical outlets throughout the building to run all equipment.

8.14 Handling Facilities for Livestock

Cattle performance can be improved with correct handling facilities. (Figure 8-3). The facilities for the Demonstration Farm must be functional for Yemen livestock and must be located between the two wings of the livestock center, immediately behind the animal protection classroom. By locating it in this position it will be easy to move animals through the faciltiies and into the classroom for instruction or treatment.

Working chutes should be adjustable to handle different size animals (sheep and cattle). It should be possible to close down to 35 cm at the bottom when working sheep and goats. The sheep table must be moveable so other portable equipment can be used in the same chute opening.

Two moveable panels should be used at the end of the cattle squeeze chute, so stock can be moved into the animal protection classroom or across to the scale and dip vat chute.

The chutes, holding pens, and corral fences and feeders can be built with used or damaged 5 cm pipe. Pipe is available through some of the local well drilling companies. Additional equipment is in Figure 8.

8.15 Poultry Building

The poultry building (Figure 8-4) should be 20 m x 6 m and constructed similar to the new building of the MOAF poultry farm at Rawdah. The building should have a feed room and egg room. The storage facility, located in the center, should divide the layer flock and the broilers and reduce the chance of spreading disease from one to the other.

The building should have a concrete floor. Equipment needed includes feeders, waterers, nests, and miscellaneous equipment.

8.16 Feed Center

The building (Figure 8-5) is 7 m x 7 m and serves as the storage area for hay, grain, and other fodder. This building should be centered near the livestock and poultry facilities. Space should be allowed for a future mill. Included are bins for bulk grain storage as well as sacked feed (Figure 8.5).

8.17 Farm Shop and Equipment Storage

The farm shop and equipment building (Figure 8-6) is 7 m x 17 m. This facility has a farm shop at one end and equipment storage in the balance of the building. It should include restrooms with water supplied to the restroom, a wash-up area located in the farm shop, and an outside area to wash off equipment before it is brought into the shop. Construction in the shop will need to include a beam strong enough to support an overhead, 5-ton hoist.

The farm shop area should have a concrete floor. The equipment storage area should be gravelled. The farm shop should be equipped adequately to provide maintenance and up-keep of buildings and equipment but not to do major overhauls.

OPEN CORRAL AREA LIVESTOCK CENTER

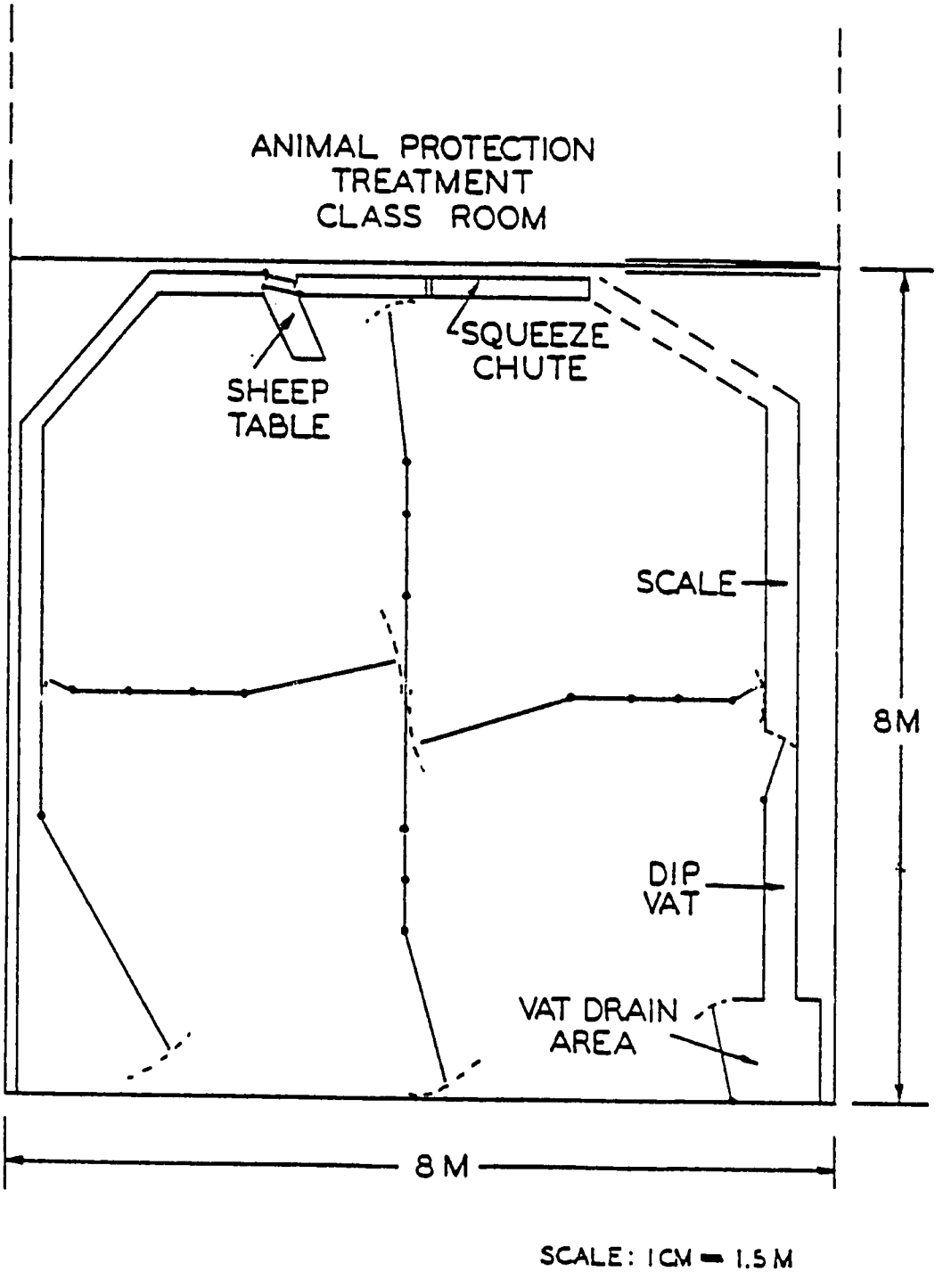

FIGURE J-5 Schematic Drawing of Open Corral Area Livestock Center, University of Sana'a, Yemen Arab Republic

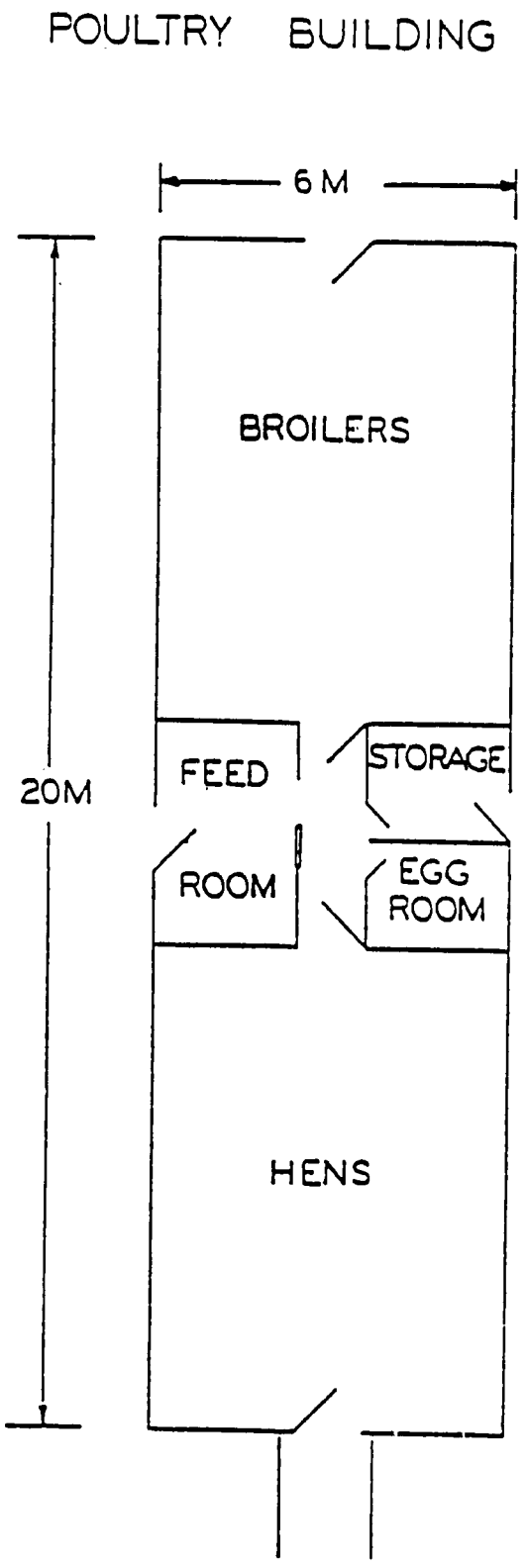

FIGURE J-6 Schematic drawing of Poultry Building, University of Sana'a, Yemen Arab Republic

FEED CENTER AND PUMP HOUSE

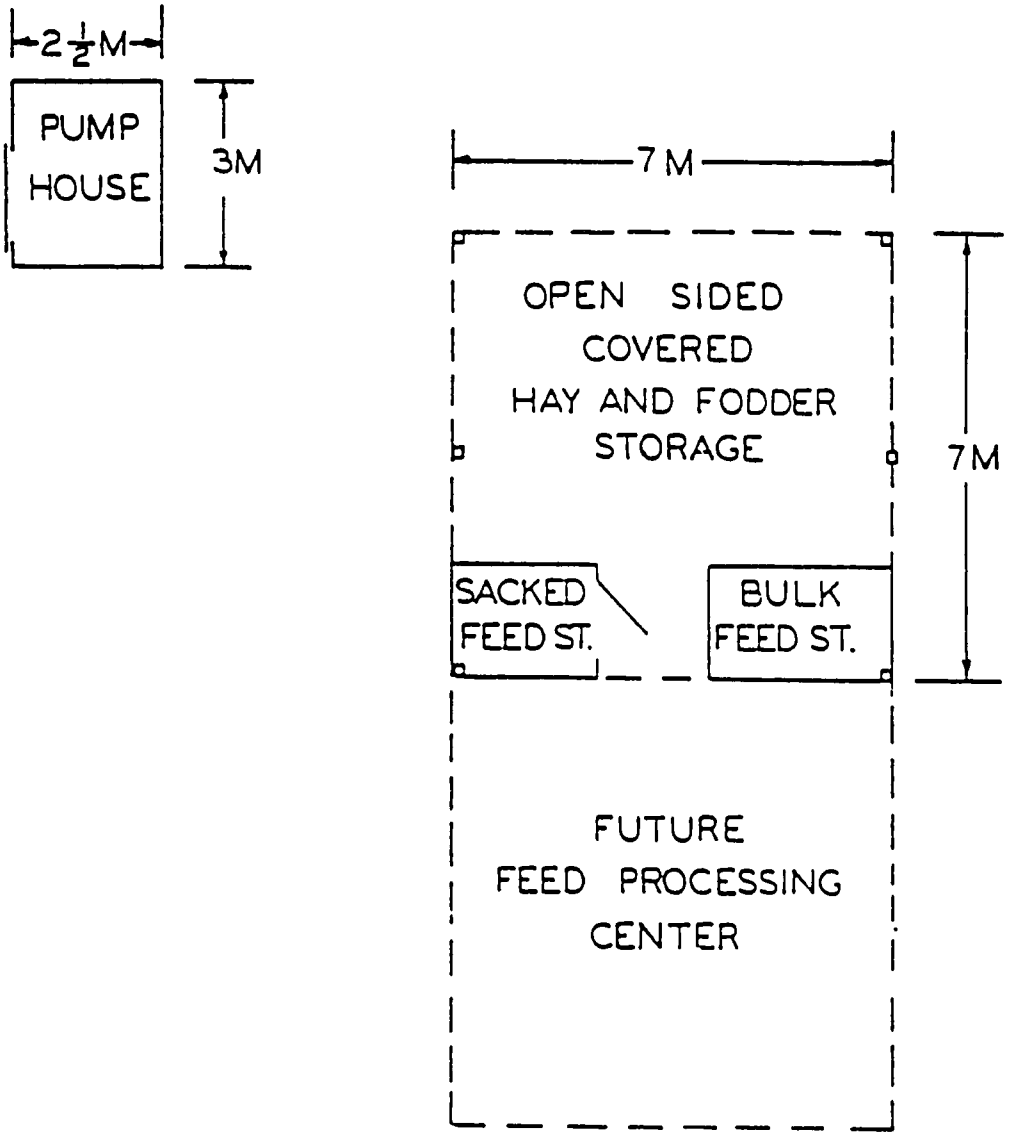

FIGURE J-7 Schematic drawing of Feed Center and Pump House, University of Sana'a, Yemen Arab Republic

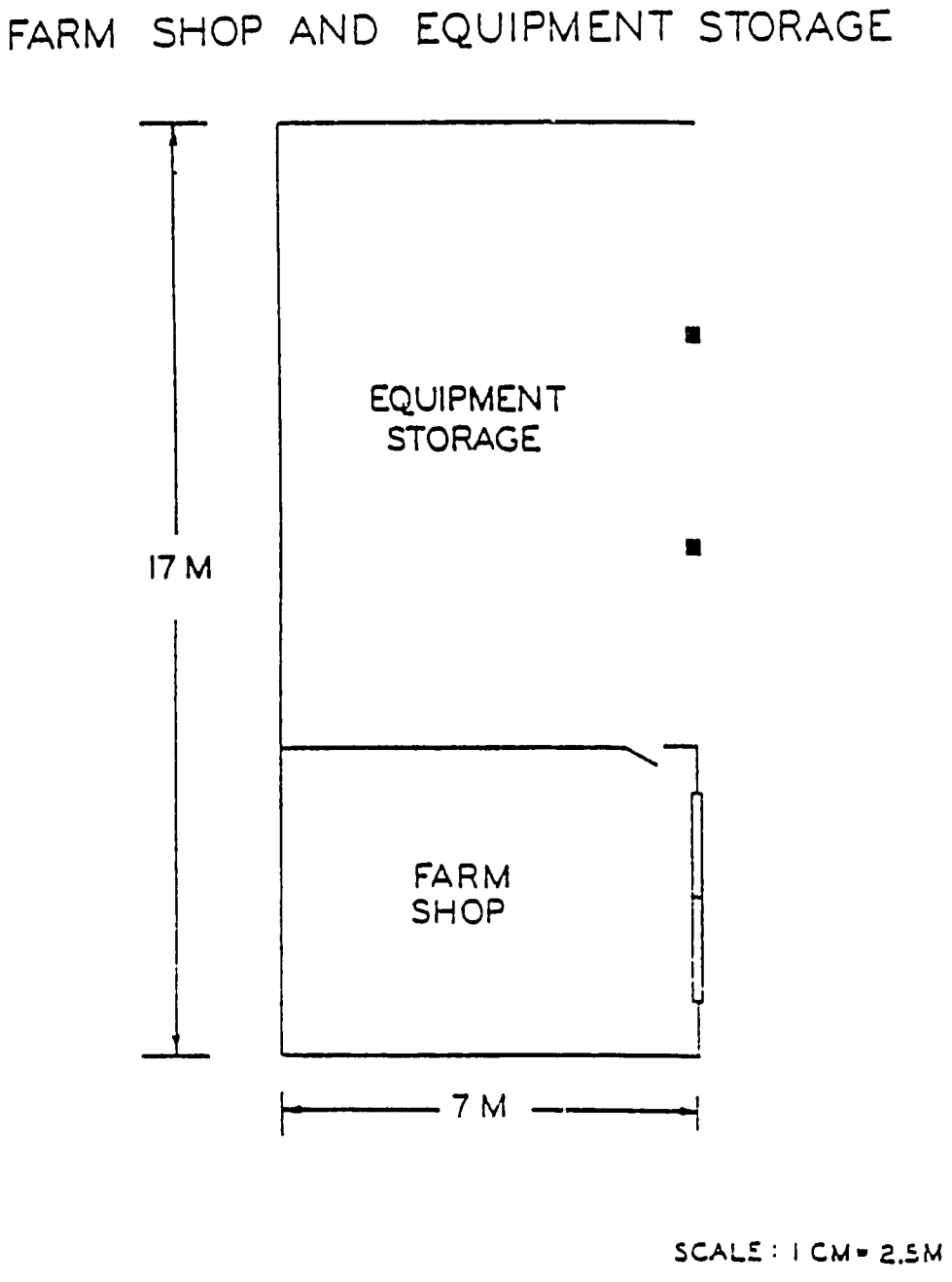

FIGURE J-8 Schematic drawing of Farm Shop and Equipment Storage, University of Sana'a, Yemen Arab Republic

8.18 Pump House

Two pump houses (Figure 8.5), 4x6 m, should be constructed over the well holes. These houses should have nearby fuel storage servicing equipment and light and electric outlets.

8.2 Equipment

The equipment for the buildings and farm establishment are listed in the appendix.

9. IRRIGATION AND MECHANICAL PLAN

9.1 Objectives

The irrigation plan must be devised to provide the students and faculty the flexibility to optimize the teaching and learning processes. The system must provide for irrigation of small plots, but it must also be possible to irrigate large plots such as hayfields or pasture paddocks with it. The system should provide flexibility to allow various faculty members to conduct research with new irrigation techniques such as drip or trickle. The system must provide water for the numerous irrigation methods which might be appropriate for various terrains and various crops produced in YAR.

The mechanical plan of the University Farm, that is, the complement of equipment for agricultural operations, should have a similar flexibility. It should provide opportunities for students to appraise operations including tillage, planting, cultivation, plant protections, and harvesting. It should be targeted at several levels of technology including draft animals as well as small and moderate sized machines and power units.

9.2 A Mixed System for Irrigation

Consistent with these needs is the idea of using a mixed system for irrigation of crops. For instance, agronomic crops might be irrigated in rills or flood basins, or they might be irrigated by sprinkler systems. All three opportunities should exist for the faculty and students to work and experiment with. Similarly, horticulture crops will require beds and furrows, sprinklers, rills and basins, gated pipes, siphon tubes, gated ditches, or flooded basins for orchards. Drip and/or trickle systems along with other options for orchard or vineyard irrigation should be available. The availability of water under pressure and other such accommodations should be arranged so that these options are available.

9.3 The Delivery System

To provide the above flexibility, the delivery system should be constructed as a mixed system. It could start out from the impoundment with two main lines, one running essentially north by northwest and the other running in an easterly direction, towards the present university buildings. Each of the main lines could service a series of buried submains and at the same time, dump through valves into surface canals serving as submains for land on some terraces. Preferably, these irrigation ditches should be concrete lined to minimize percolation losses. For servicing terraces at different levels, stand pipes should be used on the buried laterals and sublaterals. Drop structures would be needed with gates and stoned terrace walls or stoned channels for drop structures in the open ditches. This sort of mixed system would provide for water delivery to several terraces which could be used in different fashions.

In situations where the submains would not be operating at an adequate pressure to operate sprinkler systems, small portable pumps could be connected to the submains or operated with a suction hose lowered into an open ditch to pressurize water to operate a trickle or sprinkler system without necessarily pressurizing the water in the whole system. Water could be pressurized for irrigation of individual plots or small blocks of plots depending on the needs of the faculty to demonstrate a particular

kind of operation. This delivery system would provide opportunity to broaden student experiences and expose students to a variety of techniques for the handling of irrigation water. At the same time, it would be important that the faculty build into these, every possible option for the conservation of water. They should take advantage of opportunities to illustrate to students how to avoid water losses through deep percolation and evaporation.

9.4 Tillage Systems

9.41 Tilth and Tillage

The tillage systems should be designed to give the students the opportunity to see and test comparisons of several kinds of tillage methods including rotary tillage, moldboard plowing, lister plowing, disc plowing, plowing with sweeps, and plowing with the ripper-thrust plow currently employed in draft animal agriculture. The students could be expected to practice with each of these tillage procedures and to observe the difference in soil condition obtained by these different procedures. Thus, they can learn to understand the reasons for and the principles of tillage.

9.42 Minimum Tillage

One of the variables which students should learn about is the affect of different tillage intensities and the influence of varying the tillage depth. They should be made conscious of the potential for energy conservation through reducing tillage depth and intensity. The students should learn about adequate tillage and about methods to avoid excessive amounts of tillage. The need exists to teach minimum tillage to future generations of farmers in YAR to conserve resources and energy.

Part of the minimum tillage trials and demonstrations for students and farmers might be to appraise the current plowing operation to see what its influence is on tilth and moisture conservation.

9.43 Tillage for Water Control

Students and faculty should have opportunities to study effects of dust mulch and weed control on the conservation of water. Weed control in these trials could be by tillage or herbicide or some combination thereof. Students might be asked to work out a comparison of the cost of controlling weeds by tillage and by the use of herbicides.

The effectiveness of dust mulch on water conservation involves a principle the students should be acquainted with. They should recognize the potential and the limitation of this practice for reducing soil moisture losses from evaporation. They should have the opportunity to try different depths of mulch and different levels of pulverization. They should study the effects of compaction of the mulch by roller or by plowing on the retention of water within the seed zone and throughout the soil. The students should examine the effect of mulches and tillage practices on soil temperature, especially early in the growing season when the soil might be cool.

9.44 Pre-Tillage Irrigation

Much of the practice area for students learning to operate machines (including tillage machines) could be on non-irrigated land. However, in some cases it can be important that the students examine the effect of tillage at various moisture contents. Therefore arrangements

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should be made for some pre-tillage irrigation. Students may be required to understand the sequence of procedures which involves irrigation, very light tillage, and planting a crop into moist soil. They should also be aware of and be cautioned about the possibilities of adverse physical conditions due to soil compaction.

9.5 Miscellaneous Machine Operation Practice

One of the uses the faculty and students will made of the Demonstration Farm will be to work with various kinds of machines and become acquainted with principles of operation. They must become acquainted with the procedures for safely operating and servicing various machines: mowers, rotary rakes, binders, combines, corn harvesters, forage choppers, and other auxiliaries which might be mounted on power units. Machines should be available for students to use in the agronomy plots, the horticulture plots, or initially, in an area which is not cropped so that they can observe the operation before entering cropped plots for operation of the equipment.

9.6 Physical and Mechanical Arrangements

In Sections 6 and 7, consideration was given to the features of the crop and livestock management capabilities of the various plots. The irrigation and mechanical plans, as outlined in this chapter, are for uses described in previous chapters. However, it would be appropriate to set aside an area of irrigated land and an area of non-irrigated land, perhaps one hectare each, for demonstrating equipment and to allow students to practice with farm and irrigation equipment prior to their utilizing it in growing crops or with livestock. This land requirement is allocated in Table 4-1 only for the case where the farm size approaches 20 hectares. In the event that only smaller water supplies are available and the farm land area would be smaller, these irrigation and mechanical plans would be confined to the cropped plot areas.

The equipment referred to in this chapter and additional equipment described in Chapters 5, 6, and 7 is listed in the appendix along with estimated costs. The cost estimates are conservative, based on early 1982 prices for medium to high quality components. Efforts were made to select quality levels which would provide a probable longevity to obsolescence even under the adverse conditions of use by untrained, occasionally careless, student.

10. RECOMMENDATIONS

1. The size of the Demonstration Farm for the University of Sana'a depends on the water supply resulting from drilling two wells; one on campus and one several kilometers north of the campus.

2. If a water supply of 14 l/s is found, the University Farm should be 21 hectares. The first step is to develop a water supply to determine the appropriate farm size. It will be preferable to develop two wells. If less water is available for the farm, the land area should be scaled down to fit the water supply. (Table 4-1). A scaling factor of 1.5 hectare of area for 1 l/s of water is recommended.

3. If 21 hectares of land are irrigated, 3.0 hectares should be allocated to agronomy, 5.3 hectares to horticulture, 12 hectares to livestock, and 0.7 to soil management and irrigation. These parcel sizes are such as to allow students to accumulate data for microeconomic analysis.

4. If the water supply is only 7 l/s, 10.4 hectares should be partitioned as follows: agronomy, 2.2; horticulture, 2.6; livestock, 5.2; and soil management 0.4 hectares. On a very small farm the major emphasis should be on horticulture. If an area smaller than 21 hectares is to be used, the eastern boundary should be moved westward.

5. The study team strongly recommends that the Demonstration Farm should be at least 10.4 hectares, preferably 21 hectares.

6. In the agronomy section, there would be space to accomodate as many as 20 crops on 324 plots measuring 5 x 10 meters. Crops will be produced under full irrigation, deficit irrigation, and under dry land conditions. Equipment and facilities were selected to give students experience with modern technology, labor saving implements, and scientific measurements.

7. In the horticulture section, space has been allocated for fruit, vegetables, and forestry and landscape crops with as many as ten fruit crops on 120 - 5 x 20 meter plots, 30 vegetables on 360 - 5 x 10 meter plots, and 10 forest species and landscape species on 60 - 5 x 10 meter plots.

8. The 21 hectare farm accommodates 50 sheep, 30 goats, 16 cattle, and 500 chickens on an irrigated land allocation of 12 hectares. With smaller water supply, this would be scaled down and the proportions accordingly changed (see Table 4-1 of the text, Chapter 4).

9. Provisions should be made to instruct students in pasture management techniques; how to grow, use, and maintain productive pastures. Instruction in range management should be arranged on non-irrigated land. Opportunities for animal breeding trials should exist.

10. A piece of land should be set aside for soil management, tillage, tilth, and irrigation practices including basin, flood, rill, furrow, sprinkler, drop and trickle. About 0.7 hectares of irrigated land is recommended for this purpose.

11. The farm will include the following buildings:

A. Crops Laboratory Building and Offices (both agronomy and hort).
B. Farm Shop and Equipment Barn.
C. Livestock Barn and handling facilities.
D. Poultry Building.
E. Feed storage and future mill.
F. Greenhouse.
G. Pump House(s).

12. The faculty of agriculture must phase the development of the farm at a rate consistent with the growth of the faculty and student body.

13. Every effort should be made to retain for the faculty the maximum flexibility in the use of the land and water resources. This is planned for by an elaborate water supply system. It was considered proper to recommend the investment of funds to create a reserve of flexibility to be used as the student body, faculty and the agriculture of YAR grow and change.

14. The size of the land unit and water supply recommended will provide the faculty with research opportunities in a variety of disciplines in the plant and animal sciences. It will also create opportunities for effective extension work.

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A P P E N D I X

DEMONSTRATION FARM COST ESTIMATE

Water Delivery System	
Two wells, possibly to 1000 feet (300 meters) at $125,000 per well	$ 250,000
Seven kilometers of low pressure plastic pipeline, 12 inch (30 cm) plastic	$ 90,000
Installation of pipeline from well #2 to campus farm	$ 20,000
Two pump houses, flow meters and fuel tanks	$ 8,200
Two turbine pumps, one for each well, sized proportional to the dynamic head and equilibrium water production rate	$ 24,600
Impoundment - 2000 cubic yards (1750 cubic meters) of earth moved by carryall plus 575 square meters of plastic membrane facing	$ 65,000
Subtotal	$ 457,800
On Farm Water Distribution System	
Mainline, 1100 meters of 20 cm low pressure plastic buried	$ 12,000
Submains, 9400 meters of 15 cm low pressure plastic buried with surface valves every seven meters	$ 55,000
Submains II, 2400 meters of open 50 cm x 60 cm concrete lined ditch	$ 30,000
Appropriate drop structures open ditch terrace to terrace	$ 5,000
Concrete Stand Pipes 20 necessary	$ 3,000
50 reducers for couplers from submain outlet valves to 5 cm, 7.5 cm or 15 cm tubing -	$ 1,200
Elevated concrete water tank	$ 6,000
Subtotal	$ 112,200

Irrigation Equipment

200 items of 5 meter lengths of 5 cm aluminum tubing with couplers, 100 with riser orifices	$	4,000
100 cm and 200 cm riser tubes, 1.5 cm diameter to fit above orifices, 200 each length	$	2,200
600 items 2.5 cm siphon tubes	$	1,500
200 items 5 meter lengths 5 cm gated pipe gated every 50 cm	$	1,000
100 items 5 meter lengths 10 cm gated pipe, gated every 50 cm	$	3,000
200 small rainbird sprinkler heads	$	2,500
Assortment of nozzles; 2.38, 3.175, 4.76, 6.35, 7.94 mm; 200 each size -	$	2,000
200 meters of 15 cm plastic gated pipe	$	2,600
1650 meters of drip system, 3 cm, 2 cm and 1 cm tubing, 550 meters each with 300 microtube emitters with 4 pumps, each with capacity of 0.5 - 0.8 liters/sec at 0.5 bar pressure -	$	4,000
20 check gates, 100 ditch outlet flumes 100 ditch outlet gate pipes, hand checks miscellaneous small irrigation hardware	$	2,000
12 items small irrigation water pumps, capacity 0.5 liters per second valvable; pressures up to 4 bars.	$	10,000
20 meters of buriable automatic gated pipe lateral	$	1,000
One item 40 meter end tow sprinkler lateral with risers, skids, and nozzles at 10 meter spacing end cap for one end.	$	1,500
One item big gun nozzle 1.5 cm orifice on hose and on cart, including 40 meters of 4-5 cm hose. Capacity of about 5 liters per second at 6 bars pressure	$	2,100
One diesel driven high pressure pump for item above	$	3,500
Subtotal	$	42,900

Irrigation Measurement Equipment

Weather station; air temperature (maximum) minimum and current) soil temperature at 10, 20, 40, 80 cm depths, relative humidity, buried evaporation pan, standard U.S. weather service evaporation pan, standard accumulator rain gauge total solar radiation, net solar radiation, wind speed and direction	$	12,000
Water meters; 50 needed to measure water as applied to individual plots	$	6,500
20 small weirs, for measuring up to 0.5 liters per second maximum	$	2,000
150 soil moisture blocks, cylindrical concentric electrode with two meter leads and meter and neutronprobe.	$	10,000
50 tensionmeters of varying lengths 15, 30, 45, and 60 cm.	$	4,000
Infiltration cylinders, double ring, six in number	$	120
2 sets of catch cans and volumetric measure for sprinkler distribution pattern assessment	$	100
Subtotal	$	34,720

Office and Crops Building

Building	$	150,000
Office equipment (3 Offices)	$	6,200
Arm chairs (60)	$	9,300
Scales (Balance)	$	3,100
Soil drying oven	$	1,300
Autoclave	$	4,650
Horticulture lab equipment	$	9,300
Agronomy lab equipment	$	9,300

Horticulture cold box	$ 9,300
Misc equipment	$ 12,400
Lab tables and benches	$ 3,100
Subtotal	$ 217,950

Livestock Center and Feed Building

Building	$ 95,000
Feed building	$ 15,000
Office equipment	$ 1,550
Housing furniture	$ 1,550
Milking and milk house equipment	$ 10,000
Animal protection lab equipment	$ 9,000
Animal management equipment	$ 5,000
Animal protection classroom equipment	$ 8,000
Livestock handling equipment (Chutes, squeeze, scales, dip vat, etc)	$ 15,000
New Zealand style flex netting fence, Solar Power Unit and Electric Fence charger)	$ 4,000
Installed fencing (1 meter woven with 15 cm vertical stays) and 1 - strand barb wire at the top. Use steel "T" post (5000 meters @ $3.75/m)	$ 28,000
Subtotal	$ 192,100

Poultry

Building	$ 22,500
Feeders (16) (2½ m)	$ 500
Waters (20 liters) (8)	$ 300
Nests (6)	$ 600

Brooders	$ 500
Misc. equipment and tools	$ 1,000
Subtotal	$ 25,400

Farm Shop

Building	$ 40,000
180 amp arc welder	$ 400
Oxy-acet gas welding and cutting set	$ 500
Air compressor (gas motor)	$ 1,100
Portable generator	$ 1,550
Large bench vice	$ 230
Radial arm saw	$ 800
Overhead hoist (5 ton) (5 metric ton) and beam	$ 930
Drill press (floor model)	$ 550
Power hack saw	$ 400
Bench grinder (heavy duty)	$ 300
Fuel tanks (2) (diesel, gas) (800 L. each)	$ 600
Heavy anvil	$ 225
Tire equipment and floor hydraulic Jack	$ 625
Work benches and tool cabinets	$ 2,300
Misc tools	$ 7,800
Subtotal	$ 58,310

General Farm Machinery and Equipment 4/

Tractor J.D. Model 650 4.W.d. 1/	$ 29,300
Plow 1/	$ 2,790
Disk harrow 1/	$ 3,720
Spike tooth harrow 1/	$ 1,150
Rear blade 2/	$ 900
Front end loader 2/	$ 7,750
Tool bar 1/	$ 900
2 Row corn planter 2/	$ 3,[illegible]0
Cultivators 1/	$ 4,650
5' Grain drill (1.75m) 3/	$ 5,425
Rototiller JD Model 448 1/	$ 5,800
Pull sprayer 3/	$ 1,395
6 (EA) Shovel openers 1/	$ 1,395
Hay rake (side delivery) 3/	$ 1,550
Hay mower 3/	$ 2,250
Hay baler 3/	$ 7,750
Valadane rototiller, plow, mower, cultivator attachments (3 each)	$ 15,000
5' Fertilizer spreader (1.75m) 3/	$ 1,850
Border disc ridger 2/	$ 2,170
2 Wheel trailer 2/	$ 3,100
Pick-up truck (4-WD) 3/	$ 23,200
Subtotal	$ 125,175

Perimeter Fencing	
Chain link fence (2000 meters)	$ 85,000
Subtotal	$ 85,000
Establishment Cost	
Rejuvination cost of land, expatriate manager, seed fertilizer and chemicals inflation allowance	$ 215,000
Subtotal	$ 215,000
TOTAL	$1,566,555

1/ Minimum represents 2 sets of equipment and maximum represent 3 sets
2/ Two sets of equipment
3/ One set of equipment
4/ Brand names are used strictly to illustrate size and nature of units.

ANNEX K

A/E PREFEASIBILITY REPORT

PREFEASIBILITY STUDY
FACULTY OF AGRICULTURE
UNIVERSITY OF SANA'A
SANA'A, YEMEN ARAB REPUBLIC

July 1983

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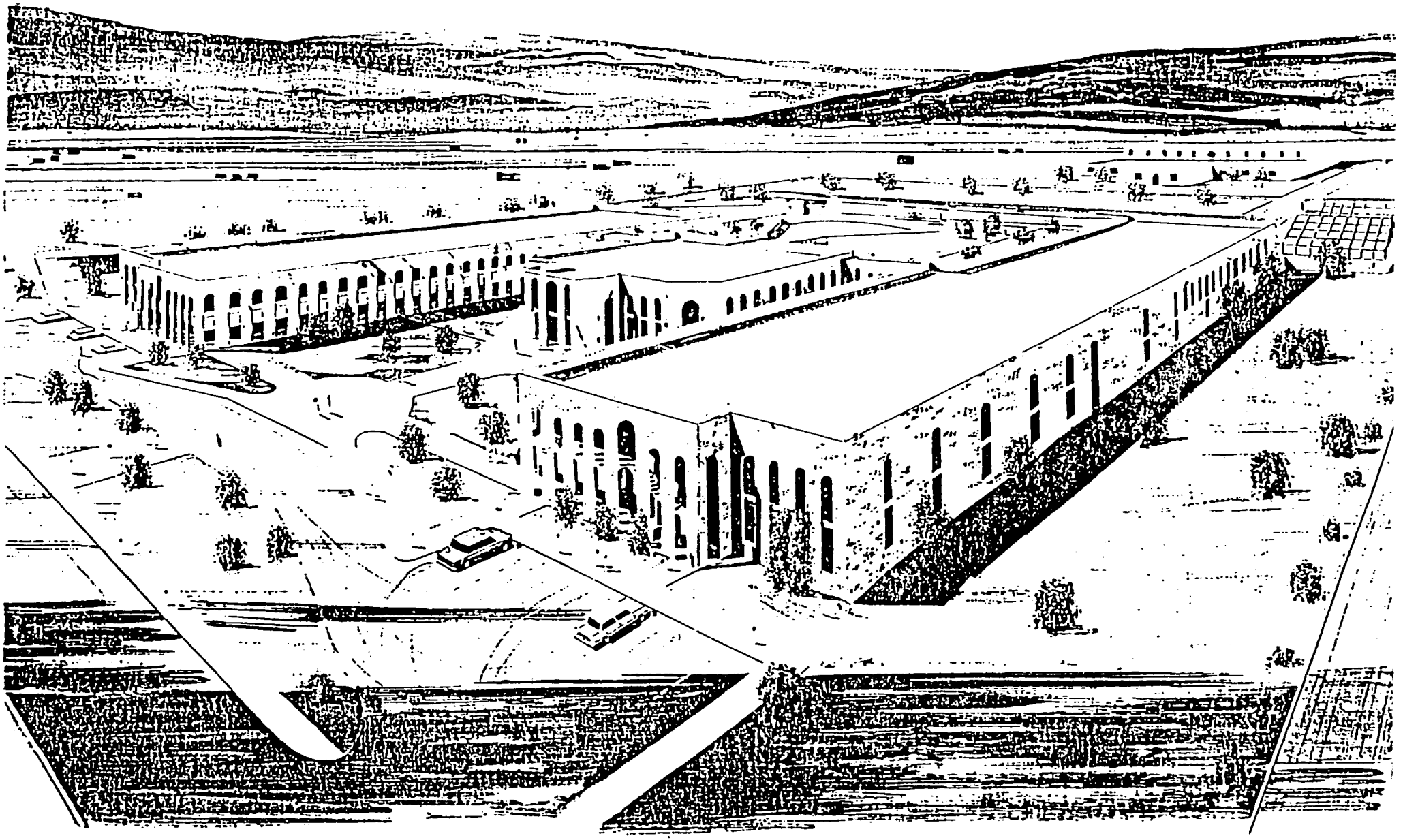

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A. Introduction

The need for a Faculty of Agriculture at the University of Sana'a has been described in several studies and reports. The Government of the Yemen Arab Republic issued a Presidential Decree, July 26, 1982, to establish a Faculty of Agriculture within the University of Sana'a.

This report was developed by a study team composed of an architect and an agricultural advisor charged with developing a Prefeasibility Report on building(s) to be used by the proposed Faculty of Agriculture

The team spent 12 days in the Yemen Arab Republic, and received valuable information from officials and staff members of the University of Sana'a (UOS) and American agriculturalists with the United States Agency for International Development (AID)/YEMEN and the Consortium for International Development (CID). Buildings on both the old and new campuses of the University of Sana'a were observed. The site for the demonstration farm was toured. Information in the earlier studies and reports greatly influenced the recommendations for types and amount of space in the buildings for the Faculty of Agriculture, (FOA). These resources include studies by University of Sana'a staff, by the League of Arab States, by the University of London, by the Faculty of Agriculture Planning Unit, by the Food and Agriculture Organization of the United Nations, and by CID/AID study teams.

B. Republican Decree No. 51

The government of the Yemen Arab Republic issued the following Decree in 1982 stating its intention to establish a Faculty of Agriculture within the University of Sana'a.

Printed exactly as received from Abdulkader M. Uqba:

Y.A.R.

President of the Republic and the Cabinet

Legal Office

REPUBLICAN DECREE NO. 51
YEAR 1982
FOR THE ESTABLISHMENT OF
A COLLEGE OF AGRICULTURE
AGRICULTURE FACULTY
AT SANA'A UNIVERSITY

(DECREE INTRODUCTION AND CONSTITUTIONAL REFERENCES)

The President has decreed:

Article (1)—the establishment of a college of Agriculture to be included in the Sana'a University colleges and subject to the provision of the law no. 89 for year 1977 "The Law of Establishing Sana'a University"

Article (2)—This decree is effective as of the date of issue to be published in the Government Official Magazine.

Issued at the Republican Palace, Sana'a

Date of Issue 26th July 1982 Shawwal 6, 1403H

Signed by:

Ali Abdulla Saleh	Dr. Abdulkarem Al Iryani	Ahmed Mohamed Abdul Malik Alasbahi
Y.A.R. President and Commander in Chief	Prime Minister	Minister of Education

C. Executive Summary

The purpose of this report is to identify the type and quantity of space and the type of furnishings and equipment needed by the Faculty of Agriculture at the University of Sana'a. Also included are estimated costs for the above, anticipated demand for agricultural graduates, type of degree to be conferred, general make-up of the curriculum, and the organization of the faculty staff.

The decision to establish the Faculty and its location were proclaimed by Yemen Arab Republic Presidential Decree in 1982. Numerous studies for the Faculty have been completed to date. This report is built upon the findings and recommendation of those studies.

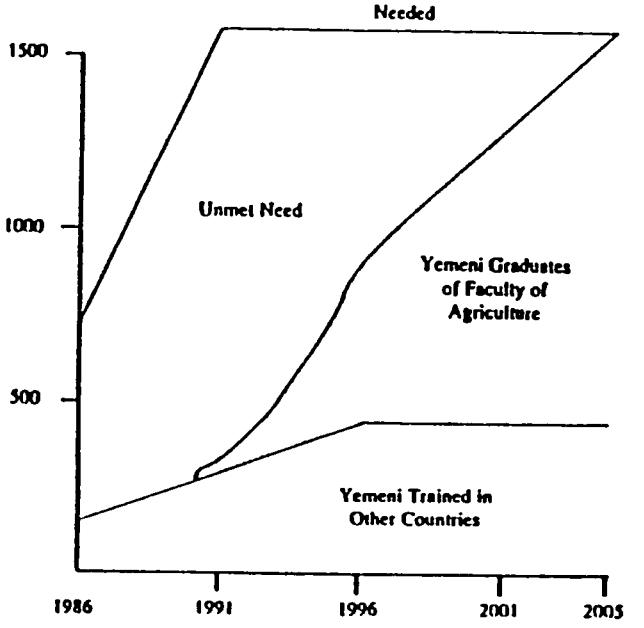
Sites for the Faculty and the demonstration (instructional) farm have been selected by university planners. These functions are adjacent to each other. The buildings planned for the Faculty house normal university instructional activities such as classroom instruction; lecturing; laboratory instruction and research; administration; library functions; snack bar operations; and practical instruction space such as farm implement mechanics and farm building construction. These spaces total about 14,000 square meters and are projected to cost 100,000,000 Y.R. or $22,000,000. Design, contracting and construction for the new facilities can be expected to take at least four years to complete. Drawings of the proposed solution are found in the Appendix. Lists of equipment and furniture items are found in Section K.

The projected demand for Faculty of Agriculture graduates, along with other factors such as anticipated attrition, led to selecting a class size of 150 students each year. Participation of women is expected to be the same as for the University as a whole, about 20 percent. A sizable share of the initial demand for graduates comes from the Ministry of Agriculture and Fisheries. A general agriculture degree with a strong background in the basic sciences is recommended. The recommended curriculum may permit some specialization in the fourth year. It is anticipated that some of the higher level students will stay at the University for some post graduate work which will permit greater specialization.

Although it is expected that the staff will build up slowly, the final staff is projected at 39 plus a dean and three associate deans covering the areas of instruction, research, and extension. The staff will be supported by approximately 100 support personnel including secretaries, laboratory technicians, library personnel and so forth. The staff of 39 includes department heads and professors for six departments. A department organization is assumed although it is recognized that a different final department make-up may evolve as the faculty develops; refer to Sections F and G for recommended staff make-up.

D. Demand for Graduates

The number of Bachelor of Science degree general agriculture personnel needed by the Ministry of Agriculture and Fisheries is projected to be 600 in 1986, the end of its Second Five-Year Plan, and 1540 in 1991, the end of its Third Five-Year Plan. Only 187, one-half of whom are expatriates, with this level of education are currently employed at the Ministry. Therefore, there exists a great need for trained Yemenis in the public sector. This need will be met from two sources: 1) Yemenis receiving degrees in other countries; and 2) graduates of the Faculty of Agriculture, the University of Sana'a. The needs for agricultural manpower have not been projected past 1991. Assuming the needs remain constant, it is anticipated that needs of the Ministry will be met by the year 2005 as shown opposite.



Number of Bachelor of Science level Yemeni Agriculturists needed by and available to the Ministry of Agriculture and Fisheries. Private sector needs are not included above and are not yet quantified.

Assumptions in arriving at the number of Yemeni graduates of the Faculty of Agriculture employed by the Ministry of Agriculture and Fisheries include entering class of 150, four plus years to complete the degree, a 20% attrition rate, and that 60% of the graduates are hired by the Ministry. The other 40% of the graduates may be hired in the private sector or pursue advanced degrees in other countries.

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E. Degree Recommendation

The degree will be comparable to a Bachelor of Science degree with a major in general agriculture in the United States. The curriculum below provides for emphasis on basic sciences in the first year, focuses on introductory agriculture sciences in the second year, and in the third and fourth year offers commodity oriented production courses as well as specialized courses in various disciplines. Students, with the aid of a staff advisor, will select courses among those offered in the fourth year.

Curricula continually evolve so it is expected that courses and course content will change per Yemeni staff experience. Eventually, the majors may include, in addition to general agriculture: agricultural economics; agricultural education and extension; agricultural engineering; crop production and protection; livestock production and protection; and food science and technology. This listing was used to establish the classroom, laboratory and other space requirements included in Section G. No final decision has been taken by UOS regarding curriculum and degree requirements.

PROPOSED CURRICULUM AND PRACTICUM EXPERIENCES FOR STUDENTS ENROLLED IN THE FACULTY OF AGRICULTURE, UNIVERSITY OF SANA'A

FIRST YEAR

Formal Coursework:
- English Language
- Economics
- Chemistry
- Botany
- Mathematics
- Microbiology
- Zoology
- Computer Logic
- Introduction to Agriculture of YAR

Vacation Practicum:
Supervised orientation and field trips to different agricultural regions of YAR. Purpose is to show variability to ecological and climatological conditions under which agriculture is practiced in the YAR.

SECOND YEAR

Formal Coursework:
- Farm Management
- Agriculture Cooperatives
- Animal Science
- Poultry Science
- Plant Science
- Soil Science
- Introduction to Agricultural Engineering
- Food Quality, Chemistry
- Plant Diseases
- Economic Entomology
- Statistics
- Leadership Development

Vacation Practicum:
Intensive and closely supervised training at Demonstration Farm, where students are familiarized with various aspects of crop and animal husbandry, and learn basic skills.

THIRD YEAR

Formal Coursework:
- Agricultural Marketing
- Agricultural Finance
- Ruminant and Monogastric Nutrition
- Animal Breeding and Improvement
- Animal Reproduction
- Soil Fertility
- Plant Breeding and Improvement
- Plant Growth and Development
- Power and Farm Mechanization
- Irrigation Systems and Design
- Farm Structures
- Food Processing
- Human Nutrition

Vacation Practicum:
Assign students to different public and private organizations, institutions, and farms. Students expected to carry on normal practical work being performed and maintain diary of activities. Final evaluation based on report prepared by student at conclusion of experiences.

FOURTH YEAR

Formal Coursework:
- Advanced Farm Management
- Poultry Production and Management
- Sheep, Goats, Cattle Production
- Livestock Grazing Management
- Soil Morphology and Development
- Weed Control
- Cereal and Forage Crops
- Fruit and Vegetable Production
- Agricultural Product Processing
- Secondary Teaching Methods
- Extension Methods
- Secondary Agricultural Curriculum
- Rural Sociology
- Experimental Design
- Computer Applications In Agriculture
- Personnel Management
- Fiscal, Budgetary Management and Control

Vacation Practicum:
Students will be assigned to various public and private organizations, institutions, secondary, schools, etc., where they will obtain intensive management experience.

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F. Organization of the Faculty of Agriculture

Initially, there will be a non-departmentalized structure with the only administrator being the dean who will be responsible directly to the President of the UOS. The primary emphasis of the staff will be teaching.

As the number of staff, their support personnel (secretaries, assistants, library staff, and so forth), and students increase it is envisioned that the organizational structure will be similar to that of colleges of agriculture in land grant universities in the U.S. The dean will be aided in administration by associate deans for teaching, research, and extension. Departments, administered by department heads, may include: agricultural economics; agricultural education and extension; agricultural engineering; crop production and protection; livestock production and protection; and food science and technology. Most of the teaching staff will also conduct research or participate in extension activities. Office space is proposed for five visiting staff who will teach the basic sciences, thirty-three staff in agricultural disciplines, six department heads, three associate deans, and the dean.

Research will be conducted by some outstanding fourth year students under supervision by staff. Some teaching staff will also conduct research. It is recognized that the designation of the use of research laboratories in Section G of this report may change as final plans for the buildings are formulated or after the buildings are occupied.

Participation in extension activities will be an essential activity of many of the staff. A 250 seat auditorium and two 100 seat classrooms, whose primary use is for instruction of students, also provide excellent facilities for conducting short courses for farmers, horticulturists, livestock producers, and other agriculturists invited to the UOS. The media preparation center will prepare audio-visual aids for classroom instructions as well as for extension meetings held both on and off the campus.

G. Space Needs Analysis

The following is a listing of spaces by use along with the net floor area in square meters (SQ M). The list is divided into five basic uses: Administrative spaces, common student spaces, faculty offices, classrooms, and laboratories. These net areas do not include circulation space, toilet rooms, mechanical spaces, and space taken by walls, columns, or partitions.

1. ADMINISTRATIVE COMPLEX SPACES

SPACE	ESTIMATED POPULATION	AREA	
Dean's Office	1	42 SQ M	
Associate Deans (3 @ 20)	3	60	
Dean's Reception, Secretary	2	25	
Fiscal Officer	1	20	
Purchasing Office	3	25	
Personnel Officer	1	20	
Student Affairs Officer	1	20	
Administrative Assistant	1	20	
Secretarial Pool	5	35	
Reception Area	2	35	
Small Kitchen	—	10	
Central Files	—	60	
Duplicating Space	1	15	
Storage Rooms (2 @ 15)	—	30	
Conference Rooms (large, dividing room)	—	60	
			477 SQ M

2. ENTRANCE LOUNGE/LIBRARY/COMMON STUDENT SPACES

SPACE	ESTIMATED POPULATION	AREA	
Reception Hall	5	50 SQ M	
Display Areas (permanent and temporary)	20	80	
Student Registration Office	20	80	
Student Book Store	4	40	
First Aid Room	2	16	
			266 SQ M
Central Prayer Room			
Prayer Room	40	60 SQ M	
Ablution Area (male/female, 2 @ 12 ea.)	6	24	
			84 SQ M
Library (20,000 vols.)			
Open Shelving (100 vols./sm.)	20	200 SQ M	
Periodicals	5	30	
Learning Center (20 cubicles @ 2.5 SQ M/cubicle)	20	50	
Control Desk Area (including lending & return)	20	40	
Reading Places (100 @ 2.5 SQ M/place)	100	250	
Catalog	10	30	
Offices (lib., asst. lib., stor., media, 4 @ 15)	5	60	
Copying	2	20	
Repair	2	20	
Storage	—	40	
			740 SQ M
Student/Faculty Snack Lounge		220 SQ M	
Snack Lounge Kitchen (including offices, receiving, storage)		80	
			300 SQ M
			1390 SQ M

G. Space Needs Analysis

3. STAFF OFFICE SPACES

SPACE	ESTIMATED POPULATION	AREA
Animal Production/Protection:		
Department Head (future)	1	25 SQ M
Secretary/Reception/File Space	2	25
Staff Offices (7 @ 15)	7	105
		155 SQ M
Crop Production/Protection:		
Department Head (future)	1	25 SQ M
Secretary/Reception Space	2	25
Horticulture Staff Offices (4 @ 15)	4	60
Field Crops Staff Offices (4 @ 15)	4	60
Soils Staff Offices (4 @ 15)	4	60
		230 SQ M
Food Sciences:		
Department Head (future)	1	25 SQ M
Secretary/Reception Office	2	25
Staff Offices (3 @ 15)	3	45
		95 SQ M
Agricultural Engineering:		
Department Head (future)	1	25 SQ M
Secretary/Reception Office	2	25
Staff Offices (4 @ 15)	4	60
		100 SQ M
Agricultural Economics:		
Department Head (future)	1	25 SQ M
Secretary/Reception	2	25
Staff Offices (4 @ 15)	4	60
		110 SQ M
Agricultural Education/Extension:		
Department Head (future)	1	25 SQ M
Secretary/Reception	2	25
Staff Offices (3 @ 15)	3	45
Media Preparation Center	3	60
		155 SQ M
Visiting Science Staff Offices (5 @ 12)	5	60 SQ M
Staff Lounge/Kitchen (2 @ 25)	8	50
Conference Room (2 @ 20)	10	40
Storage Rooms (6 @ 20 avg.)		120
		270 SQ M
		1125 SQ M

4. CLASSROOMS, LECTURE HALLS

SPACE	ESTIMATED POPULATION	AREA
General Auditorium Space*	250	320 SQ M
Large Lecture Hall* (2 @ 175)	100 ea.	350
Classrooms (10 @ 80)(2 SQ M/student)	40 ea.	800
Classrooms (10 @ 50)(2 SQ M/student)	25 ea.	500
		1970 SQ M

*Fixed, elevated seating (1.25 SQ M/student in the auditorium; 1.75 SQ M/student in lecture halls).

G. Space Needs Analysis

5. LABORATORIES

SPACE	ESTIMATED POPULATION	AREA
Plant Science Laboratories:		
Teaching Laboratory (A)* (growth/pathology)	35	140 SQ M
Shared Preparation Room (A)	3	30
Research Laboratory (A) (growth/pathology)	5	120
Teaching Laboratory (B) (weeds/entomology)	30	90
Specimen Storage (herbarium, entomology specimens)	—	20
		400 SQ M
Soil Science Laboratories:		
Teaching Laboratory (A)	35	140 SQ M
Shared Preparation Room (A)	3	30
Research Laboratory (A)	5	120
		290 SQ M
Animal Science Laboratories:		
Teaching Laboratory (A) (animal reproduction)	35	140 SQ M
Shared Preparation Room	3	30
Research Laboratory (A) (animal reproduction)	5	120
Teaching Laboratory (B) (livestock grazing)	25	75
Specimen Storage (herbarium)	—	20
		385 SQ M
Food Science Laboratories:		
Teaching Laboratory (A)	20	100 SQ M
Shared Preparation Room	3	30
Research Laboratory (A)	5	100
Teaching Laboratory (A)	15	40
		270 SQ M

*Type A laboratories have water, air, gas, and vacuum. Type B laboratories have water.

FIRST YEAR SCIENCE LABORATORIES:

SPACE	ESTIMATED POPULATION	AREA
General Chemistry (A)	30	100 SQ M
Organic and Biological Chemistry (A)	30	120
Botany (A)	30	150
Zoology (A)	30	150
Microbiology (A)	30	150
Shared Preparation Rooms (2 @ 25)	4	50
		720 SQ M
Animal Nutrition Laboratories (teaching and research):		
General Use (A)	30	100 SQ M
Kjeldahl Analysis (A)	—	40
Solvent Room (A)	—	30
Instrument Room (A)	—	50
Chemical and Sample Storage (A)	—	30
		250 SQ M
General Teaching Laboratories (B) (2 @ 120):	35	240 SQ M
Preparation Room	4	40
Miscellaneous Storage Rooms (3 @ 25)	—	75
Computer Processing Center (instruction)	25	100
Separated Spaces:		
Agricultural Mechanics Complex	40	1200
Greenhouses (2 @ 250)	—	500
Headhouse	—	120
Chemical Storage	—	20
Emergency Generator	—	20
Faculty Shower/Locker Rooms (40 full size lockers) (1 @ 20, 1 @ 40; 10 female, 30 male)	5	60
Student Shower/Locker Rooms (100 half-size lockers) (1 @ 30, 1 @ 90; 20 female, 80 male)	30	120
		2040 SQ M
		4810 SQ M

G. Space Needs Analysis

SUMMATION

Total net floor area by use:

Administrative Spaces	477 SQ M	(5%)
Common Student Spaces	1,390	(14%)
Staff Offices	1,125	(12%)
Classrooms	1,970	(20%)
Laboratories	4,810	(49%)
	9,772 SQ M	(100%)

Factor to account for floor area devoted to walls, columns, and other structure ..... 8% of net area.

Factor to account for mechanical spaces, laboratory utility spaces, and other equipment ..... 22% of net area.

Factor to account for circulation spaces including corridors, stairways, and elevators ..... 15% of net area.

Total of factors above 45%

Total gross floor areas needed = 9,772 + 9,772 × 45% = 9,772 + 4,397 = 14,169 SQ M

Say 14,000 SQ M

H. Site Development

The location of the site on the campus and the size of the site were determined by the UOS. The site is fairly level, has an area of 40,000 square meters, and measures 200 meters square. It is free of trees or other substantial vegetation.

As the campus is developed, the site will be bounded by streets on all four sides. These streets run northwest to southeast and southwest to northeast. The adjacent site to the southwest will be developed as a demonstration (instructional) farm. Adjacent sites to the northwest and southeast will be developed for a Faculty of Dentistry and a Faculty of Veterinary Medicine, respectively. Development of these sites is not addressed in this report. A road will run northeast from the site to Wadi Dahr Road.

Buildings on the site will be developed on the axis of the approach road from Wadi Dahr Road. Their organization will be somewhat formal in nature and add to the importance of the FOA and the profession of agriculture. The administrative, reception, and lecture areas will be at the center of the axis with a classroom wing on the southeast side and a laboratory wing on the northeast side. These wings will also house faculty offices, the agricultural library, and the snack bar. The classroom wing will receive early morning sun and its warmth. The wings as well as the center portion will be developed as two-story structures in keeping with present campus development and the general development throughout Sana'a. The prayer room will be located behind these buildings within the enclosed court. The snack bar will also border this court with some outdoor seating occupying part of the space. Circulation between the buildings will be by way of two story walkways connecting both the first and second stories. There will be planted areas at the front of the site that will be maintained by the students in the second, third, and fourth years. It is hoped that some competition will develop between the classes in developing the best maintained green space.

There will be a small parking area in the front of the site to permit visitor parking for a few vehicles at a time; however, the access to the main parking areas will be from the rear. This same access will be used as an entry for deliveries to the receiving area. The main parking area will accommodate 150 automobiles.

The agricultural mechanics complex, as well as the shower facilities, will be developed on the demonstration (instructional) farm site adjacent to the road. This will be done to ease crowding on the FOA site, because the activities there may create objectionable noise, and because the types of activities there are similar to other activities on the farm.

The establishment of this faculty will have an impact on other UOS activities and institutions not part of this project. There will be a need for more student housing, faculty housing, and cafeterias; and a greater work load imposed on the language center, athletic facilities, the central library, and utilities.

Water and electrical power will be brought underground to the FOA site when available along Wahi Dahr Road. Capacity will be verified during design. Sanitary sewerage will initally be run to new on-site septic tanks and tied to the new Sana'a area sewerage system when complete in this area; about five to six years.

I. Environmental Assessment

The development and uses for this project are the same as that for the UOS campus as a whole. Uses include classroom instruction, laboratory instruction and research, library use, snack bar operations, and office business operations all of which are consistent with the operations of a university. Operation of the agriculture mechanics complex are mostly instructional in nature and are similar to other laboratory and demonstration (instructional) farm activities. This complex will be located on the land dedicated to the farm. Development of the FOA site includes pavements and landscaping. Landscaping is to be undertaken with trees, shrubs, and grasses native to the Yemen Arab Republic. It is felt that this landscaping will help buffer winds and create a campus-like enviroment for the FOA buildings.

Environmental impacts and influences of the above have been reviewed in some detail for both the FOA and the demonstration (instructional) farm. We feel that the uses of these developments are compatible with university uses and that these uses do not represent a degradation of the local environment. There will be some temporary impacts during construction, however, due to delivery truck and construction equipment traffic, excavation, and general construction operations. These will be controlled by designating haul roads, temporary sedimentation controls, and limiting construction to daytime hours.

J. Building Construction Discussion

DESIGN FEATURES

The buildings will be of permanent high quality construction. The design will be of high quality to emphasize the importance of agriculture in the society and to help entice students to enroll in the FOA and to pursue careers in agriculture.

The buildings will utilize exterior design elements that are in harmony with traditional indigenous construction. The building exterior and selected interior spaces will be faced with local Yemeni stone masonry.

The agricultural mechanics laboratory and practical instruction area will be separated from the areas where classrooms, staff offices, and the library are located to reduce noise interference. Shower and locker room facilities will be provided for those returning to the classroom or laboratory buildings from the demonstration (instructional) farm or the agricultural mechanics complex. While lockers in the student shower will be unassigned, the staff will each have permanently assigned locker space in separate facilities.

Permanence, durability, and ease of maintenance will govern selection of interior finishes and fixtures. Acoustical treatment will be used in classrooms, offices, and the library to help control sound. Elevators will be the hydraulic type with only the simplest and most straightforward controls.

SPATIAL CONSIDERATIONS

Separate teaching and research laboratories will be provided to encourage staff research into Yemeni plants, foods, and methods. The size of teaching laboratories will be based on one quarter of a class in a laboratory together with two such groups each semester.

Faculty offices will include spaces for future department heads. Until the time when departments are actually formed and indeed, until the staff grows to its planned size, many of the staff offices will be subdivided into student cubicles by temporary construction of light gage metal studs and gypsum wallboard. Other interior partitions will be more permanent masonry construction. The student cubicles could be assigned to upperclass and post graduate students to encourage greater scholarship. The Dean's office and other staff offices will be equal in size and quality to those planned for other faculties. Staff office areas will have their own staff-only toilet facilities. Toilet facilities will be based on an 80 percent male/20 percent female staff and student population. The Dean's office will be located in a prominent position in keeping with the importance of that office. Five offices will be set aside for visiting Faculty of Science staff teaching the first year science courses.

Classrooms will be provided in three basic capacities: 80 students or approximately one-half a class size; 40 students or approximately one-quarter a class size; and 25 students or about one-sixth a class size. Several of the 40 student classrooms will be enclosed on one side by operable (moving) partitions to allow creation of additional 80 student classrooms if the staff prefers to lecture to larger groups. One large auditorium type space will be included to enable lectures to be given to groups of students larger than one class and to non-student agricultural groups. This space as well as the two larger classroom spaces will have fixed seating on a sloped floor to offer good views for all. These spaces will also have elevated lecture platforms and projection rooms.

J. Building Construction Discussion

Classroom and laboratory space will be provided for teaching the basic sciences in the first year of the curriculum although the FOA staff will not teach these courses. A language laboratory will be located in another UOS facility but space for classroom language training will be included. Although laboratories will be designated for certain uses, the number, size, and type of laboratories, and classrooms as well, will permit flexibility in changing curriculums and types of degrees offered.

Special spaces in the FOA include a library to supplement the general library that serves the UOS campus as a whole; a prayer room to permit short prayer recesses and supplement the campus mosque; and a snack bar where fast food type refreshment will be available for both staff and students. Although separate staff kitchens will be located in staff areas, it is felt that the staff will be encouraged to mingle with the students in the snack bar when possible to promote interchanges of ideas and learning.

UTILITIES

It is understood that local electrical power varies extensively in voltage output. This will be rectified to a constant voltage in the laboratory areas for protection of research equipment. An emergency generator will be included in the complex to maintain power to critical research functions while normal emergency power applications such as exit lighting will be served by a central campus emergency generator complex being developed as a separate project.

Sanitary sewage from domestic wastes will be collected in septic tanks for periodic transport to agricultural sites. Heating, ventilation, and air conditioning will be provided primarily to laboratory areas and will include dust filtration and control by positive pressures. Domestic hot water heating will be assisted by solar collectors.

EARTHQUAKE EXPERIENCE

The recent earthquake that occurred south of Sana'a created some concern for all construction in the Sana'a area. Design for earthquake probability will be investigated during the design process.

RECOMMENDED CODE

Although no building code has been adopted or officially recognized, there are certain consistencies in design concepts that can be fulfilled by following a single unified building code. Therefore the design will be based on one building code, specifically one of the three major U.S. building codes. It is anticipated that some allowances must be made to accommodate certain local customs and utility deficiencies. It is also noted that the facilities will be constructed to accommodate the handicapped This will be done by complying with the American National Standards Institute Standard A 117.1-1980, "Specifications for making buildings and facilities accessible to and usable by physically handicapped people."

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K. Furnishings

Furnishings is defined to include non-built-in laboratory furniture and equipment; bench top laboratory equipment, unattached laboratory equipment, and teaching aids; workshop and agricultural mechanics shop equipment; classroom furnishings; and, normal office furniture and equipment

Built in laboratory furniture and equipment such as fume hoods, and built-in auditorium furnishings such as seating and stage equipment are included in the building construction cost estimate, Section M.

It is attempted here to include budget cost estimates for the purchase of these furnishings. It must be understood that because most of these purchases are at least two and one-half to three and one-half years away, these budgets must be conjectural in nature.

Benchtop and unattached laboratory equipment includes items such as microscopes, scales, spectrophotometers, autoclaves, incubators, dryers, centrifugal machines, growth chambers, sterilizers, anatomical instruments, laboratory glassware items, and an initial supply of chemicals. Teaching aids include flip charts, projectors, library books, and library equipment. Some of these items will be determined in more detail during design, but a budget estimate is projected at this time to be about 9,200,000 Yemen Rials (Y.R.) or $2,000,000.

Workshop and agricultural mechanics equipment includes tractor engines, welding equipment, power tools, concrete mixers, and so forth. A budget estimate for this equipment is 920,000 Y.R. or $200,000.

Classroom desks, classroom chairs, and library furniture could be expected to cost a further 1,380,000 Y.R. or $300,000.

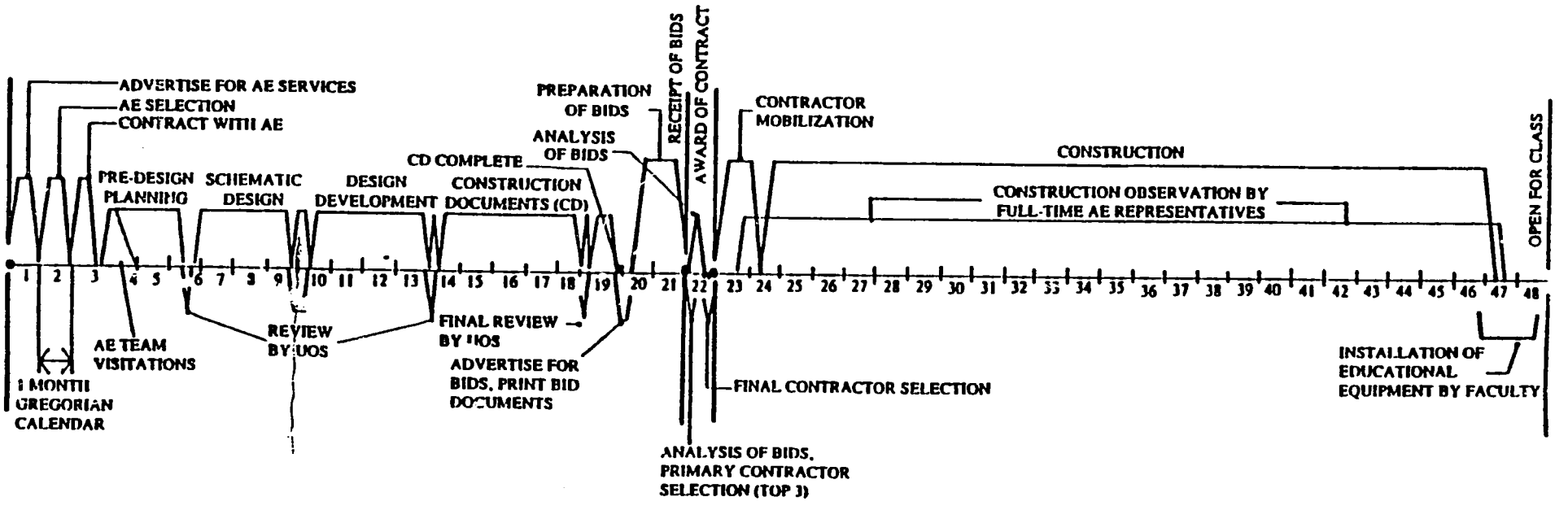
Desks, chairs, shelves, office equipment such as typewriters, and items like copy machines are estimated at 2,300,000 Y.R. or $500,000.

The total budget estimate for furnishings, excluding built-in items, is 9,200,000 + 920,000 + 1,380,000 + 2,300,000 = 13,800,000 Y.R. or $3,000,000. These expenditures are expected to take place close to the end of construction. An attempt has been made to adjust these figures for the inflation that is assumed to occur between now and the expected time of purchase.

L. Anticipated Schedule of Events

The schedule below presents the types of activities and events that will take place prior to the time the first agricultural students can be taught in FOA spaces. The schedule includes time for these Architectural/Engineering/Planning tasks: 1) Pre-design planning including site inventory, gathering of design data, developing a program of requirements, and advanced feasibility studies; 2) Schematic Design; 3) Design Development; 4) Contract Document Preparation including the invitation to bid, the Contract form, General Provisions, Drawings, Specifications, and Cost Estimate; 5) Analysis of Bids; 6) Construction Observation; and 7) Visits to Sana'a at appropriate times. The schedule is shown with the project depicted as one phase for simplification. The project could be designed and contracted in phases to speed completion of a portion of the total facilities. This would probably not decrease the total time for completion of the entire FOA, however, and is not recommended.

Team visits and actual review meeting schedules should be timed with consideration given to the observance of Ramadan.



M. Cost Estimate

A budget cost estimate is included to help define the project construction cost. This is done on a unit area basis and the unit area cost figures used are conservative as there are no detailed construction drawings yet prepared. A unit cost of 3,300 Y.R./SQ M is used for normal office use type spaces. The unit cost used for auditorium spaces is 4,800 Y.R./SQ M. It includes the cost of built-in fixed seating, built-in audio visual equipment, and other stage equipment. The unit cost used for laboratory spaces is 4,500 Y.R./SQ M. It includes the cost of air handling and filtration equipment; laboratory services such as water, air, gas, and vacuum piped to benchtop areas; built-in laboratory furniture with sinks, drawer and door faced storage units; and, built-in laboratory equipment such as fume hoods and refrigerators. The relative costs for these types of spaces are similar to that experienced in the U.S.

Site development costs include general excavation, grading, paving, landscaping, and underground utilities. These are given as a percentage of building construction costs as more refinement is not possible at this time.

An allowance for inflation is included at 10 percent per year figured from now until the anticipated midpoint of construction. Compounded for the three year period, this totals 33 percent. Although the inflation rate has been quite high in the recent past, it has been lower over the last 12 to 18 months. The allowance of 10 percent per year is conservative.

Professional fees for design and construction observation are not included. Refer to Section K for more detail of non-built-in furnishings cost.

Construction of Buildings (14,000 gross square meters):

Auditorium spaces @ 4,800 Y.R./SQ M =	950 SQ M × 4,800	=	4,560,000 Y.R.
Laboratory type spaces @ 4,500 Y.R./SQ M =	7,200 SQ M × 4,500	=	32,400,000 Y.R.
Classroom, Administrative, and other spaces @ 3,300 Y.R./SQ M =	5,850 SQ M × 3,300	=	19,305,000 Y.R.
Total Building Costs		=	56,265,000 Y.R.
Site Development Costs, approximately 15% of above		=	8,440,000 Y.R.
Total Buildings and Site		=	64,705,000 Y.R.
Allowance for inflation of midpoint of construction, approximately three years at 10 percent per year, 33%		=	21,350,000 Y.R.
Total Buildings and Site at midpoint of construction		=	86,055,000 Y.R.
Total Non-Built-In Furnishings Cost, Section K		=	13,800,000 Y.R.
Total Project Cost		=	99,855,000 Y.R.
		Say	100,000,000 Y.R.

At 458 Y.R. = $100 U.S., this cost is approximately $22,000,000.

N. Conclusions

The following is a summary of the major conclusions of this report:

- The FOA will be based upon incoming classes of 150 students each year after an initial phase-in period.
- The initial curriculum will be based upon general agricultural degrees only with some specialization in the fourth year.
- The staff will be organized similar to a college of agriculture at a United States land grant university.
- The size of the faculty staff will be projected at about 39, including future department heads, plus a dean and three associate deans. Associate deans will each have an area of responsibility in either instruction, research, or extension.
- The staff will also have responsibilities in instruction, research, or extension.
- Separate laboratories for teaching and instruction will be included in the Faculty to encourage individual staff research.
- One large auditorium type space will be included to enable lectures to be given to groups of students larger than one class and to non-student agricultural groups.
- Facilities will be planned based upon a 20% female, 80% male student population.
- Shower facilities will be included in the project for both staff and students. These facilities will enable staff and students to shower before returning to class from activities at the demonstration (instructional) farm or the agricultural mechanics complex.
- A back-up electrical generator will be included in the complex to serve critical research experimentation needs.
- The new facilities will utilize exterior design elements that are in harmony with traditional indigenous construction.
- 14,000 square meters of classroom, classroom, laboratory, administrative, and support spaces will be constructed costing approximately 86,000,000 Yemen Rials or $19,000,000.
- 13,800,000 Yemen Rials or $3,000,000 will be budgeted for the purchase of equipment, furnishings, and teaching aids.
- Total project cost will be budgeted at 100,000,000 Yemen Rials or $22,000,000.

O. Acknowledgements

We wish to acknowledge the following studies, organizations, and individuals that contributed greatly to the execution of this prefeasibility report. Every effort was made to make this list complete as possible. We apologize for any inadvertent omissions.

STUDIES AND REPORTS

Preliminary study on the establishment of a College of Agriculture at the University of Sana'a. Nasser A. Aulaqi, Associate Professor of Agricultural Economics, University of Sana'a and Advisor to the Ministry of Agriculture, Yemen Arab Republic (Y.A.R.), April, 1980.

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Special recognition is given to CID and its Subproject Identification Document Team for information they developed that is used in this report particularly that related to curriculum development, faculty requirements, number of students, and demand for graduates.

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University of Sana'a, Faculty of Science
University of Sana'a, Technical Office
Consortium for International Development, Yemen Arab Agricultural Development Support Program
United States Agency for International Development, Yemen Arab Republic Mission

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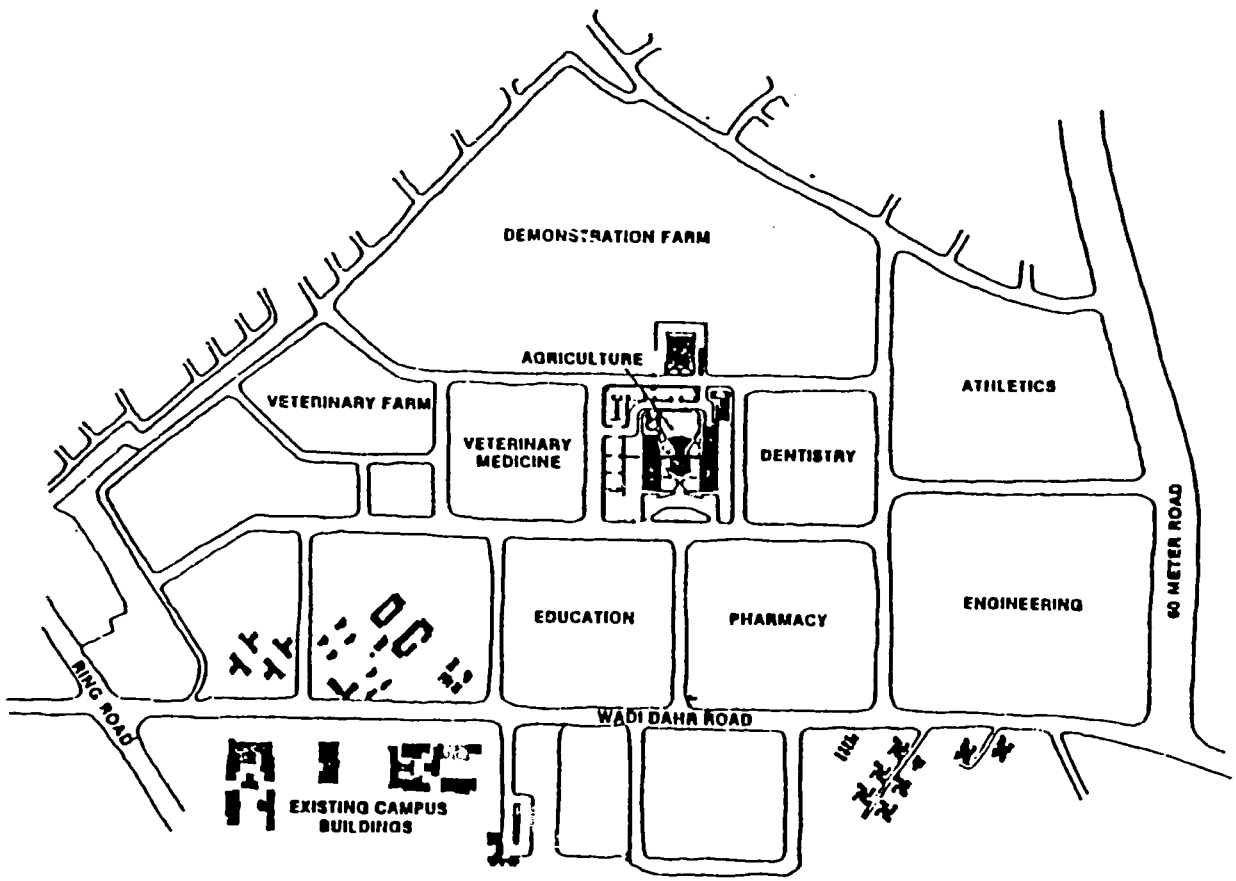
Mr. John D. Wooten, Jr., Project Design Officer, Consortium for International Development/ Executive Office.

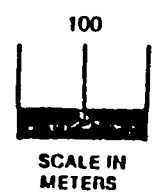
Appendix – Site and Building Drawings

Drawings in Order:

1. Campus Master Plan
2. Functional Relationships
3. Site Plan
4. First Floor Plan
5. Second Floor Plan
6. Elevations
7. Building Sections
8. Agricultural Mechanics Complex

CAMPUS MASTER PLAN
FACULTY OF AGRICULTURE
UNIVERSITY OF SANA'A
SANA'A, YEMEN ARAB REPUBLIC





GAUTHIER, ALVARADO AND ASSOCIATES

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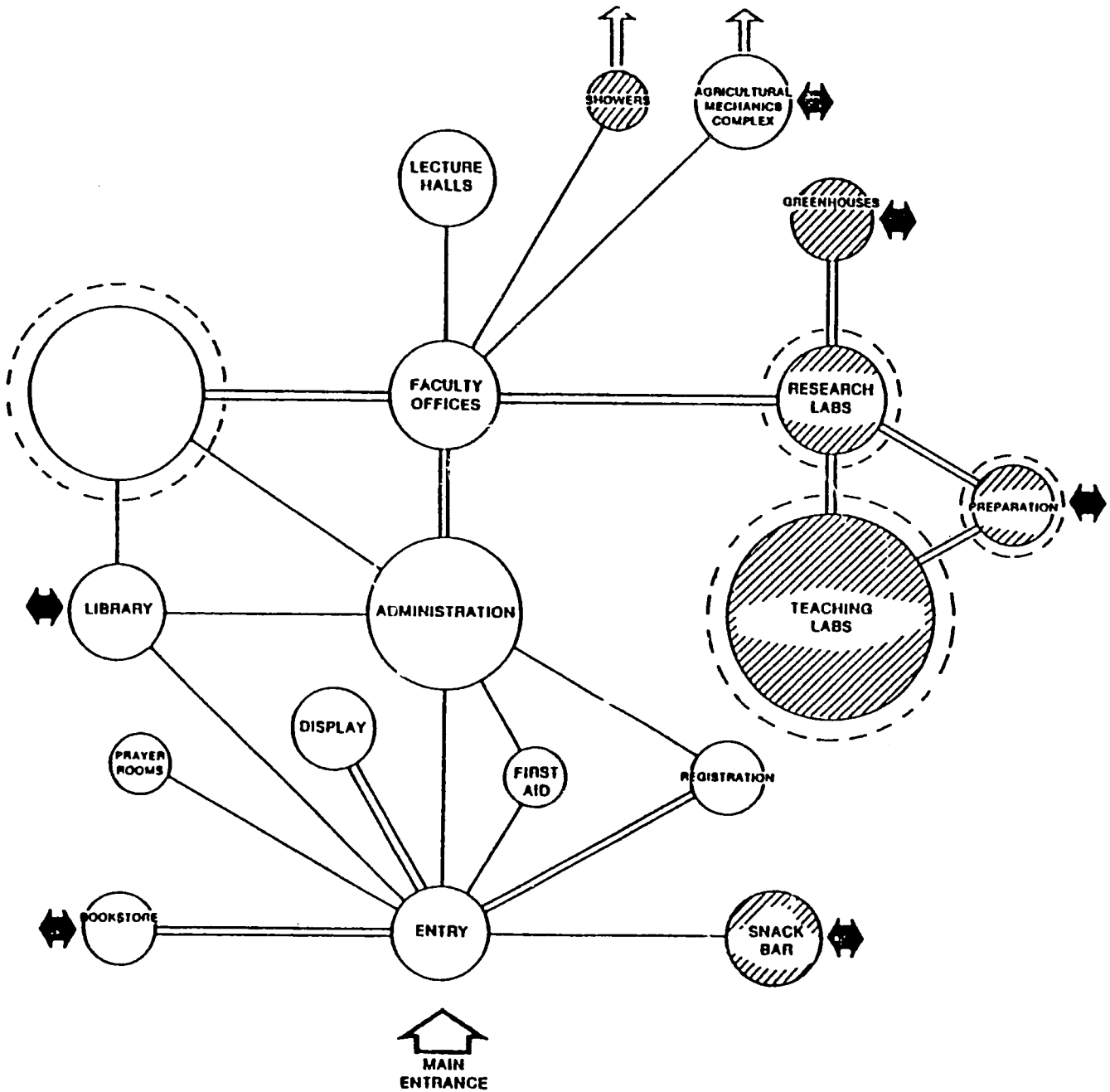
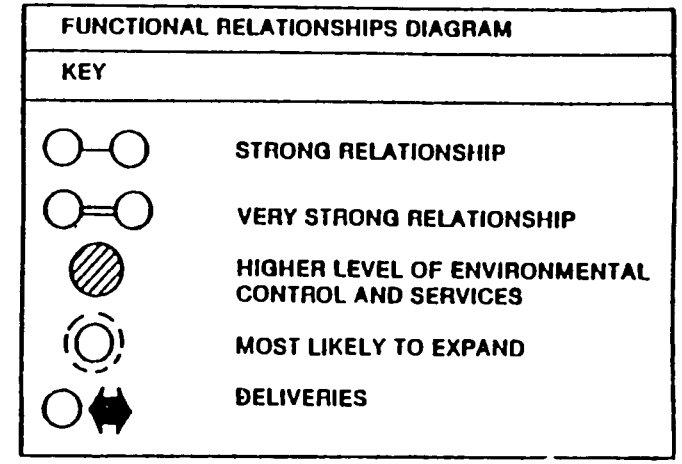
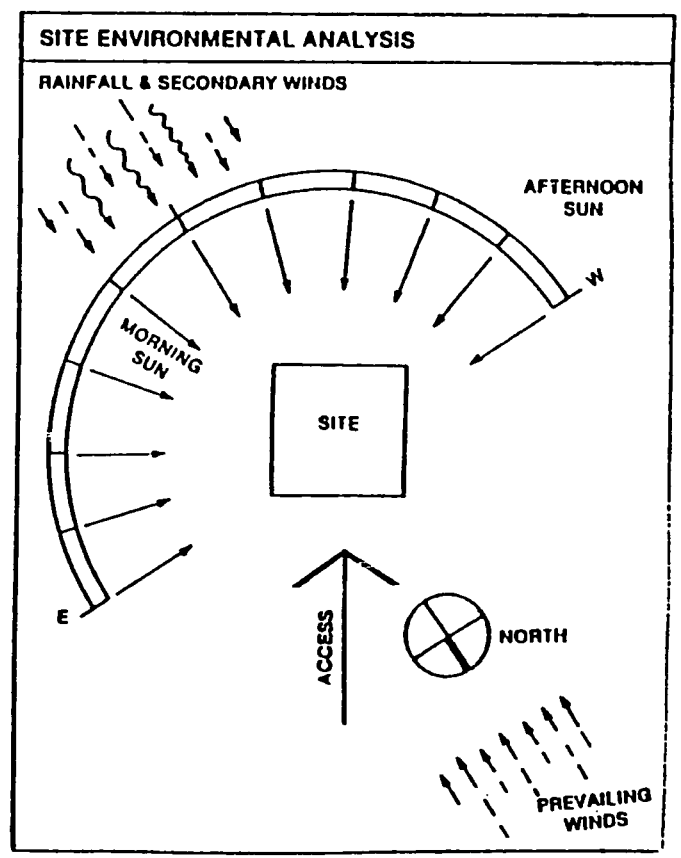
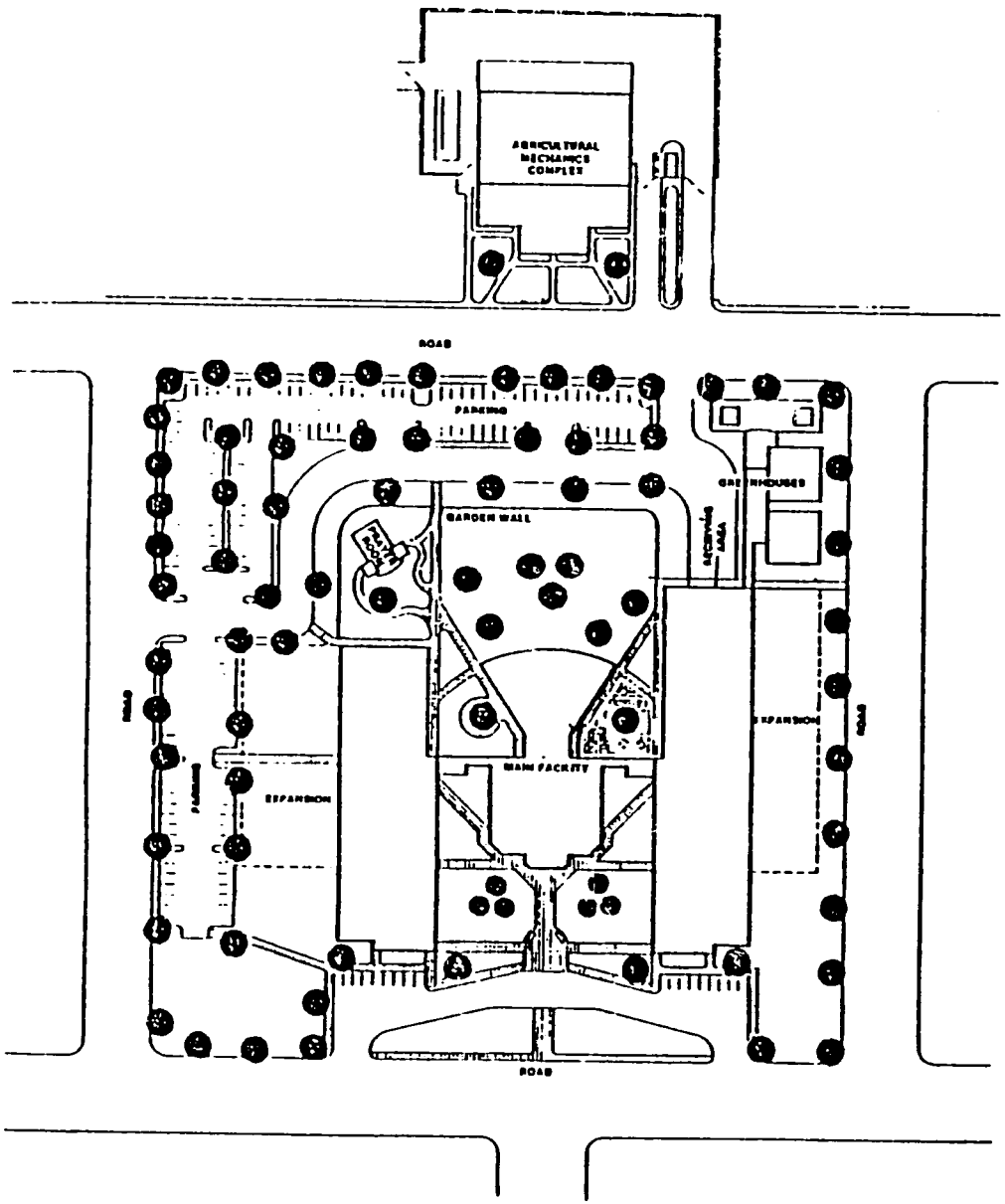

SHOWERS
AGRICULTURAL MECHANICS COMPLEX
LECTURE HALLS
GREENHOUSES
FACULTY OFFICES
RESEARCH LABS
PREPARATION
LIBRARY
ADMINISTRATION
TEACHING LABS
DISPLAY
PRAYER ROOMS
FIRST AID
REGISTRATION
BOOKSTORE
ENTRY
SNACK BAR
MAIN ENTRANCE


FUNCTIONAL RELATIONSHIPS DIAGRAM
KEY
STRONG RELATIONSHIP
VERY STRONG RELATIONSHIP
HIGHER LEVEL OF ENVIRONMENTAL CONTROL AND SERVICES
MOST LIKELY TO EXPAND
DELIVERIES


SITE ENVIRONMENTAL ANALYSIS
RAINFALL & SECONDARY WINDS
AFTERNOON SUN
W
MORNING SUN
SITE
E
ACCESS
NORTH
PREVAILING WINDS



SITE PLAN

FACULTY OF AGRICULTURE
UNIVERSITY OF SANA'A
SANA'A, YEMEN ARAB REPUBLIC

N

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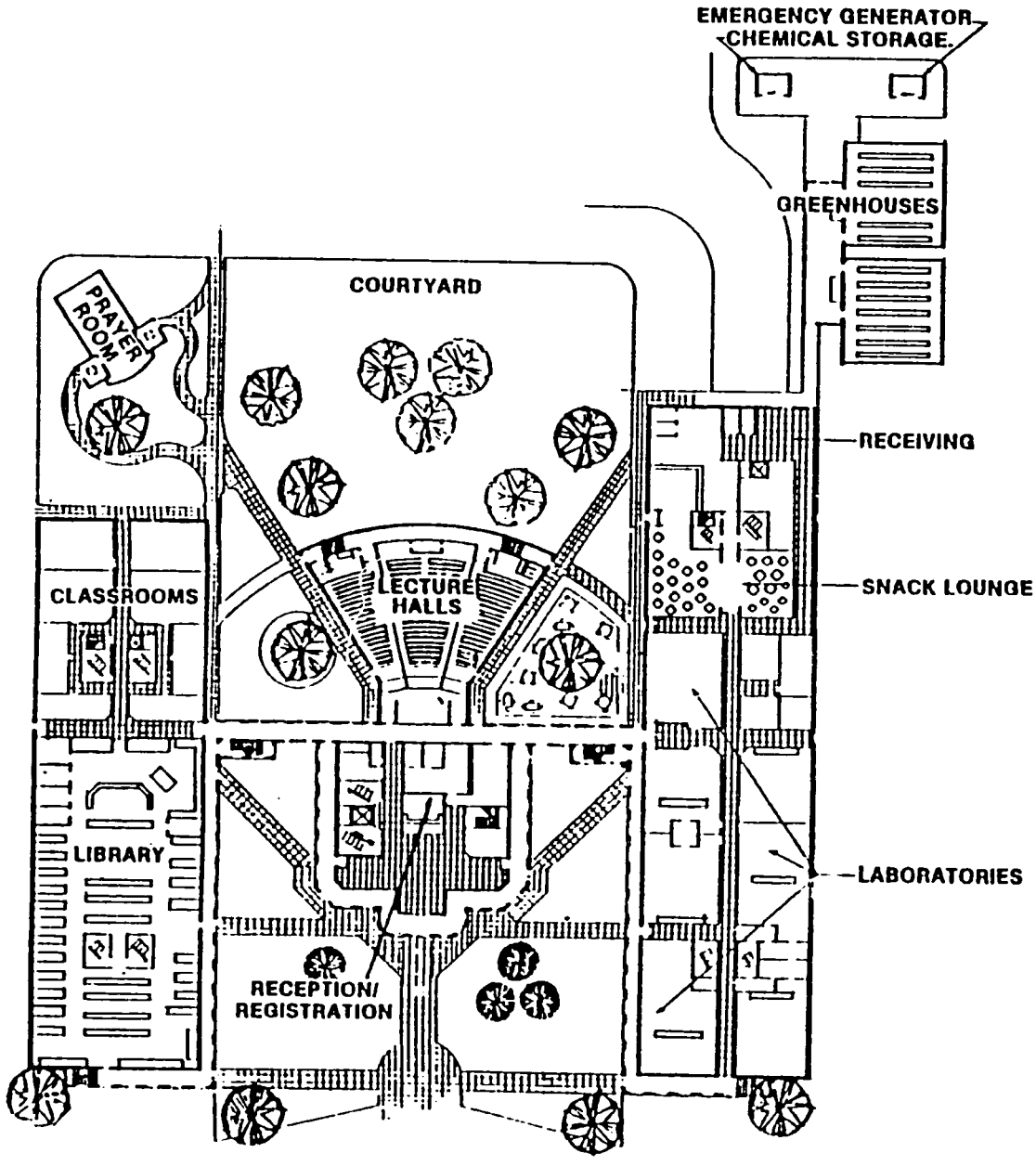
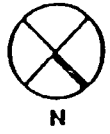
SCALE IN METERS

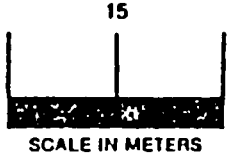
GAUTHIER, ALVARADO AND ASSOCIATES



FIRST FLOOR PLAN

FACULTY OF AGRICULTURE
UNIVERSITY OF SANA'A
SANA'A, YEMEN ARAB REPUBLIC

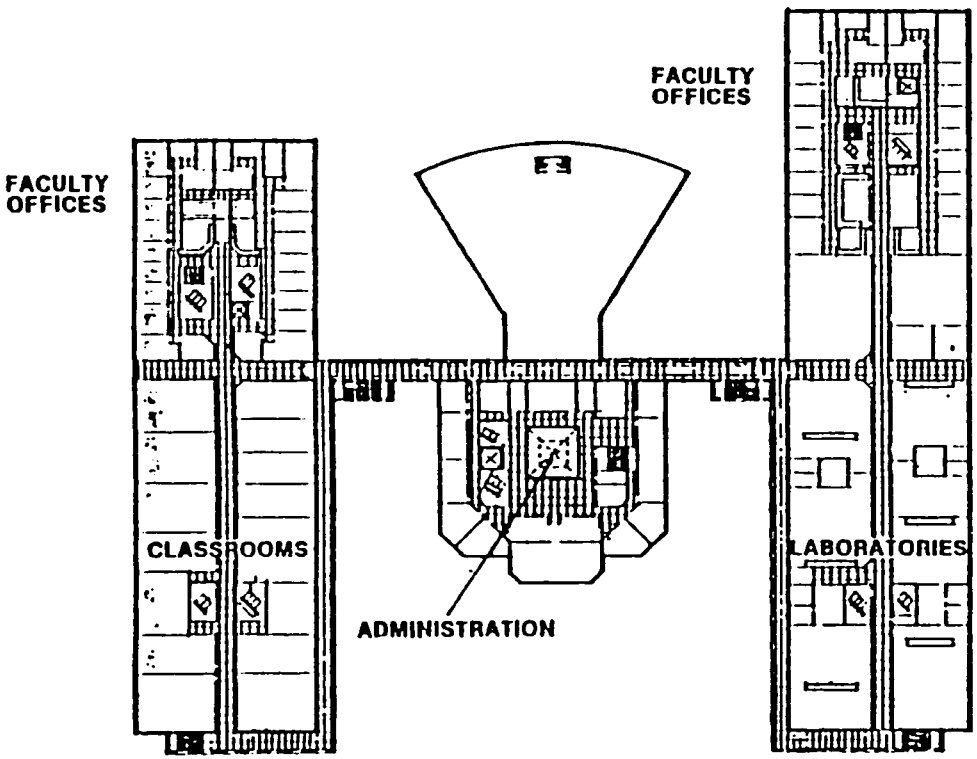


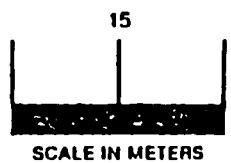


GAUTHIER, ALVARADO AND ASSOCIATES

SECOND FLOOR PLAN

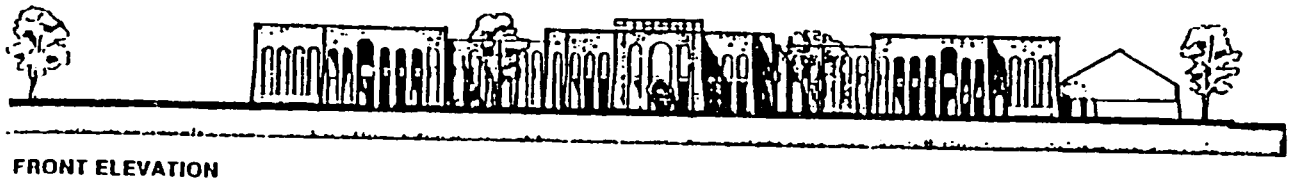
FACULTY OF AGRICULTURE
UNIVERSITY OF SANA'A
SANA'A, YEMEN ARAB REPUBLIC



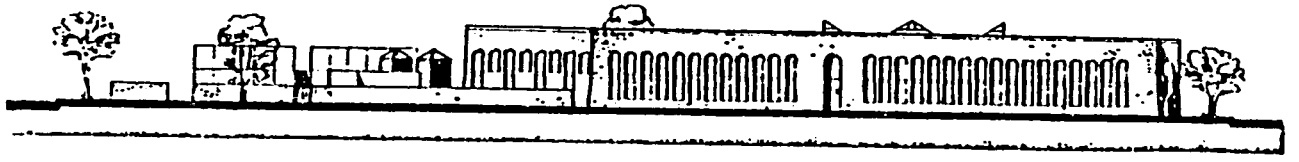


GAUTHIER, ALVARADO AND ASSOCIATES

ELEVATIONS
FACULTY OF AGRICULTURE
UNIVERSITY OF SANA'A
SANA'A, YEMEN ARAB REPUBLIC



FRONT ELEVATION



SOUTHEAST ELEVATION

N

SCALE IN METERS

NORTHWEST ELEVATION

GAUTHIER, ALVARADO AND ASSOCIATES

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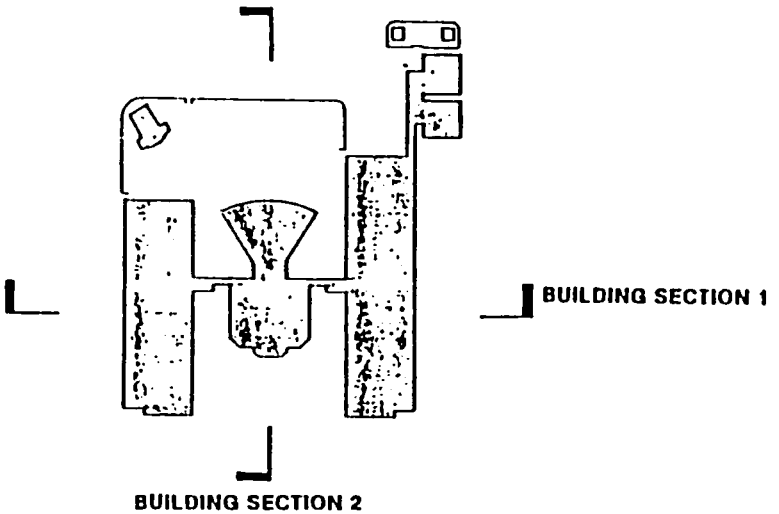
BUILDING SECTIONS

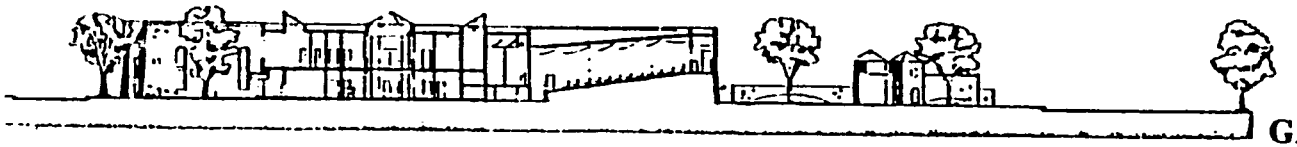
FACULTY OF AGRICULTURE
UNIVERSITY OF SANA'A
SANA'A, YEMEN ARAB REPUBLIC



KEY PLAN

ILDING SECTION 1

SCALE IN METERS

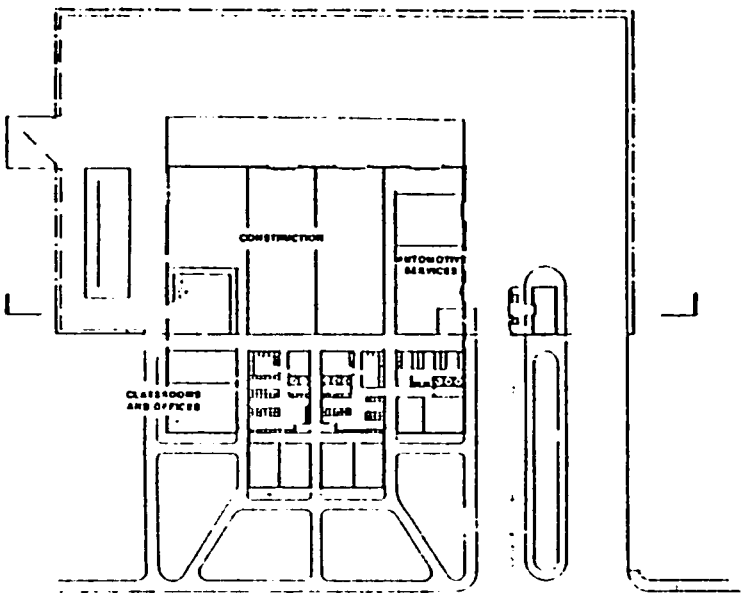


ILDING SECTION 2

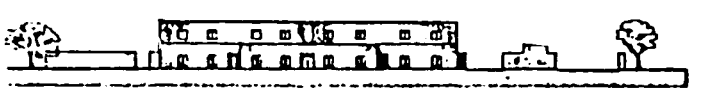
GAUTHIER, ALVARADO AND ASSOCIATES

AGRICULTURAL MECHANICS BUILDING

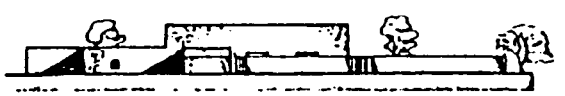
FACULTY OF AGRICULTURE
UNIVERSITY OF SANA'A
SANA'A, YEMEN ARAB REPUBLIC



PLAN

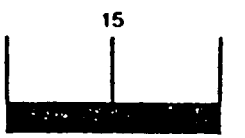


FRONT ELEVATION



NORTHWEST ELEVATION

BUILDING SECTION



GAUTHIER, ALVARADO AND ASSOCIATES

ANNEX L

A/E SCOPE OF WORK

Scope of Work
Architect/Engineer Services
for the
Faculty of Agriculture
University of Sana'a
Sana'a, Yemen Arab Republic

July 1983

Gauthier, Alvarado and Associates
Architects Engineers Planners
Falls Church, Virginia, U.S.A.

I. INTRODUCTION

The purpose of this report is to define the professional services to be provided by the selected Architect-Engineer (A/E) for accomplishment of the project for construction of the Faculty of Agriculture of the University of Sana'a (the University), and to provide a budget cost for contracting for the services.

It is intended that the statement of the A/E Scope of Work shall supplement the general provisions contained in the Standard Architect Engineer Contract as outlined in U.S. Agency for International Development's Handbook 11, Country Contracting. The statement shall be appended to the A/E contract and shall thereby be made a part of it.

The basis for development of the Scope of Work and the budget is the Prefeasibility Report for the project. This report shall constitute the general guidelines for the work of the A/E.

The duties and responsibilities of the contracting party on behalf of the University (the Client), of the A/E and of the University as outlined in Handbook 11 shall provide the framework for cooperation and interchange between the parties to the A/E Contract.

II. SCOPE OF WORK

This contract requires the provision of all architectural and engineering services necessary for the accomplishment of the project. These services generally include but are not limited to the development of the program of requirements; analysis of the site; schematic design; design development; production of construction contract documents for international competitive bidding; bid analysis; and, construction observation and administration.

The A/E shall strive to achieve excellence in design. Accordingly, quality architectural design, including proper use of materials, economy of construction, functional integrity, and compatibility with the environment shall be required. The construction materials shall be of a quality that is consistent with the intended use of the facilities and reflect local availability and construction skills.

The phasing of the A/E Services shall be as follows:

A. *Program of Requirements:* The A/E shall develop a comprehensive program of requirements of the facility. He shall work with appointed representatives of the University.

   Based on the Prefeasibility Report for the project, the Project Paper, and on information furnished by the University, the A/E shall prepare a program of requirements that shall include as a minimum the following:

   — Definition of objectives.

   — Description of the general space and functional requirements.

   — Determination of space criteria.

   — Determination of quality standards.

   — Description of the use and space requirements of each organizational unit and each room within the unit.

   — Determination of functional relationships and adjacency requirements of spaces.

   — Listing of equipment requirements for each room.

— Listing of special requirements such as utility services, loading, vibration, acoustics, conveying, and communication systems.

— Determination of expansion needs based on student load projections.

— Determination of site improvements including parking requirements and supply access.

— Presentation of a proposed schedule of implementation for the project including determination of milestones in the design process and alternative proposals for accomplishment of the construction by phasing of the work.

The conclusions of the Program of Requirements phase shall be presented in a report format with supplementary tables, schedules and diagrams.

The report shall be presented to the Client and the University representatives in Sana'a.

The A/E shall plan to assign the necessary personnel to work in Sana'a for the time required to gather the information for development of the Program of Requirements.

B. *Site Inventory:* The A/E shall visit the site to gather available information and to assist the Client in obtaining the necessary additional site data. He shall gather information relating to the local laws, conditions, and customs affecting the proposed work. The site inventory shall provide as a minimum the following information:

— General description of the topographic and physical features of the site.

— Soils evaluation.

— Description of the existing hydrology and hydraulics.

— Land use compatibility.

— Road network analysis.

— Utility systems availability.

— Vegetation analysis.

— Visual sensitivity analysis.

— Microclimate.

The Client will procure services for a topographic survey and geotechnical investigation program. The A/E shall assist the Client in such procurement by provision of information and data requirements, and by evaluation of the work.

C. *Schematic Design:* The A/E shall provide a schematic level project design in response to the Program of Requirements and the Site Inventory, and having as its objective the consideration of design alternatives. The schematic design shall present proposed solutions in accordance with the objectives of the University and shall include as a minimum the following:

— Land use study, including proposals for siting, zoning, utility use, site development, and access roadways.

— Study of alternative functional layouts of the spaces, including circulation patte· and future expansion considerations.

— Study and selection of optimum major building systems: structural, lighting, utility, acoustical, partitions, roofing, exterior building enclosure, and mechanical.

The work of the Schematic Design shall be presented in report form which shall include:

— Master plan of the site.

— Scaled model representation of the project to provide a clear understanding of the project's massing relationship on the site, forms and scale. Scale shall be 1:500.

— Facility plans showing departmental areas and relationship at an appropriate scale.

— Building elevations showing fenestration and exterior materials.

— Building sections and typical wall sections.

— Design analysis, outlining options considered in each discipline.

— Outline material specifications.

— Gross space tabulations.

— Preliminary cost estimate based on building costs by area and including site development.

The report shall be presented by the A/E to the Client and the University for their review and approval. The drawings shall be mounted on stiff material suitable for group presentation.

The A/E shall include in the Schematic Phase one visit to Sana'a by the design team to present the concept and to receive review comments.

D. *Design Development:* Based on the approved schematic design and including agreed-on revisions, the A/E shall develop the design by the preparation of sufficient drawings, calculations, specifications, and cost estimates to evaluate the design and its adherence to systems selection criteria and the project scope.

The content of the design development submission shall include but not be limited to the following:

— Drawings including site plan, floor plans, elevations, sections, and details to establish further the design, and at scales suitable for use in contract documentation.

— Schedule of materials and finishes.

— List of equipment and furnishings.

— Requirements for typical and individual spaces.

— Site utility diagrams.

— Diagrams of the structural, mechanical, and electrical systems.

— Complete supportive calculations.

— Listing of special requirements.

— Detailed estimate of costs.

— Schedule of specifications for each section of work.

— A professionally prepared color perspective rendering, approximately 24 by 36 inches in size with matting and frame approximately 32 by 46 inches in size.

— Analysis of floor area with specification of programmed, circulation, and support areas in relation to the gross area.

The Design Development documents shall be submitted for review by the Client and the University. The A/E shall plan for one visit to Sana'a by the design team to receive and respond to review comments.

E. *Contract Documents:* The objective of this phase shall be to provide the Client with contract documents and supportive materials which are ready for international competitive bidding in accordance with international regulations. The A/E shall provide complete and fully coordinated drawings and specifications in accordance with the previously approved design. The drawings and specifications shall be in sufficient detail for construction of the project. The submission of the construction documents phase shall include:

— A project manual including instructions to bidders, conditions of the contract, technical specifications for the work, and a bill of quantities.

— Construction drawings, 100% complete.

— Cost estimate based on quantity take offs and unit material and labor prices.

— Calculations for final system components.

— List identifying any long lead time items; and any items which because of their uniqueness, criticality, or lack of tolerance in manufacture and installation require particular scrutiny during construction.

— An analysis in report form to determine the feasibility of separate construction bid packages, equipment, and building material purchases. The analysis shall also recommend procedures for prequalification of bidders.

The A/E shall submit the contract documents for review and approval by the Client and the University. Upon incorporation of necessary revisions and their approval, the originals of the documents shall be delivered to the Client. Drawings shall be on plastic film sheets; and the project manual shall be on originally typed bond paper.

F. *Bid Analysis:* The A/E shall assist the client in obtaining international competitive bids. He shall attend a pre-bid conference in Sana'a to answer questions and clarify the intent of the documents. Additional drawings and specifications shall be prepared if necessary to explain potential areas of misunderstanding.

After receipt of bids, the A/E shall assist the client in analyzing and evaluating the bids submitted, and in preparing the contract between the parties involved.

G. *Construction Phase:* Upon the issuance of the Notice-to-Proceed, the A/E shall administer the project on behalf of the University. He shall hold a pre-construction conference with all parties concerned to establish procedures and standards for the proper administration and observation of the work.

The A/E shall provide services during the construction period to include full-time on-the-site observation by two project representatives, shop drawing and sample review, professional consulting, and preparation of record drawings. The on-site representatives shall be qualified and empowered to make necessary design modifications during construction.

The observation and management functions shall include:

— The A/E shall meet periodically with the Contractor and major subcontractors to review the network analysis progress diagrams, job schedules, and construction progress to assure adequate planning and execution of the work.

— The A/E shall be responsible for observation during construction of the project and will provide qualified surveillance and observation of the construction during the contracted construction period. The A/E shall designate and assign two full time on-site representatives whose primary duty and responsibility will be to perform on-site surveillance and observation of the construction work in progress. Fully qualified personnel will be used for observation of structural, electrical and mechanical systems.

— Upon notice by the Contractor that the project is ready for final review, the A/E, represented by appropriate staff members, shall, at a date and time mutually convenient, review the work for quality of construction and conformance with the drawings and specifications.

— Observation of the construction project will include, but not necessarily be limited to the following:

(1) The adherence to the standards of materials and craftsmanship approved in the final construction drawings and specifications.

(2) The checking of building progress and the evaluation of materials to assure conformity with the specifications.

(3) Site visits by design architects and engineers shall be made during the installation of all major items as required to observe and witness the major operational tests; and, review and analyze Contractor-submitted test reports for the major operational items.

(4) Establishing the standards of acceptability of workmanship.

(5) Developing and establishing a method of correspondence to record observations of the project, interpretations, decisions, meetings, and progress of the construction.

(6) Reviewing and monitoring the monthly progress schedules submitted by the Contractor and informing the Contractor when corrective action is necessary to maintain established schedules.

(7) Eliminating unacceptable substitutions.

(8) Attending frequent conferences with the Contractor to assist in the interpretation and clarification of the intent of the contract documents.

(9) Reviewing guaranteed materials or workmanship at the time of installation.

(10) Observing the performance of tests at the project site as required by the contract documents.

(11) Establishing and maintaining an accurate daily construction report reflecting the events on the job to include weather conditions, temperatures, activities, difficulties, controversial matters, instructions given or received, record of tests and progress information. The report will also include number, category and classification of each trade manning the job.

(12) Submitting of a monthly progress report to the Client and the University summarizing the job status, including requirements listed in paragraph (11) above.

(13) Preventing improper practices and procedures or attempts at avoidance of contractual obligations.

(14) Establishing and controlling a schedule of submissions required of the Contractor by the contract documents, such as shop drawings, mill reports, certificates, bills of materials, samples, tests, operation manuals, spare parts lists, and guarantees.

(15) Analyzing Contractor-submitted change order cost proposals and submitting evaluations and recommendations as to reasonableness of price.

(16) Obtaining necessary material approvals and assuring the performance of required tests.

(17) Recommending approval of progress payments.

(18) Prepairing punch lists and providing necessary follow-up to assure completion.

(19) Assuring the recording of changes on drawings by the Contractor.

(20) Liaison with the Client and the University as required.

— The A/E shall thoroughly review, coordinate as required, and approve all shop drawings, manufacturer's data, and samples submitted by the Contractor for correctness and conformity to the contract documents.

— The A/E shall establish a roster in his office indicating the date of receipt of each submittal, the date of reply, and the action taken.

— The A/E shall provide professional advice during the course of construction and, when so requested, shall assist in the settlement of claims or other problems that may arise. When so requested, the A/E shall investigate each situation and present all facts together with a recommendation to the University for the proper settlement of a claim or problem. General consultation shall also include on-site visits by the design architect, mechanical engineer, electrical engineer, structural engineer, and civil engineer, as appropriate, during the course of construction to consult with and to provide professional advice to the full time project representative and the Contractor.

— The A/E shall review copies of plans and specifications maintained by the Contractor on the work site, to insure that a careful record of all changes and corrections is maintained.

— When the construction project is completed, the A/E shall verify the as-built conditions, then correct original tracings to insure as-built conditions are properly recorded.

III. BUDGET COST

Following is a budget estimate of the cost of Architect/Engineer services per phase, based on the Scope of Work of Section II, and on a schedule as recommended in the Prefeasibility Report. These phases are further divided into three parts:

PART I:

Program of Requirements		
A/E fee	$ 35,000.	
2 man-round trips to Sana'a	6,000.	
16 days per diem	2,000.	
		$ 43,000
Site Inventory		
A/E fee	$ 17,000.	
2 man-round trips to Sana'a	6,000.	
16 days per diem	2,000.	
		$ 25,000
Schematic Design		
A/E fee	$ 180,000.	
5 man-round trips to Sana'a	15,000.	
25 days per diem	3,000.	
Reproduction, printing	1,000.	
Model	3,000.	
		$ 202,000.
TOTAL, PART I		$ 270,000.

PART II:

Design Development		
A/E fee	$ 240,000.	
5 man-round trips to Sana'a	15,000.	
25 days per diem	3,000.	
Reproduction, printing	2,000.	
Rendering	3,000.	
		$ 263,000.
Contract Documents		
A/E fee	$ 480,000.	
3 man-round trips to Sana'a	9,000.	
25 days per diem	3,000.	
Reproduction, printing	12,000.	
		$ 504,000.
TOTAL, PART II		$ 767,000.

PART III:

Bid Analysis		
A/E fee	$ 60,000.	
1 man-round trip to Sana'a	3,000.	
7 days per diem	1,000.	
		$ 64,000.
Construction Phase		
A/E fee	$ 450,000.	
4 man-years living expenses	100,000.	
6 man-round trips to Sana'a	20,000.	
48 days per diem	7,000.	
Telephone/Telex	25,000.	
		$ 602,000.
TOTAL, PART III		$ 666,000.
TOTAL, A/E COST		$1,703,000.

An allowance for inflation has been included in the Construction Phase as this work will take place between one and three years after a design contract is set. The unit travel and per diem costs are slightly higher for this phase.

The costs for the performance of a topographical survey; a geotechnical investigation; and, the selection and ordering of furnishings and equipment are not included in the above amount.

ANNEX M

DETAILED IMPLEMENTATION PLAN

ANNEX M

DETAILED IMPLEMENTATION PLAN

YEAR	PAGE
First Year	3
Second Year	4
Third Year	6
Fourth Year	6
Fifth Year	7
Sixth Year	8
Seventh Year	8
Eighth Year	8
Ninth Year	9
Tenth Year	9
Eleventh Year	10

7,04

ANNEX M

DETAILED IMPLEMENTATION PLAN

Agricultural Development Support Program
(Project 279-0052)
Faculty of Agriculture Subproject

Year and Program Month of Occurrence	Activity/Event	Responsibility
Before Implementation	FOA SPP Approved	USAID/W
Before Implementation	FOA Grant Agreement Signed	USAID/YARG
Before Implementation	FOA Conditions Precedent Met	YARG
Before Implementation	Farm site surveyed	CID
First Year		
1	Subproject Director in place	CID
1	Subproject Secretary in place	CID
1	Subproject Manager in place	CID
1	Farm Co-Manager in place	CID
1	Participants (13) recruited for graduate training slots	CID/USAID/UOS/MAF
1	Farm layout completed	CID
1	Advertise for A/E services for construction of FOA building	USAID/W
2	Short list of A/E firms developed for FOA building	USAID/W
3	Contractor selected for construction of temporary fencing of farm	CID
3	Temporary fence installed around instructional farm	CID
3	Well drilled for instructional farm	CID
3	A/E firms interviewed for construction of farm buildings	CID/USAID/YARG
5	A/E firm selected for FOA building	USAID/W

5	Contracts signed with selected A/E firm for FOA building	USAID/W
6	Dean of FOA selected	UOS
6	Farm Manager selected	UOS
6	Participants (13) selected and in Yemen American Language Institute	UOS/USAID/CID/MAF
8	Major professors and participants make possible trip to YAR and return to plan thesis	CID/UOS
7	Schematic design for FOA building developed	A/E
8	Schematic design for FOA building reviewed	CID/UOS/USAID
11	Design development for FOA building complete	A/E
12	Land leveled/graded on farm	CID
12	On-farm roads completed	CID
12	Permanent fence installed	CID
12	Farm building designs completed	CID/A/E
12	Design of FOA building completed	A/E

Second Year

1	FOA Dean and Farm Manager in Stateside internship program	CID/USAID/YARG
1	Participants (5) recruited for graduate training slots	CID/UOS/MAF/USAID
1	Participants (13) in Stateside graduate programs	CID/USAID/YARG
1	Farm construction bidding initiated	CID
1	Order U.S. and local expendable and nonexpendable equipment	CID
2	Farm building construction contract signed	CID/USAID/YARG

-3,000

3	Farm building construction initiated; Construction document for FOA building prepared.	A/E
5	Construction document for FOA building reviewed	CID/USAID/UOS/A&E
6	FOA Adviser in place	CID
6	FOA Dean and Farm Manager in place	UOS/CID
6	Participants (5) selected and in YALI	UOS/CID/USAID/MAF
6	U.S. equipment and commodities for farm ordered; utilities completed; construction completed	CID
6	Internal subproject assessment completed	CID
6	Final corrections in construction document for FOA building completed	A&E
6	Advertise for tenders for construction of FOA building	USAID/W
9	Award contract to tenders for construction of FOA building	USAID/W
11	Mobilize contractors for construction of FOA building	USAID
12	Farm access roads completed; farm staffing completed; local equipment and supplies ordered,	CID/UOS
12	Begin construction of FOA building	A&E

Third Year

1	Participants (3) recruited for graduate training slots	CID/UOS/MAF&USAID/Y
1	Participants (5) in Stateside graduate training program	CID/USAID
1	Order U.S. and local expendable and nonexpendable equipment and materials	CID

5	All farm equipment and supplies ordered, installed	CID
6	Subproject Manager term complete; replacement in place	CID
6	Farm Comanager term complete; replacement in place	CID
6	Expatriate faculty in agric. engr., livestock prod., food science, ESL specialist in place	CID
6	Participants (3) selected and in YALI	CID/UOS/MAF/USAID
6	Major professors and participants make possible trip to YARG and return to plan thesis	CID/UOS
6	Farm operations begin	CID/UOS/UOS
6	Conduct first external evaluation	CID
8	Complete construction of FOA building	YARG/A&E
9	Close out construction contracts of FOA bldg.	YARG/USAID/UOS

Fourth Year

1	Co-Librarian in place	CID
1	Participants (3) recruited for graduate training slots	CID/UOS/MAF/USAID
1	Participants (3) in Stateside graduate training program	CID/USAID
1	Participants (7) in place as members of FOA	CID/UOS
1	Order U.S. and local expendable and nonexpendable equipment and materials	CID
6	Participants (3) selected and in YALI	CID/USAID/UOS/MAF
6	Major professors and participants make possible trip to YAR and return to plan thesis	CID/UOS

9	FOA students begin to use FOA building and instructional farm	CID/UOS
12	FOA Adviser term complete; replacement in place	CID

Fifth Year

1	Participants (3) in Stateside graduate programs	CID/USAID
1	Order U.S. and local expendable and nonexpendable equipment and materials	CID
6	Project Manager term complete;	
6	Farm Comanager tear complete; replacement in place	
6	Expatriate faculty in agric. educ./ext. in place	CID
6	ESL specialist assignment complete	CID
6	Major professors and participants make possible trip to YAR and return to plan thesis	CID
6	Major professors and participants make possible trip to YAR and return to defend thesis	CID
6	Conduct internal assessment	CID
12	Co-Librarian assignment complete	CID

Sixth Year

1	Participants (11) in place as members of FOA	CID/UOS
1	Order U.S. and local expendable and nonexpendable equipment and materials	CID
6	Expatriate faculty in agric. engr., livestock prod. assignment complete	CID

6	Major professors and participants make possible trip to YAR and return to plan thesis	CID
6	Conduct second external evaluation	CID

Seventh Year

1	Order U.S. and local expendable and nonexpendable equipment and materials	CID
6	Project Manager term complete; replacement in place	CID
6	FOA Adviser and Farm Comanager assignment complete	CID
6	Major professors and participants make possible trip to YAR and return to defend thesis	CID

Eighth Year

1	Participants (11) in place as members of FOA	CID/UOS
1	Order U.S. and local expendable and nonexpendable equipment and materials	CID
6	Expatriate faculty in food science assignment complete	CID
6	Major professors and participants make possible trip to YAR and return to defend thesis	CID
6	Conduct internal assessment	CID

Ninth Year

1	Participants (5) in place as members of FOA	CID/UOS
1	Order U.S. and local expendable and nonexpendable equipment and materials	CID
6	Project Manager term complete; replacement in place	CID

6	Expatriate faculty in agric. educ./ext. assignment complete	CID
6	Major professors and participants make possible trip to YAR and return to defend thesis	CID
6	Conduct third external evaluation	CID/USAID

Tenth Year

1	Participants in place as members of FOA	CID/UOS
1	Order U.S. and local expendable and nonexpendable equipment and supplies	CID
6	Major professors and participants make possibletrip to the YAR and return to defend thesis	CID

Eleventh Year

1	Participants (3) in place as members of the FOA	CID/UOS
1	Order final U.S. and local expendable and nonexpendable equipment and supplies	CID
12	Project completed; all project personnel assignments complete	CID/USAID

ANNEX N

Alternative Phasing of the FOA Subproject

ANNEX N

Alternative Phasing of the FOA Subproject

The proposal to establish a FOA as part of the UOS has been developed in some detail in this SPP. Throughout the paper the SPP team has made reference to and been involved in the preliminary specification of a building to house the FOA (see Annex K). The availability of a suitable structure to house this faculty is considered by the SPP team to be essential to the permanent establishment of the FOA to achieve the goals identified (see Purpose Assumption #1, Logical Framework, Annex B). Simultaneously, however, the SPP team is aware that at the time of this writing no donor commitments have been achieved which will assure the availability of a building at the time specified for classes in agriculture to be offered.

Extensive conversation with administrators from the UOS and the FOS have established that classroom, laboratory and faculty office space is an existing constraint to growth of the UOS. Hence, it is not reasonable to anticipate the successful development of the FOA in accordance with this SPP without the construction of an appropriate and specifically identified building to house the faculty. This physical constraint does not, however, preclude the phased construction of the building. In order for such an alternate construction schedule to be successful, however, the following provisions must be met:

1. By the approval date of the Subproject, a documented commitment and financial resources to proceed with construction of, or a minimum of one-third, of the office, laboratory, and classroom space. The provision of that commitment shall be that the space shall be available for use within 36 months.

2. Within 2 years (24 months) from the approval date of the Subproject, a documented commitment and financial resources to proceed with construction are sufficient to assure that within 3 years (36 months) of that date (5 years from subproject approval) a minimum of two-thirds of the proposed faculty office, classroom, and laboratory space shall be available for use.

3. Within 4 years (48 months) of the date of subproject approval, a documented commitment and financial resources to proceed with construction to assure that within 3 years (36 months) of that date (7 years from subproject approval) all of the proposed FOA building shall be available for use.

4. Should the YARG find it impossible to meet either Provision 1 or 2 above, it is advised that all USAID Subproject funding shall terminate except for those commitments to students already involved in graduate training in preparation for employment in the FOA.

5. Should the YARG find it impossible to meet Provision 3 above, USAID funding for the FOA shall be reduced to be appropriate for a faculty sufficient for graduating 75 students per year rather than the proposed 150.

ANNEX O

INITIAL WORK PLAN

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ANNEX O

INITIAL WORK PLAN
(March 1 to September 30, 1984)

Faculty of Agriculture Subproject

I. INTRODUCTION

This initial work plan describes the projected schedule and cost estimates for implementing the FOA Subproject for the period of March 1, 1984 (approximate) to September 30, 1984.

The purpose of the FOA Subproject is to support the establishment, within the UOS, of Yemen's first FOA which will be responsive to the YAR's agricultural development needs, is supportive of private and public sector development, and has appropriate linkages to the agricultural sector's production and institutional structure.

II. ACCOMPLISHMENTS

Since the subproject has not yet been formally approved, the accomplishments prior to the time of interval of this initial work plan have focused on subproject development and design. The following efforts summarize those development and design activities:

A. CID identified OSU in 1981 as the lead institution for the design and implementation of the FOA Subproject. OSU identified an acting subproject director who has been involved in each step of the development and design process.

B. During July and August 1981, CID planned and implemented a month-long fact-finding tour for selected YARG officials of Faculties of Agriculture in Jordan, the United Kingdom and the United States. The report of that team's findings was published in October 1981.

C. CID sent a three-man team to the YAR to examine the feasibility of developing an institutional farm adjacent to the proposed FOA site on the new UOS campus. The team's report and preliminary design specifications was published in January of 1982.

D. In January 1983, CID fielded a three-man team in the YAR to develop the SPID. The SPID was submitted through USAID/Y to USAID/W and approved in June 1983.

E. Also in January 1983, USAID/W contracted with Gauthier, Alvarado and Associates, a Virginia-based A/E firm, to complete a prefeasibility A/E report of the proposed FOA building. Their report was approved in August 1983.

F. In October 1983, CID sent a seven-person team to develop the SPP. The team completed their in-country work in November 1983, this document represents that effort and will be the basis for USAID/W approval in early 1984.

G. Also in October 1983, Gauthier, Alvarado and Associates sent a two-man A/E team to the YAR to complete a program of requirements and site

inventory of the proposed FOA building. This document will be submitted to USAID/W in early 1984.

III. MAJOR ACTIVITIES PROPOSED (March 1, 1984 through September 30, 1984)

Proposed activities include: recruiting and hiring on-campus and in-country personnel necessary for initial subproject implementation activities, recruiting and selecting Yemeni graduate training participants for targeted FOA positions; developing a master plan for the instructional farm; and providing advisory input to USAID in their selecton of one or two U.S. A/E firms who will design and supervise the construction of the FOA building and the buildings of the instructional farm.

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Table 0-1 Current Approved Activities, FOA Subproject

Functional Area	Activity	Approval Date	Approval Source	Planned Phase-Out Date	Purposed Statement	Status Statement
	None					

Table 0-2 Current Program/Subproject Staffing Status: FY 83-84 W.P. #Initial Subproject: Faculty of Agriculture

Functional Area	Position Title	Position Approval Date	Position Approval Source	Incumbent Name	CID	USAID	YARG	End of Tour	Position Phase-out Date	Status Report
	No Current Staff Assigned									

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Table 0-3 New Activities which May Be Proposed by FY 83-84.
Subproject: Core

Proposed Activity or Action	Function	Estimated Time for Planning to Begin
None at this time		

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Table 0-4 Implementation Schedule 3/1/84 to 9/30/84 Subproject Faculty of Agriculture

Functional Area	Activity	Responsibility CID	Responsibility USAID	Responsibility YARG	Approval Date	Approval Source	Completion Date Quarter	Measurement of Accomplishment or Output
On-campus sub-project Management	Recruit for and hire Subproject Director and Sec/Accountant.	X					3	Subproject Director and Secretary/Accountant hired by 4/1/84.
In-country Subproject Management	Recruit for and hire TL/Subproject Manager and Instructional Farm Co-Manager.	X					3	Team Leader/Subproject Manager and Instructional Farm Co-Manager hired by 6/1/84.
Participant Training	(13) Participants recruited for graduate training in specified areas.	X	X	X			3	(13) Participants recruited and in English language training by 6/1/84.
	Major professors and (7) participants make possible trip to YAR and return to plan thesis.	X	X				4	(7) Participants return from trip to YAR by 10/1/84.
UOS FOA Staffing	FOA Dean and Instructional Farm Manager selected.			X			3	FOA Dean and Instructional Farm Manager selected by 6/1/84.

Table 0-4 Implementation Schedule 3/1/84 to 9/30/84 Subproject Faculty of Agriculture

Functional Area	Activity	Responsibility CID	Responsibility USAID	Responsibility YARG	Approval Date	Approval Source	Completion Date Quarter	Measurement of Accomplishment or Output
FOA building Design	Advertise in Congress Business Daily (CBD) for A/E services for construction of FOA building.		X				3	Advertisement appears in CBD by 4/1/84.
	Short list of A/E firms developed for FOA building design.						3	Short list developed by 5/15/84.
	A/E firms submit bids for FOA building design.		X				3	Bids submitted by 6/15/84.
	A/E firm selected for FOA building design.		X				3	A/E firm selected by 7/1/84.
	Contract negotiated with selected A/E firm for FOA build-design.		X				3	Contract signed by 7/10/84.

Table 0-4 Implementation Schedule 3/1/84 to 9/30/84 Subproject Faculty of Agriculture

Functional Area	Activity	Responsibility CID	Responsibility USAID	Responsibility YARG	Approval Date	Approval Source	Completion Date Quarter	Measurement of Accomplishment or Output
Instructional Farm Design	Master Plan of Instructional Farm developed.	X					3	Master Plan of Instructional Farm completed by 4/1/84.
	A/E Firms invited to bid on farm buildings.		X				3	Advertisement appears in CBD 4/5/84 to 6/5/84.
	Well drilled for Instructional Farm.	X					3	Well drilled and pump installed by 5/1/84.
	Contractor selected for installation of perimeter fencing of Instructional Farm.	X					3	Temporary perimeter fencing installed by 6/1/84.
	Interest expressed by A/E firms on farm building design.	X	X				3	Interest expressed by 6/5/84.
	Short list developed of A/E firms for farm building design.		X				3	Short list developed by 6/20/84.
	A/E firm selected for farm building design.	X	X				4	A/E firm selected for farm building design by 8/15/84.

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Table O-4 Implementation Schedule 3/1/84 to 9/30/84 Subproject Faculty of Agriculture

Fu 'onal Ar	Activity	Responsibility CID	USAID	YARG	Approval Date	Source	Completion Date Quarter	Measurement of Accomplishment or Output
Instructional Farm Design (continued)	Contract negotiated with A/W firm for farm building design.	X	X				4	Contract negotiated by 8/20/84.
	Grading and leveling of farm for roads.	X					4	Contractor selected and grading, leveling initiated by 8/1/84.

IV. PROPOSED BUDGET FOR INITIAL WORK PLAN (MARCH 1, 1984 TO SEPTEMBER 30, 1984)

USAID DOLLAR BUDGET

A. Salaries and Wages			
1. On-campus			
a. Home Office			
(1) Project Director	$29,167		
(2) Secretary/Accountant	8,750		
b. TDY			
(1) Project Consultants	26,400		
(2) Graduate Student Superv.	32,340		
Total On-Campus Salaries and Wages		96,657	
2. Off-Campus			
a. Project Manager/TL	20,417		
b. Co-Manager, Farm	19,250		
Total Off-Campus Salaries and Wages		39,667	
3. Fringe Benefits			
a. On-Campus (Acad., 28.2%)	24,790		
b. On-Campus (Class., 31.5%)	2,756		
c. Off-Campus (Acad., 28.2%)	11,186		
Total Fringe Benefits		38,732	
Total Salaries and Wages			175,056
B. Indirect Costs			
1. On-Campus, 30%	59,974		
2. Off-Campus, 19.5%	13,050		
3. CID G&A, 8%	5,842		
Total Indirect Costs			78,872
C. Allowances			
1. Post Differential, 25%	9,917		
2. Cost of Living Allowance, 6%	2,380		

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3. Sunday Pay, 5%	1,983		
4. Educational Allowance, (1,570/fm)	1,983		
5. Move In ($11,800/fm)	23,600		
6. Storage ($1,500/fm)	1,750		
Total Allowances			41,451
D. Travel and Transportation			
1. Per Diem			
a. Domestic			
(1) Project Director, 17 days @ $75	1,275		
b. International			
(1) Project Director, 30 days @ $105	3,150		
(2) Grad. Stud. Superv., 174 days @ $105	15,435		
Total Per Diem		19,860	
2. Travel			
a. Domestic			
(1) Project Director, 3 @ $500	1,500		
b. International			
(1) Project Director, 1 @ $2,500	2,500		
(2) Grad. Stud. Superv., 7 @ $2,500	17,500		
Total Travel		21,500	
3. Transportation			
Commodities, 55%	16,500		
Total Transportation		16,500	
Total Travel and Transportation			57,860
E. Expendable Equipment and Materials			
Total Expendable Equipment and Materials			-0-
F. Non-Expendable Equipment and Materials			
1. Vehicles, 2 @ $15,00	30,000		

Total Non-Expendable Equipment and Materials		30,000
G. Instructional Farm		
Total Instructional Farm		-0-
H. Other Direct Costs		
1. Arabic Language Training	9,000	
Total Other Direct Costs		9,000
SUBTOTAL		392,239
Contingency, 5%		19,612
I. Participant Training		
1. Graduate Scholarshops, 7 @ $13,571	95,000	
Total Participant Training		95,000
J. A/E Design & Supervision	705,000	
Total A/E Design & Supervision		705,000
K. Repayment to Core for Pre-Implementation Activities	100,000	
Total Repayment to Core		100,000
TOTAL USAID DOLLAR BUDGET		1,311,851

USAID LOCAL CURRENCY BUDGET

A. Salaries and Wages		
al Salaries and Wages		-0-
B. Operations		
1. Rent, 2 Fam. @ $13,050	26,100	
2. Utilities, 2 Fam. @ $1,450	2,900	
3. Maintenance, 2 Fam. @ $2,030	4,060	
4. Retro fitting, 2 Fam. @ $725	1,450	
Total Operations		34,510
C. Travel and Per Diem		
1. Medical Evacuations	3,000	
Total Travel and Per Diem		3,000
D. Training		
1. English Language	20,000	
Total Training		20,000
Expendable Equipment and Materials		-0-
Total Equipment and Materials		-0-
F. Other Direct Costs		-0-
Total Other Direct Costs		-0-
SUBTOTAL		57,510
Contingency, 5%	2,876	
G. Instructional Farm		
1. Establishment Costs	917,000	
2. Contingency, 10%	91,700	
Total Instructional Farm		1,008,700
TOTAL USAID LOCAL CURRENCY BUDGET		1,126,596

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YARG BUDGET

A. Salaries and Wages		
Total Salaries and Wages		-0-
B. Operations		
Total Operations		-0-
C. Travel and Per Diem		
Total Travel and Per Diem		-0-
D. Facilities Development		
1. Land	12,400,000	
Total Facilities Development		12,400,000
TOTAL YARG BUDGET		12,400,000

V. SCOPES OF WORK FOR FOA SUBPROJECT PERSONNEL OF INITIAL WORK PLAN PERIOD.

A. On-Campus Subproject Personnel:

1. FOA Subproject Director

a. TITLE: FOA Subproject Director (SPD/FOA), Yemen Title XII ADSP, College of Agricultural Sciences, OSU, Corvallis, Oregon.

b. MAJOR DUTIES AND RESPONSIBILITIES: The SPD/FOA reports to the CID DED/Y and the College of Agricultural Sciences administration and is generally responsible for overall subproject direction and coordination of the FOA Subproject. This includes all aspects of subproject development and evaluation. S/he will serve as a technical advisor to the UOS, MAF, CID subproject, and USAID Mission on matters relating to the FOA Subproject.

c. QUALIFICATIONS: A Ph.D. in some field of agriculture is essential. Preference will be given to individuals with training and experience in agricultural and vocational education, and/or general agriculture. A minimum of 5 years instructional and/or administration experience in agricultural education at the secondary and/or post-secondary level. Equivalent education and experience may be considered. This may include combinations of research, extension, consulting, advisory service and administration. International experience and foreign language capability is highly desireable; Arabic preferred, but not essential. A willingness to adapt to changing opportunities and position requirements.

SALARY AND RANK: Open, commensurate with background, qualifications, and experience. Rank shall be at the Associate Professor level or above. The appointment status will average 0.75 FTE through the 11-year subproject duration as follows: 0.75, 1.0, 1.0, 1.0, 1.0, 0.75, 0.75, 0.5, 0.5, 0.5, 0.5 for years 1 through 11 respectively.

2. Secretary/Accountant

a. TITLE: Secretary/Accountant, FOA Subproject, Yemen Title XII ADSP, College of Agricultural Sciences, OSU, Corvallis, Oregon.

b. MAJOR DUTIES AND RESPONSIBILITIES: Assist SPD/FOA in duties and responsibilities for smooth running of subproject. Assume responsibility for independently handling assigned duties. Type a variety of correspondence, reports, and other materials from machine or oral dication, draft, or general instructions, using knowledge of program requirements, proper formatting techniques/standards, to assure that finished copy is acceptable and meets required standards. Responsible for maintaining subproject accounts

and financial records. Prepare purchase orders, travel authorizations and reimbursements, invoices and journal vouchers as required. Develop and maintain subproject filing system for records, correspondence, and reports. Prepare telexes for transmission. Receive and direct callers and telephone calls; provide general information to callers.

c. QUALIFICATONS: Outstanding management and organizational skills; superior writing and all communications skills; ability to work under frequent pressure and deadlines; knowledge of how to maintain financial records and bookkeepping system and how to complete personnel documents. Knowledge and skill in the use of a telephone, typewriter, dictaphone, calculator, copy machine, and word processing/computer terminal. Willingness to adapt to changing opportunities and position requirements.

d. SALARY: Commensurate with experience and qualifications. The appointment status will be on a 12-month full-time annual basis.

B. In-Country Subproject Personnel

1. TL/Subproject Manager

a. TITLE: FOA TL/Subproject Manager, Yemen Title XII ADSP, College of Agricultural Sciences, OSU, Corvallis, Oregon.

b. REPORTS TO: S/he will be directly responsible to the on-campus SPD/FOA and maintain close communication with the in-country CID, USAID, UOS and MAF administrative and fiscal personnel.

c. MAJOR DUTIES AND RESPONSIBILITIES: S/he will be responsible for in-country leadership, management, and liaison to the UOS, MAF, CID and USAID Mission in all aspects of the FOA Subproject. S/he will maintain in-country subproject fiscal records, handle subproject commodity flow from stateside couriers, and other logistical and management support as deemed appropriate.

d. QUALIFICATIONS: An M.S., or M. Agr. degree with a strong emphasis in business and/or personnel management is required. A minimum of 3 years experience in business and/or personnel management is required. Equivalent education and experience may be considered. International experience and foreign language capability highly desireable; Arabic preferred, but not essential. Willingness to adapt to changing opportunities and position requirements.

e. SALARY: Open, commensurate with background, qualifications, and experience. The appointment status will be on a full-time 12-month basis for the duration of the subproject.

2. Farm Co-Manager

a. TITLE: Instructional Farm Co-Manager, FOA Subproject, Yemen Title XII ADSP, College of Agricultural Sciences, OSU, Corvallis, Oregon.

b. REPORTS TO: Reports to SPD/FOA through the in-country FOA Advisor and TL/Subproject Manager.

c. MAJOR DUTIES AND RESPONSIBILITIES: Works with A/E firm to develop design specifications for construction of instructional farm buildings. Develop master plan for instructional farm including design specifications for perimeter fencing, access roads, water delivery system, and field plot system for instructional and demonstration purposes. Work in a counterpart training mode with a UOS faculty counterpart.

d. QUALIFICATIONS: B.Sc. in Construction Engineering, Agricultural Engineering, or related field. Training in the design of agricultural buildings, i.e., livestock and poultry housing, product storage and/or processing facilities, water delivery systems, road and fence construction, etc. At least 3 years experience in construction supervision. Practical experience and skill in construction processes, i.e., carpentry, surveying, masonry, concrete work, electrical installation, operation of construction equipment. Willingness to adapt to changing opportunities and position requirements.

e. SALARY: Open, commensurate with background, qualificatons, and experience. The appointment status will be full-time through the first 6.5 years of the subproject.

ANNEX P

ESTABLISHING HIGHER AGRICULTURAL UNIVERSITIES IN DEVELOPING NATIONS: PREVIOUS EXPERIENCE AND LESSONS LEARNED

INDEX TO ANNEX P

ESTABLISHING HIGHER AGRICULTURAL UNIVERSITIES IN DEVELOPING NATIONS: PREVIOUS EXPERIENCE AND LESSONS LEARNED

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ANNEX P

ESTABLISHING HIGHER AGRICULTURAL UNIVERSITIES IN DEVELOPING NATIONS: PREVIOUS EXPERIENCE AND LESSONS LEARNED

I. INTRODUCTION

The involvement of Americans in helping to establish institutions of higher education in developing countries is long-standing. It has only been since World War II, that a formal large-scale assistance program was launched to (in the words of Harry Truman's "Point Four"):

> ...make available to peace-loving peoples the benefits of our store of technical knowledge in order to help them realize their aspirations for a better life...

The first involvement of U.S. universities proceeded beginning in the late 1940s through a number of different kinds of contractual modes and institutional arrangements. By the mid-1950s, many U.S. universities were involved. These involvements continued into the 1960s, but began to taper off by the early 1970s when the USAID/W de-emphasized institution-building and began to target assistance at specific populations within developing nations. Indications are that agricultural institution building (particulary in agricultural research) is again viewed favorably as the goal and purpose of potential projects. In any case there is a rich legacy of experience in institution-building know-how.

The purpose of this annex is to try to identify the key "lessons learned" from the higher agricultural education projects of the past. The immensity of this task is only partially apparent as one notes the existence of about 100 case studies which could be examined. More profound, as an obstacle, is the near uniqueness of each country situation. Hardly less troublesome is the nebulous definition of institution-building.

In spite of the difficulty in addressing the subject, it is possible to draw some implications for ensuring success in the FOA subproject (as well as for limiting some of the inevitable constraints).

To accomplish this, the annex has six sections. Following this introduction is a review of social and economic characteristics of higher education in LDCs. The major part of this annex is then devoted to a review of a major study of the establishment of higher agricultural institutions. The annex concludes with a survey of four host country examples: Hassan II Institute (Morocco), Kabul University (Afganistan), Agricultural University at Faisalabad (Pakistan), and the Indian Agricultural Universities (India). Conclusions and references are placed at the end of each section.

II. ECONOMIC AND SOCIAL ISSUES IN HIGHER AGRICULTURAL EDUCATION IN LESS DEVELOPED COUNTRIES

A. General

Higher education in less developed countries received a great deal of support from donor agencies in the period from 1950 to 1970. Since that time interest has shifted implementation of projects which have benefits to targeted populations -- often disadvantaged groups of small-holders. Sometimes included in these targeted projects are vocational and other nonformal education projects. Sometimes there are large voc-ag and nonformal education projects implemented along with general support to primary and secondary education. There are considerably fewer projects undertaken to support higher education, and in particular, higher agricultural education.

There is, however, sufficient data available to attempt analyses on the costs and returns of investments in higher agricultural education in developing countries. Although this kind of assessment has been done for several Western countries over the last 25 years, there have only recently been attempts to do it for LDCs. The findings of Psacharopoulos (1980) are summarized here.

B. Trends

Although budgets for higher eudcation in LDCs typically amount to less than 20 percent of the state budget for education, an increasing part of this expenditure is devoted to technical and vocational subjects. There is evidence (World Bank loan data) which indicates a rising relative share of higher education budgets devoted to programs in engineering, agriculture, and related fields. The main reason given to explain this trend is probably "related to the intuitive notion that it is technical education that contributes to economic development".

C. Prospects for Analysis

Testing the hypothesis is difficult because of lack of data and the costs of securing it. However, one can lay out an analytical plan. Returns to higher education are hypothesized to influence not only economic growth and income distribution (social efficiency), but also such things as the social demand for education, employability of graduates, graduates' potential for learning on the job, and adaptability of graduates to continuously changing economic and social conditions.

D. Cost Issues

As one would expect, there are considerable economies of scale in the costs of implementing higher education projects. This implies that once the base institution has been built, programs can be economically added. However, this must be qualified by the fact that university subjects such as

agriculture, sciences, and engineering are, on the average, more than twice as expensive as general subjects such as arts, humanities, and social sciences.

E. Approximations on Benefits

It is hypothesized that relative earnings advantages of graduates are a measure of the monetary return from higher education. On a relative scale (100 = average for all LDC university graduates), Psacharopoulos found this ranking of disciplines: engineering = 106, social sciences = 104, arts = 94, sciences = 88, agriculture = 87. In this analysis (where measurement problems were not insignificant), one has to address the question of whether earnings are an adequate measure of monetary return. One chief objection is that most professionals in LDCs are employed in the public sector where earnings are probably artificially set with respect to "actual productivity". On the other hand, salaries cannot be extremely out of line with what exists in the private sector (both within and outside of the country). On all fronts (theoretical, empirical, and political), the issue of properly assessing the returns to education remains problematical.

F. Social Demand for Higher Education

Attempts have been made to assess the demand for graduates of higher education institutions. It is generally observed that graduates in LDCs go through a transitory period of unemployment. This has sometimes been misinterpreted as an inefficiency of the school system in producing graduates "relevant" to the needs of the country. Although the data is very limited, it appears that science, humanities, and art graduates have a higher incidence of unemployment, whereas agriculture, engineering, social sciences, and law are doing better in terms of employment. On another front, it may be useful to consider the rates at which capacity in higher education is utilized. A World Bank review of 42 case studies revealed the fact that general university faculties are on the average 40 percent over utilized, whereas technical and agricultural faculties are severely underutilized.

G. Conclusions

The attempts to assess higher education from and economic perspective are hindered by a lack of good information. As a result of what has been examined, Psacharopoulos suggests that shifting attention to teaching more general curricula in universities and relying on on-the-job training may be more socially-efficient than implementing the specialized curricula in every LDC. The counterarguments to this hypothesis are that the level of training in on-the-job programs in public agencies is generally always suppressed and does not allow for incorporation of state-of-the-art technology. (This would probably not be true, however, if private firms were doing the training). Although it is claimed (from evidence) that graduates in technical disciplines can easily switch among different kinds of technical work, there is nothing to indicate that agricultural science or agricultural management are recipient industries in this kind of occupational mobility. More than likely, it is a net loser of talented workers. Hence, even if there

are some inefficiencies in conventional measurements of benefits and costs, the implementation and maintenance of these programs would continue to be justified on the bases of need.

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III. CIC STUDY ON INSTITUTION BUILDING

A. General

During the years 1967 to 1969, a group of international development specialists at a few mideastern universities (called the Committee on Institutional Cooperation or CIC) collaborated on a major study of institution building in less-developed countries. The investigators at these universities had gained considerable experience with the establishment of higher agricultural education institutions and host country agricultural research institutions. They were in a unique position to evaluate institution-building work that had been supported by the USAID as well as other donors.

The number of projects (on record as of 1968), location and duration is given in the following table:

Region	Duration of Project (years)			
	10+	5-10	1-5	Total
Africa				
Active	1	1	14	16
Expired	0	0	0	0
Far East				
Active	0	0	0	0
Expired	0	5	7	12
Latin America				
Active	2	0	14	16
Expired	0	4	4	8
Near East-S. Asia				
Active	11	0	0	11
Expired	2	1	2	5
TOTAL	16	11	41	58

Of the 68 institutions, 49 were designed as degree-g[illegible]ng institutions.

Since 1968, there have been several additional projects to establish institutions of higher agricultural education. No complete summary of these newer projects could be found.

B. Main Findings

Based on a survey of 67 instances of establishing all or parts of universities (the agricultural component), the CIC group reported that it was unlikely that success in attaining project goals (such as increasing incomes in the host country). The most important findings were:

1. Even though progress was observed to have been made in some aspects of institutional development, none of the institutions examined in the study had achieved "...the kind of overall maturity that was essential for them to sustain a dynamic, self-generative level of performance. It was questionable whether they would make meaningful contributions to the economic, social and political growth of the country in which they were located."

2. In coming to this conclusion, the evaluators admitted that the "...criteria used to determine institutional maturity were clearly inadequate...Decisions to terminate projects were made on the basis of achievement in physical characteristics such as numbers of buildings, faculty, and institutional role which had been established."

3. Each institution tended to suffer a traumatic period of time after the assistance contract was terminated. Retrogression and loss of competence was experienced rather than continued growth.

4. Unless additional inputs could be made in areas where little growth had occurred, it was likely that neither the U.S. nor the host country would realize the potentially significant dividends from the investments of money, manpower and professional skills which had been spent.

5. There were many valid reasons <u>not</u> to have terminated contracts at a time when many aspects of the institutions were still in the early stages of maturity leading to feelings of bitterness and disappointment.

C. Measures of Maturity and Progress

The CIC report paid considerable attention to evaluating the "Land-Grant" model of university in LDCs since this was invariably the model which was used by the contracting universities. Although the report(s) recognize the critical need to assess the progress of university development in the context of the host country, there is a decided tendency to fall back on U.S. measures of how a "Land-Grant" institution should be working. For instance, the following are suggested as measures of institutional maturity:

1. Mission - For the institution, it is serving the rural community. "Its faculty will feel a keen sense of purpose and dedication to resolving the problems of the rural area, and communicating the solutions back to the rural community. Thus, they will conceive their professional purpose in life, to be primarily that of serving the rural people." (R&R,41)

2. Service Orientation -- For the individual this is (in theory) the devotion to the solution of important agricultural problems and the keen desire to train students in that philosophy and capability.

3. Motivation -- The sense of satisfaction of having served the rural people well. Acclaim and recognition from farmers becomes an important feature in the set of values of the professional.

4. Support for Institution - Rural clientele more willing to provide monetary support in recognition of the value of the university services provided there is a viable means of public finance. Institutional support, because it is a mark of cultural distinction, is also important.

5. Administration - Internal administrative attitudes and relationships reflect faithful compliance with the mission of producing useful people and useful information.

C. Measurement Variables

It is, of course, easy to be cynical about these measures of maturity even in the U.S. Land-Grant Institutions. The important question here is whetner they should be held up as measures of maturity for institutions in LDCs. In the CIC study, they apparently were the basis for evaluation (of maturity). These five, issues were, in turn, basis of a list of criteria by which an institution's maturity could be gauged.

1. Teaching

   a) Teacher's attitude toward his major function
   b) Teacher's relationship with students
   c) Teacher's execution of function
   d) Teaching methods employed to achieve objectives
   e) Relationship of subject matter to country needs

2. Research

   a) Volume and Productivity of research
   b) Proportion of subjects directed to high priority problems
   c) capability of staff for documenting the relevance to country needs

3. Extension Education

   a) Definition of extension function by the university
   b) Identification of priority activities with country needs

c) Coordination with other agencies
d) Organizational self-improvement activities
e) Use of communication techniques: e.g., local leadership training, etc.
f) Focus on best technology

4. Administrative Incentives

a) Stimulation of professional improvement
b) Recognition and reward for excellence
c) Delegation of authority
d) Sharing in making of professional decisions
e) Effective use of controls
f) Development of public support

D. Application of Criteria

The criteria listed above were used in a detailed evaluation of higher agricultural education projects in the Near East-South Asia (NESA) region. Insights from that evaluation were that an indirect survey format had to be devised so that respondents would not presuppose "what the correct answers were." More important was the task of attempting to implement a teamwork concept in the evaluation phase. This was necessary in order to overcome hesitancy of officials to participate in an evaluation that might potentially expose inadequacies in their own performance. Since this evaluation was conducted by personnel outside the U.S. university contract team, there was also some resistance by the latter individuals to the evaluation.

The results of the evaluation of the NESA group of institutions are organized in a manner different from the objective nature of the criteria listed above. The authors attempted to deduce the best strategy for moving an institution into the "maturity phase". Most of the strategy recommendations concern what measures could be implemented after most of the contractor's obligations had been fulfilled.

E. Technical Personnel

What could the technical personnel have done early in the project to foster maturity? It was observed that the U.S. advisors had devoted exceptional effort toward the establishment of personnel rapport and technical acceptance of their advice. While this appears to have yielded some immediate gains, it appears to be somewhat counterproductive in the longer time frame: "these friendship qualities and relationships become 'old hat', and the once highly regarded advisors were in jeopardy of being regarded as second-rate and anachronistic". Rather than sympathetic, fatherly guidance in matters which require great tact and skill, the quality sought at this latter stage was technical virtuousity and stimulation. Rather than stifling this need, there was greater success in satisfying this need by say, providing short-term contacts with imaginative and energetic experts. In administration, for

example, this could have been provided for by short-term visits by department heads, other experienced adminstrators, or experts in adminstrative science. The results point strongly toward the long-term experienced generalists as the optimum input early in a project and short-term, highly articulate specialists as the most productive in the latter stages.

F. Participant Trainee Program

The study of NESA participant-trainee programs seemed to reveal that a large number of returnees soon found themselves in some administrative post. The difficulty is that they typically had little training in the administrative sciences and institution-building. It was observed that the ones who did well in this type of assignment had the opportunity to undertake short-term assignments in order to examine different adminstrative situations.

G. Commodity Purchase

In the initial phases of implementing a higher agricultural institution, there was more or less adherance to the common-sense rule of outfitting the labs and classrooms, etc. with basic and fundamental kinds of equipment. In nuturing institutions, equipment purchases tended to be oriented to more or less esoteric research objectives. It was believed that more could be done to research the relevancy of equipment needs to host-country agricultural develoment than was being accomplished.

H. Exchange of Personnel

It was observed that while there is general enthusiasm for exchange professorships as a means of helping an agricultural university achieve institutional maturity, there was in practice little activity in this area. The principle blame appeared to lie with the U.S. institutions who appear unwilling to budget "hard monies" for this kind of exchange. There appear to be ample teaching and research justifications of engaging in and initiating such exchanges.

I. Technical Interchange

One of the most often-mentioned objectives of the usual U.S. university mode of assistance to higher agricultural education in LDCs is the establishment and maintenance of interchanges of personnel and departments. In the NESA group of agricultural universities, however, this was the most underachieved objective. As much as these universities desired this interchange, it was a case of either the barriers being too significant or the administration not providing for the interchange. In the case of the U.S. universities, it was simply a matter of the objective not being recognized as having some importance in the functioning of the institution. If a large budget project (or follow-up project) was not secured explicitly for that purpose, the interchange generally failed to materialize.

J. Transition of Responsibility

Observations in the projects in the NESA region indicated that far too little attention had been given to the phasing over of responsibility for teaching, research and administration. It was "dumped on them" or withheld until the U.S. advisor was ready to return home. In one project, host nationals were extremely impatient because the U.S. advisor had held the responsibility of Department Head for seven years and even then was still not quite convinced that anyone else was ready to take it over. In other cases host nationals were fearful that U.S. advisors were read to return home with little or no overlap. Strategies aimed at overcoming this problem should at least include the following elements: (a) host country professionals must be given overt responsibility as soon as possible; (b) allow for mistakes, which are not very costly, to be made; (c) engage in real-time evaluation of the individual's performance; (d) transition should be smooth and gradual rather than abrupt.

K. Conclusions

The CIC results (books, articles, and proceedings) reveal a mammoth attempt to identify the main determinants of success or failure in building agricultural institutions in developing countries. It is clear that a universal mode of planning and implementing do not exist. The CIC did not comprehensively report on the experiences of all of the agricultural universities in their sample. A few indicators were summarized to give a brief cross-sectional view. Instead many pages were devoted to distilling out the essence of what works and what doesn't.

1. Some factors which contribute to success are:

a) A high regard for education must exist in the developing country. Moreover, there must be an appreciation for a proper balance among the various levels. A higher education system cannot exist in a vacuum.

b) U.S. universities collectively must have a large reservoir of professional agriculturalists to undertake institution-building projects. This would alleviate the most common problems of (1) undermining domestic programs, (2) offsetting the adverse effects of long-term assignment on professional developments.

(c) U.S. Universities and AID personnel must be personally dedicated to the desire to help the needy in less developed countries. This common allegiance has helped to hold these personnel groups (each with a different reward structure) together when there were strong forces pulling them apart.

(d) Land-Grant college philosophy must be transferred (in some recognizable form) to the host country. Although much has been

written about the nature of the Land-Grant college philosophy, the main feature is the strong desire to develop research on practical problems thereby producing findings which are of use to farmers. Other features of the Land-Grant model (e.g. integral extension service component) may have to be adopted in modified forms.

e) Attitudes within Land-Grant institutions toward technical assistance programs had to change significantly over existing attitudes toward state- and national-level responsibilities (and even beyond attitudes about international teaching and research programs). Technical assistance programs simply demand more time to administer if they are to be successful.

f) University field teams must be supported adequately. Although most of the cases examined in the CIC study showed adequate support, significant effort was devoted to the issue of achieving equity among the staffs of various institutions.

2. Factors serving as constraings on successful operations:

a) Inadequate knowledge of technical assistance and institution-building. This is a quite common complaint that defies concise elaboration. As a result much has been written but the problem may remain because of the inability of technically-minded individuals to appreciate the subjective nature of the problems.

b) Failure to use existing knowledge shows up in several places. One major finding was that the ceremonial nature of the visits of top administrators to field sights precluded them from providing substantial knowledge to team members.

c) Inadequate knowledge of host country agriculture and agricultural institutions. The CIC study found the most serious deficiencies in knowledge about the social and economic conditions in the host countries.

d) Time needed and difficulties are almost always underestimated.

e) Field staff and host country personnel lack confidence in the permanency of the program.

f) Technical assistance contracts, like all contract work, has a low ranking on home campuses.

g) The rapid turnover of personnel makes it difficult to attain continuity in programs.

h) The operations are made complex by the involvement of six or more entities: USAID/W, USAID/Mission, host country ministry, host university, U.S. university home campus, U.S. university field mission, to mention a few.

i) Few technical assistance personnel have appropriate (if any) foreign language capability.

j) Agriculture has little prestige in most developing countries which leads invariably to a relatively fewer number of competent foreign nationals working in this field or desiring to enter it. U.S. professionals can counteract this belief, but cannot entirely overcome it.

k) U.S. institutions lack experience in developing countries.

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IV. HASSAN II AGRONOMIC AND VETERINARY INSTITUTE (MOROCCO)

A. Background on Morocco

Morocco's population was 20 million in 1980. The population growth rate was about three percent per year. Morocco is currently heavily dependent on food imports, particularly on imports of breadwheat. It is projected that 75% of breadwheat consumption in the year 2000 will have to come from imports.

Morocco is a moderately poor country. Average per capita income in Morocco in 1978 was $550, but only $200 in rural reas. The agricultural sector, while not stagnant, is experiencing decline in per capita production.

The public sector is involved in increasing agricultural production. Sixty percent of public sector expenditures on agriculture were oriented to production of irrigated crops. Much of this was allocated to exportable crops. The Moroccan ministry for agriculture (MARA) has been unable to implement projects focusing on dryland agriculture. This is an area that exhibits processes that are less capital intensive and that require more intensive, special types of training. In addition, the irrigated agriculture sector needs to advance by lowering costs and enhancing product quality if it is going to remain competitive in the world market.

A principle way of accomplishing these objectives is to enhance the magnitude and quality of agricultural education in these areas. A prerequisite step in this regard is the training of professional agriculturalists.

B. Higher Agricultural Education in Morocco

At the time of Moroccan independence in 1956, the only agricultural school in Morocco was the French-administered school at Meknes. It was for the sons of French colonialists. Most Moroccan students went to France for higher education in agriculture (146 with bachelor-level degrees, 53 with masters level degrees, and 14 with doctoral level degrees in veterinary science).

C. Note on French System of Higher Agricultural Education

There are two mainstreams in the French higher educational system. One is the system of "Grand Ecoles". At the apex of this system are the Grand Ecoles themselves. They occupy the predominant position in the structure of education, offering the most prestigeous and usually the highest paying level of education. These institutions are very selective and are formally tied in with professional organizations whose members are placed in the highest positions in both private sector and public sector LDCs. There are 19 Grand Ecoles which offer specialized training in agriculture. Practical aspects of agriculture (e.g., farm management) are NOT the focus of Grand Ecoles. Graduates are given either a science or engineering or management orientation intended to serve in government agencies or large private firms. Five Grand Ecoles are intended to offer advanced level training and continuing education in these areas.

Applicants for the Grand Ecoles must have been awarded the Baccalaureat from a secondary school (usually at age 19). Applicants must study for regorous written and oral entrance examinations. The preparation for these exams is rather formal, taking usually two years at special schools. Of those entering Grand Ecoles, 65 percent choose this route. Another 25 percent attend a university for two years for this preparation and 10 attend universities for four years. There is most notably an excess demand of students who want to study agricultural sciences at a Grand Ecoles.

Students take a basic science, agriculture, and engineering curriculum over a three-year period leading to the Ingenieur Diplome. This

degree is thought to be superior to the B.S. degree because of the nigh admissions standards and the professional orientation.

Below the Grand Ecoles (but still within the professionally-oriented educational structure of France) are three other kinds of institutions: (a) Lycees Agricoles - for those not admitted to Grand Ecoles, most have a two-year long program, graduates enter agribusiness; (b) Colleges of Agriculture - still lower standards, two-year course for those aged 15 to 18. Most graduates are in Extension work or farming. (c) Centres de Formation Professionelle Agricole pour Jeunes. These involve lower level work than colleges; most graduates retrn home to farm.

There is some coordination among the four levels of professional training. Most likely it is in the way that instructors are provided to the lower lever schools.

It is also worth noting that the French educational system has developed another track of higher education - the university. These have had only a minor role in agricultural education. In the universities in france, years one and two are called the first cycle (diplome d'Etudes Universitaires Generales - DEUG). Years three and four are called the second cycle leading to the Maitrise. The third cycle can be anywhere from one to seven additional years of training leading to the doctorate.

D. Establishment of Hassan II Agronomic and Veterinary Institute (IAV)

Planning for a new system of higher agricultural education in Morocco was started in 1958. From 1956 (independence) to 1966, Moroccan students either studied in France or attended the National Agricultural School at Meknes. In 1966, the Institut Agronomique at Veterinarie Hassan II with 12 students enrolled using temporary facilities at the campus in Rabat. The system of higher agricultural education turned out to be somewhat of a hybrid of the French Grand Ecoles system and the French University system. IAV was from the beginning characterized by:

1. Highly professional orientation.

2. Financial stipends paid to all students.

3. Three cycles of two (2) years each:

   a) First cycle - basic science and mathematics curriculum;

   b) Second cycle - applied agricultural training leading to the degree of Diplome d'Agronomie Generale (and the title of Ingenieur d'Application);

   c) Third cycle - specialized studies leading to the degree of Diplome do Specialisation Agronomique (and the title of Ingenieur d'Etat).

In other words, IAV had an M.S. program incorporated into its initial design as a result of its initial sponsorship by French donor agencies. While agronomy was originally supposed to be the only area of specialization at the Rabat campus, veterinary science was added in 1971. The National Agricultural School at Meknes remained a two-cycle (four-year) program in general agriculture (technics and development). Later in 1978 another campus was added at Agadir. Its purpose would be to train horticulturalists through four-year and six-year programs.

E. The Agronomic Institute Project

1. Beginnings

The USAID-sponsored project which dates from 1969 was intended to provide assistance from the University of Minnesota in "planning its overall program and in developing its teaching and research work in two key fields of soils and plant sciences with particular emphasis on cereal crops" (Original Project Paper July, 1969). Under the project, Minnesota would provide a four-man team to carry out the program, development of an English language training program, and participant training of Moroccans. The principal aim was to strengthen the IAV faculty by getting the best students through a special third cycle program and having them join the staff to help teach the growing number of students expected to be enrolling in the early 1970s. The original project paper does not explicitly define the nature of the participant trainee program, but it is clear that the participant trainee system would have to conform to the objectives of IAV in establishing a Moroccan-style institute. In addition, it is clear that French institutions, a Belgian university, and the Canadian government were involved and would exert some influence.

2. First Evaluation

After the project had been implemented for five years, an external evaluation was conducted. This review found that significant adjustments had taken place in the actual conduct of the project as compared with that found in the original project paper. While the University of Minnesota (UM) staff were involved in the third cycle program on paper, the third cycle students were, in fact, going to France and Belgium for training abroad. In 1973 IAV began to limit students to one year abroad so as to be able to come back to Morocco to do their last year's research paper/thesis (the Memoire) in Morocco on a problem unique to Morocco. On one hand it appeared that the UM staff was thwarted from doing anything productive toward the accomplishment of the USAID project purposes. This is the opinion expressed in the 1975 evaluation. On the other hand it could be claimed that the UM staff was preparing itself for assisting in the supervision of the sixth year students' memoires. Indeed, the UM staff (1) produced research that was significant and useful, (2) strongly influenced students and administrators alike by demonstrating the practical approach to agricultural research, and (3) generated considerable interest in the U.S. approach to

agricultural training. One of the difficulties stemmed from the difference between the nature of the Ph.D. in U.S. higher agricultural education and the comparable French "doctorat". The latter is viewed as the accomplishment of theoretical maturity and fluency. Field research, and to a lesser degree laboratory research are viewed as technical pursuits inappropriate to intellectuals and scholars. The evaluators reported that it had taken some time for this initial view to be modified. In any event the original targeted outputs (10 Moroccans trained to the U.S. Ph.D. level and development of a full third Cycle program by 1975) was vastly over optimistic.

3. Redesign

In 1975, the project was redesigned to reflect the "Moroccanization" of the IAV program. In addition to the one-year abroad and completion of the memoire in Morocco, officials implemented a series of four summer sessions (stages) that all students had to complete prior to enrolling in the third cycle. This reflected a growing belief by the Moroccan adminstrators that "the best and most practicable way to reach the diffuse and largely uneducated target population is not through direct foreign activity, but rather through implementation of externally-assisted teaching and support programs looking toward improved Moroccan rural outreach services manned by Moroccan staff" (2nd Project Paper, September, 1975).

4. Events - 1975 to 1980

Since 1975, there has been an evaluation (1978), a third project paper (1980), and a recent evaluation (1983). The 1978 evaluation indicated that the UM program had adapted sufficiently well to the issues that confronted it in the early 1970s. From 1972 to 1978, 53 third cycle students had been sent to the U.S. for one-year special or two-year M.S. training (mostly the former). Of these, 24 had completed the memoire and third cycle degree and of the latter, 13 had been appointed to the staff of IAV. The difficulties that were emerging at this point mostly concerned communications and coordination, manageable issues that could be easily solved. A single year's work in the U.S. was observed to be a very short time. The evaluation also stressed the lack of attention given to agricultural management and marketing in the curriculum. This reflects (again) the influence of the French educational system in which modern neoclassical-based agricultural economics is subordinated relative to a more institutional eclectic social science perspective (taught as Human Sciences at IAV). The latter gets considerable emphasis in the second, third, and fourth "Stages". The 1978 evaluation indicated some impatience with IAV's research agenda even though it was only 10 years old at that point.

5. 1980 Design

The 1980 project plan indicated that there were 2,300 students enrolled (admitting 600 per year, graduating 300 per year at the end of the second cycle, and 150 per year at the end of the third cycle). The faculty was reported to the 250 strong, 100 of whom were Moroccans. Most were young

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assistants, only five had advanced degrees (beyond third cycle), and only one had a U.S. Ph.D. Although "Moroccanization" appeared to be proceding in absolute numbers, it appears that expatriate faculty were not being relieved on schedule, perhaps due to the inadequacy and/or stature of the Moroccan assistants. The basic thrust of the 1980 project paper was to conduct participant training of these "assistants" after they had been on the IAV staff for at least two years. The training (some in U.S. and some in Europe) still stipulated that any thesis-writing would be done in Morocco. It was proposed that 150 faculty (95 to Ph.D. in U.S.) be trained by this method in the period 1980 to 1990. This would leave IAV with 345 faculty of whom at least 90 percent would be Moroccan. This assumes that the normal third cycle training program would continue in a manner similar to the previous eight years.

6. Recent Evaluation

The 1983 evaluation indicates general satisfaction with the design of the third phase of implementation. The third cycle training program was proceeding very smoothly. There were 20 completing third cycle after the fifth year in U.S. and then a sixth year in Morocco. In total, there were 168 training (115 in U.S.) from 1972 to 1983. There was an increasing tendency, however, to allow some participants to receive a full M.S. degree (16 had done this from 1980 to 1983). Presumably, their thesis research was done in Morocco. Training to the doctorat (Doctor es Science) had been proceeding since 1978 with mosty all of the trainees enrolled in European institutions. From 1980 to 1983, however, 44 participant trainees (Ph.D.-level) were studying in the U.S. Since only coursework (and sometimes comprehensive examinations) are done in the U.S., it was expected that the project would be ahead of schedule by the end of FY 1984. As of mid-1983 no candidate had completed the doctorat, but 15 were due to finish by the end of FY 1985. This will be somewhat slower progress than expected due to difficulties in research accomplishment (weather, teaching responsibilities, facilities, etc. have impeded progress). Finally, it was noted that it was difficult for IAV to maintain its own research farms since they are required to "show a profit" which impedes their instructional use. Since this aspect of the IAV was not a part of the UM project, there seemed to be little that could be done about it even though it threatened progress.

The 1983 evaluation also devoted attention to the institution-building issues pertinent to the IAV. (1) Did the IAV show signs of establishing linkages to U.S. agricultural science? The evaluators expected more in the way of research linkages, but thought that as doctorat programs were completed this situation would begin to be remedied. (Budgetary considerations were a major concern affecting the initiation of any Moroccan research programs). (2) Was the IAV establishing linkages to the governmental research and extension programs? It was the opinion that a significant number of interchanges were going on and that specific formal delineation of linkages would be unlikely to be forthcoming and would not be of lasting relevance. Several of the linkages were with the National Institute for Agricultural Research (INRA), Ministry of Agriculture Livestock Directorate, and the

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Commercial Exports Office (OCE). There is less visible cooperation between IAV and the Ministry's Directorate of Extension, although some initiatives have been started with respect to veterinary medicine. (Note that there are about 10 schools in Morocco designed to train Extension agents). (3) Is IAV contributing to general institution-building in Morocco. The evaluators expressed the opinion that a "modern college of agriculture" was indeed being established. All of the manageable interests were being carried out in a way to establish a tradition of a modern institution: (a) the contractor UM had adapted several times to the changing conditions at IAV, (b) IAV adminstration has been orienting the project to create a genuinely Moroccan institution, (c) the various donors (and their points of view) have been artfully balanced by the IAV adminstration (Note that the French provided construction funds and provide the bulk of the expatriate faculty).

F. Lessons Learned

In sum, the IAV project is a complex undertaking which has required special treatment by USAID, IAV, and UM in implementation. Although it is difficult to state generalized "lessons learned" from this case study, some that are now apparent are:

1. The IAV project was implemented under a host country contract with reasonably long-term contracts to the contractor. With a reasonable level of interaction among the key actors, the 1983 evaluation concluded that this mode of contracting will provide good results.

2. The project deals with a non-standard type of participant training. With a few exceptions, this mode has generally worked well.

3. The 1983 evaluation was accomplished under a "collaborative" or teamwork mode which in itself is conducive to the promotion of institution-building.

4. Although none of the documents speak of the process of decision-making on implementation, it is apparent that there had to have been a lot of accomodation on the part of the contractor. The point is that the strict "Land-Grant model" was not offered as an all or nothing package.

5. The ultimate student/faculty ratio at IAV compares favorably with previous USAID-assisted projects in the area of higher agricultural education (a range of 8:1 - 6:1). Most of these cases stressed research output almost from the beginning of the project as does IAV.

6. Success at IAV in attracting students has to be due in part to the large number of scholarships and the attraction of government-provided jobs. Note that beginning in the academic year 1983-84, the government announced that it would no longer be able to employ all IAV graduates. Little is known about the private sector demand. With a graduation rate of 450 per year, will current and future IAV graduates find work in agriculture?

7. There is little doubt that the IAV has contributed to a more proficient Ministry of Agriculture.

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V. KABUL UNIVERSITY FACULTY OF AGRICULTURE

A. Background

In the early 1950s, when the first USAID (actually USAID's predecessor agency) mission became operational, agriculture was the occupation of 85 to 90 percent of the population. Cultural practices had been the same for centuries. After WW II, the country's leadership began to recognize the benefits that would come from a modernized agricultural sector.

The first step to spread modern agriculture and practices was the creation of the Kabul Vocational Agricultural School. The Royal Government of Afghanistan (RGA) and USAID undertook a joint project to develop this school by means of contracting with the University of Wyoming (UW) in September 1954. Not long after this effort had been commenced, it became apparent that a secondary school project was insufficient to provide the trained government officials, managers, agricultural teachers and research workers needed for genuine and lasting improvement.

In September 1956, the UW was contracted to establish a Faculty of Agriculture and Mechanical Arts at Kabul University (KU). The USAID-RGA agreement provided for American advisors, commodities, and U.S. training for selected Afghan trainees.

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The FOA had a humble beginning in April 1956 in three classrooms in the Faculty of Science building. The FOA was later moved to the surgery building of the Faculty of Medicine. In 1956 KU did not have a centralized campus. Laboratory instruction was barely sufficient at first and a planned five-acre instructional farm remained undeveloped. Yet a curriculum was established and with the UW contract team teaching (in English) 80 percent of the classroom hours, a class of nine General Agriculturalists was graduated in 1959.

B. Participant Trainees

In 1969, the participant trainee program was reported to be going along on schedule. Participants in U.S. institutions (nine different schools) were reported to be doing well. Ninety percent of the returned participants had remained in the program. As of September, 1972 (the year before the project termination) the UW team had sent 94 Afghan students to the U.S. for training in various aspects of Agriculture. Of the latter, 11 received Ph.D. degrees, 20 M.S. degrees, and 28 B.S. degrees.

C. Leadership

Leadership from the RGA/KU side was designated early in the program. The director of the Kabul Vocational Agriculture School was named the Dean of Agriculture. It did not appear that any special training was provided to this individual. Later on in progress reports and project reviews, it is noted that leadership at the university level was inadequate because of frequent personnel changes. It should be noted that, at about the same time, Indiana University was conducting a project aimed at enhancing the adminstrative performance of KU. There were other American teams at KU: Teachers College at Columbia University, for example. During the UW contract and beyond there were also many other foreign donors involved at KU, a situation which tended to confuse students and faculty about where the leadership of the FOA really was.

It was observed that the leadership of the UW team during the early years of the project was weak. While the situation solidified in the early 1960s, a rapid turnover of project directors from 1966 to 1969 jeopardized progress. From 1969 to 1973, however, the situation improved. Little mention is made of the backstopping effort at the UW. Nothing is said about communication, although this must have a serious constraint on effective functioning of this project.

D. Contribution of FOA to Agricultural Research

The UW team included personnel whose responsibilities were more focused on strengthening the research capability. It was difficult to sort out these responsibilities, but it seems that a part of the project design was to actively establish a research capability at the FOA.

How well they succeeded is in part indicated by documentation of USAID projects which followed the FOA project. Observations on the adequacy of the FOA to do research are insightful.

> ...Another issue is the existing relationship between the FOA and the MOA. There is little cooperation or coordination between the two agencies at this time. The FOA possesses considerable research expertise, but minimal activities are underway. A very clear definition of relationships, function and funding needs to be developed....
>
> ...In the initial design phase, the designers of the Wheat Research Project tried to involve the FOA. This initiative came to nought. Individual faculty members were keenly interested, but the bureaucratic procedures became an impossible barrier. Two problems emerged: (1) any substantial contribution by a particular staff or faculty member would have to be reimbursed, and this would be extremely complicated; (2) the Dean of Agriculture wanted a separate project for the FOA feeling that it was a legitimate academic function to engage directly in farm production problems. That was the kind of activity assigned to the MOA's research department....
>
> ...For these reasons, Phase I of the Wheat Research Project has not built into its implementation the services of the members of the FOA. As the project gains experience, however, it may be possible to utilize faculty members on some type of contractual arrangement for specific research problems and/or training programs.

E. Curriculum Development

In the early years, a general agricultural curriculum was developed and implemented. However, it is apparent that specializations (in plant science, animal science, agricultural machinery, agricultural economics) were being contemplated even at the onset. Five classes of general agriculturalists were graduated (1959 through 1963), then specialized degrees were offered. Through the first eight years of the project, about 60 to 80 perent of the teaching was done by the Americans. Over the last eight years, the Afghan members gradually assumed all of the teaching.

F. Intrastructure

In 1964 the FOA was occupying a modern building on the new KU central campus. The building was funded by USAID under the P.L. 480 program. No details on this building were available. At this time (1964), there was a 50 acre instructional farm, but there was considerable difficulty in getting it implemented due to having the RGA contract for the farm buildings.

There was a library element of the FOA that was transferred to the general university in 1960. The UW team contributed significantly to stocking this library with a large agricultural collection.

G. Issues Stemming from Cultural Setting

Modern scientific agriculture has been slow to be adopted even among educated and economically vell-off Afghans. Foreign engineers have been brought in for decades and the nature of their work has at least been observed if not fully understood. But there has not been a tradition of importing agriculturalists at a similar professional level. More, agriculture is the lowest paid occupation.

This contributed to the education level of first year students at the KU/FOA being lower than that of those students entering other faculties. As basic and secondary education programs in Afghanistan improved, this was thought to diminish as an issue affecting the FOA.

H. Program Development

1. First Phase (1956-1962)

This phase involved the secondary agricultural school and the upgrading of this program into a college level program in general agriculture.

2. Second Phase (1962-1967)

A decision was made to develop curricula in six (6) degree-granting departments: plant science, animal science, agricultural economics, agricultural education, horticulture, and mechanical arts. Other objectives included boosting enrollment to 400, enlarging the Afghan professional staff to 50, fully developing the experimental farm, and expanding the research program.

3. Third Phase (1967-1973)

In 1972, there were ten departments operating, enrollment was 750, Afghan staff numbered 60 and the experimental farm was operating. As for research,

> ...the Wyoming team's desire to expand the Faculty's research program has had only limited success, since the Afghan counterparts have not developed to the professional level necessary to implement research programs...

In a 1971 review, there were similar comments on the ability of the staff to teach:

> ...The Wyoming team's progress reports reveal some concern that the Faculty's capabilities are not adequate to sustain a self-generating level of performance in training. As a result, the team has consistently advised continuance of external assistance. The team expressed the view that animal science,

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agricultural education, and agricultural engineering are areas where the Afghans have shown the least interest...

There was, in addition, an apparent cultural aversion to animal science, both in vet medicine and in animal husbandry. The RGA places a low priority on agricultural education resulting in an inability to provide vocational agricultural teachers.

The Wyoming team seemed to stress the teaching of engineering principles rather than agricultural mechanics which would have probably been more applicable to Afghanistan's agriculture.

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VI. WEST PAKISTAN AGRICULTURAL UNIVERSITY (WPAU)

A. General

Now called the Agricultural University at Faisalabad, WPAU was assisted in its development by a long-term USAID program. The Inter-University Exchange Program was first implemented between Washington State University (USAID contractor) and the University of the Punjab in Lahore from 1954 to 1962. WPAU was established in 1961, inheriting 680 students, 118 staff (1 dean, 0 professors, 5 readers, 26 lecturers, 86 instructors), some buildings and equipment from the old Agricultural College, Lyallpur. The decision to implement a new institution was justified on the basis of the difficulty of basing an agricultural school in the urban setting of Lahore and the inadvisability of upgrading the British-oriented college at Lyallpur. The new university was located on 800 acres. WSU's field party initially consisted of 14 staff members. The goal of the WPAU was to "develop a higher education institution that comprises all disciplines and subjects related to agriculture, including basic sciences and arts, and that would be oriented toward agricultural development through teaching, research, and extension.

B. Performance

There is little documentation concerning the performance of WPAU during and after WSU participation. Five different faculties were developed during that time: general agriculture, animal husbandry, veterinary science, agricultural engineering and technology, and agricultural economics/rural sociology. Enrollment was 675 in 1961, 1,130 in 1963, and 1,800 in 1965. The participant training program was a key feature of the USAID-supported program. From 1954 through 1967, 167 participants were brought to the U.S. for training. Of these, 91 were to become staff members at WPAU, almost all for advanced degrees. From 1961 to 1967, 22 staff members have been stationed at WPAU. From the semi-annual reports submitted by WSU, it appears that long-term commitments by WSU staff members were commonplace. The termination report of the WSU agricultural engineering advisor provides some typical

insights as to the progress in developing WPAU. In 1962, an agricultural engineering department had not yet been established. Participant trainees (for the M.S. degree in agricultural engineering) were selected and sent to the U.S. In 1963 facilities and equipment were acquired. The department was formally established in 1963 with the advisor teaching all of the classes: "...not so great a disadvantage as was the lack of teaching facilities and the very poor preparation of the students on entry to WPAU". Later, returned participants began to take over the teaching, and this increased gradually until 1968 when all the classes were "nominally" taught by Pakistan staff members. The advisor at that time observed that "...graduates are as well-prepared, in spite of all the handicaps as are engineering students in civil and mechanical at other Pakistani institutions prepared professionally in their fields" when measured against the need of a developing agriculture for engineering capability, especially in machinery and irrigation, the accomplishments appeared to be incomplete. Students should have been given more thorough training in how to put machines into the fields and how to keep them operating. The agricultural engineering staff at WPAU was observed to be intellectually isolated, and therefore, they would have to have had continued external stimulation.

C. Research Performance

The research programs at WPAU got underway within a few years of the location of the facilities at Lyallpur. Graduate studies, first at the M.S. level and then at the Ph.D. level, were added at about the same time. Research thus became accomplished primarily through graduate student theses. A 1981 assessment of research capabilities in Pakistan indicated that "commonly the professor is not an active participant in research programs...even though world experience has established that the capability for doing excellent research is an art that is transferred from professor to student by a close master/apprentice relationship". Therefore, the quality of agricultural research and the capability of universities to assume a major provincial and national role is dependent on a more active involvement of faculty members with their students. Another obersevation was that university research at Lyallpur was too centered around laboratory experiments instead of tackling field problems with laboratory studies used in support of field work.

C. Linkage to Extension

In 1962 there were virtually no training programs in agricultural extension in Pakistan although a department with seven members existed. After five years of effort, the WSU advisor reported that the staff had been increased to 24, that they were teaching 19 undergraduates and 12 post grads, and that 16 extension courses were being taught (including three courses required by all undergraduate enrollees at WPAU). Although it appears that the teaching of Extension methods was well established at WPAU in 1968, the advisor indicated in his terminal report that much work needed to be done in determining the best ways of carrying out extension work in Pakistan. It was observed that the National Extension Service employed 4,900 including 900 college graduates, but that very few, if any, had any professional experience with extension methods.

D. Lessons Learned

It is difficult to extract lessons learned from the WPAU experience in light of the few documents in existence. There does seem to have emerged a tendency at WPAU to avoid making teaching and research relevant to the needs of all Pakistan. The author of this annex visited Pakistan in 1982 and observed that officials complaining of the "ivory towerism" at Faisalabad and the weak level of training for practical agriculture. It was remarked that inspite of its American-connection, it had become shaped along the lines of a British higher agricultural institution. WPAU's failure to meet these kinds of practical need was cited as reason to strengthen the capabilities at the Agricultural University at Peshawar in the Northwest Frontier Province.

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VII. AGRICULTURAL UNIVERSITIES IN INDIA

A. General

Soon after Indian independence in 1947, a request was made to the United States for assistance in establishing a network of agricultural institutions which perform the same role in India that the Land-Grant college system does in the United States. Beginning with an Indo-American agreement for providing aid, continuing with the contracting of six U.S. universities to assist in the establishment of the nine Indian agricultural universities during the period 1955 to 1972.

B. Higher Education in India

In colonial India, universities were seen primarily as means of training people for employment in the civil adminstration. There were 21 universities and numerous colleges in India by 1947. Higher education, based on the British model, exhibited some serious deficiencies: (1) standards of teaching and achievement did not allow for recognition of the degrees abroad; (2) curricula was not designed to meet India's social and economic needs; (3) linkages between universities and government were not established.

C. Goals for Higher Agricultural Education

A "high" commission on higher education in India, recommended in 1948, that among other things "special attention be paid to the development of higher education in rural areas...(which) would attract qualified students from rural areas, educate them in the professions related to agriculture and

all other aspects of village life, and inspire them to dedicate their lives to improving the quality of the rural life from which they came.

D. USAID Technical Assistance and U.S. Universities

USAID established its first agreement with India in 1952. In 1953, a major project involving U.S. universities assisting the Indian government to establish agricultural universities was laid out. In 1955, it was decided that five universities would be involved with each assigned a region of India where generally there existed agricultural (and other) colleges. Extensive planning and coordination tasks were undertaken by the principals at each university. In fact, all agreements were signed by top-level officials at USAID, the Government of India, and the relevant universities. The contracts called for (the now-usual combination of) participant training, commodities, and technical assistance. Although the Indian colleges were keenly interested in the first two, they were not as interested in having the services of American advisors and often they were uncertain as to how they would make use of such advisors when they arrived. The arriving advisors often found that the USAID/New Dehli staff did not understand this situation and other problems encountered in the field.

Communications were a problem. Home campus coordinators were charged with recruiting the best personnel, but this was often done in a vacuum without much consultation of relevant department heads, etc. In short, none of the universities acted from having a well-laid home campus plan. With many campus staff being "unreleasable", the India staff became recruited from other institutions or from "at large" status. This, in large measure, defeated the "institution-to-institution" idea of the original plan.

E. Initial Experience in India

At first the five U.S. universities worked with 81 different institutions. When that was pared down to 43, it was still too much ground for the 30 or so advisors/team leaders to manage. At this early stage, both American and Indian leaders generally followed tradition in identifying assistance tasks along narrow technical lines. In retrospect, India had a greater need for experienced generalists in agricultural research, teaching, and outreach, not to mention adminstration. The advisors who did serve found any number of difficulties: (a) no counterpart to work with, (b) nobody in a program to which they were assigned, (c) difficulties in working with counterparts, etc. Advisors experienced a significant degree of culture shock, but this was observed to be of secondary importance to "operating style shock". On their home campuses, advisors (as professors) generally enjoy a high degree of academic freedom and independence and a low degree of interference from rules, regulations, and red tape. Serving in India for two years usually brought out the urge to do as much as possible, as soon as possible. The Indian culture and bureaucratic environment seemed (to the advisors) to place emphasis on extraordinary compliance with rules and regulations to the complete disregard of timeliness of action. The Americans tended to view change as signifying progress. On the other hand, the Indian

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adminstrator or counterpart, in view of his fortunate lot in life, tended to view any changes as relating to danger of failure, i.e., as a threatening situation. As indicated above this initial phase of the universities' assistance program involved a significant amount of participant training in the U.S. There were many positive aspects of the American-style of higher education which the participant-trainee absorbed. Many also adopted the American tendency to be impatient to get things done. Coupled with the desire to apply knowledge so recently learned, this created a situation where there were bound to be many disappointments and frustrations when the participant trainees returned home. Colleagues at home were not ready to change, and occasionally there was resentment and blocking action of the returned participants by those who had not qualified for U.S. training. Returned participants were also disappointed that their special training did not immediately result in promotions and salary increases. In spite of these initial problems, it was observed that after a while the returned participants did begin to exert an influence in teaching, research, and outreach. Several were subsequently promoted to positions where they could contructively contribute to the work of the American advisors.

F. Agricultural University Program

The five U.S. universities carried out their regional programs from 1955 to 1963. Beginning in 1960, it was decided to focus attention on development of new agricultural universities, meaning that coordinated undergraduate and graduate programs would be established, regionally-dominant research programs would be initiated, and that a coordinated effort would be made to establish outreach programs based out of the university. These programs generally lasted until 1972 when India terminated USAID-university programs. Two of the Indian university experiences are described below.

1. G.B. Pant Agricultural University

This university was established on a state farm in Uttar Pradesh, a state in north central India. The site had to be literally carved out of the jungled land in this area. This was a physically hostile area for building a university, but eventually the facilities were implemented. The design of the project was written by H.W. Hannah (see "Blueprint for an Indian University", 1955). In general, progress at this institution proceeded satisfactorally. However, if there is one lesson learned from the G.B. Pant experience, it is that developing universities are susceptible to political influences from the government, in this case the government of the State of Uttar Pradesh. The staff members of the U.S. university (Illinois) had to persevere through changing leadership and zero-level budgets. Fortunately, these problems were resolved and G.B. Pant has gone on to be one of the outstanding Indian agricultural universities.

2. Maharashtra Agricultural University

Under the initial USAID program, Maharashtra Agricultural University had established a partnership with Kansas State University (KSU).

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Because KSU would have ended up supporting two programs, it was decided that Penn State University (PSU) would take up the U.S. university role at Maharashtra. Earlier USAID-university contracts emphasized the need for long-term advisors, preferably those who would serve initial two-year terms. Short-term consultants were recruited generally after programs were fairly well established and specific needs identified. PSU and USAID decided on an approach that used only two long-term personnel and a larger pool of short-term personnel. The task consisted in part of coordinating the efforts of seven already existing agricultural colleges in that state. Just as plans were being laid to develop the new university, the Indian state government decided that it wanted two agricultural universities instead of one. PSU declined to participate in both of these ventures and decided to advise the original one. The make-up of the staff facilitated the design of the new university, both the physical plant and the academic programs. But while the buildings went in fast, the academic programs plan lagged behind: vacancies went unfilled, research and extension programs had no follow-up. After four years, it appeared that the situation could have been rectified. But plans to do this occured right when India decided to terminate the USAID-university projects.

G. Summary and Lessons Learned

The Indian agricultural universities program involved the expenditure of $42 million over 20 years to help in the establishment of nine higher agricultural institutions in India. There were first of all three main components of assistance: advisors, participant training, and commodities. The lessons learned in these three areas correlates well with experiences elsewhere. Secondly, the assessment of the impacts of agricultural higher education in India is leading to another set of lessons learned. Although there are some initial indications of impacts, this kind of assessment is difficult to make so soon after implementation of the projects.

1. Advisors

The program involved the use of 339 advisors. While all were talented from a U.S. point of view, very few had the experience to function productively in the markedly different environmental and bureaucratic situations in India. Most suggested that much more preassignment orientation would have been valuable. How did the advisors define their role? Most responded that they helped their assigned universities improve their organizational and adminstrative structure and provided an interpretive liaison between the traditional Indian system of higher education and the American system. Land-grant university concepts had to be modified in such a way as to be acceptable to the Indian institutions but still able to carry the basic mission. Advisors indicated that they felt a valuable service was accomplished in selecting and providing orientation for participant trainees and in the purchasing of books, supplies, and equipment. Advisors felt less strongly about their contributions to teaching, research, and extension functions. In the initial, regional phase of the program (1955-1963) personnel were generally too diffused to have an effect. In the agricultural

university phase (1963 to 1971), there was less participation in teaching, research, extension than would have been desirable. What improvements would the advisors have made in the program? The predominant answer was that the Indian institutions should have done a better job of long-range planning to identify needs for university advisors and to provide for continuity of effort. Next was that home university departments should have been involved earlier and foreign and domestic programs should have been better coordinated at the department level. Also mentioned was that very few advisors knew much about institution-building in LDCs and the establishment of the Land-Grant system in the U.S. In short, they had incomplete knowledge about the system that they were trying to implement.

2. Participant Training

Between 1952 and 1973, there were 1,018 participant trainees at the six USAID designated universities. Of these, 448 returned with the M.S., and 324 with the Ph.D., while the remainder were involved in nondegree or short-term programs. 810 participants were directly affiliated with the nine Indian universities and 543 of them came back to hold positions at one of those universities. U.S. advisors listed comments about participant training that correspond well with the experience of others: political factors weighed too heavily on selection, masters and doctoral programs often deviated from the design program of study; participants returned to India with very highly perfected technical (sometimes overly-theoretical) skills but little knowledge of institutional development. Little training in administration, planning, communication was provided. As indicated previously, there was generally some letdown of expectations when participant trainees returned to India. Sometimes, salaries were the chief causeof the disappointment. More often, it resulted from the inability to introduce newly-learned ideas and concepts into the still often traditionally-oriented Indian university environment.

3. Commodities

When the Indian universities program began, all officials were in agreement that major improvements were needed in the facilities and equipment needed in teaching and research. In spite of the need (and the seemingly uncomplicated nature of the task), it "created more confusion and frustration, and resulted in more poorly spent funds than the other two dimensions of the projects combined". The major problem was that there was too much money to be spent too quickly. Purchase decisions created hurried decisions with little long-range planning. One positive aspect, however, was the upgrading of libraries.

4. Institutional Linkages

The Indian agricultural universities were generally not successful at establishing good linkages with existing ministries of agriculture. The latter often employed political tactics to ensure that the new universities did not secure a niche. In addition the new universities failed to secure the cooperation of the older, smaller colleges of agriculture

in operation. In some instances the new university was intended to consolidate these older units, in other cases, it was supposed to be merely the center for advanced studies and research. The attempts were generally thwarted by pettiness on the part of all officials.

5. Some Indicators of Impacts

Writing in 1974, Read observes that "in less than fifteen years, India seems to have achieved an almost revolutionary redirection of higher agricultural education...". But it also conceded that India would have established a new kind of agricultural university system without the assistance of the U.S. and the six Land-Grant universities. However, with the U.S. assistance came timeliness of implementation and the responsiveness of teaching, research, and outreach programs -- two features that generally did not occur at agricultural universities that India began to set up on her own. Did the Indian institutions appear to be genuinely interested in educating for social change? Some U.S. advisors noted that there was backslippage toward the British higher education model, but that some changes appeared to be permanent: closer relationships of faculty and students, faculty assistance in locating student jobs, closer ties between alumni and faculty. At the fifteen year mark, it was apparent that most students were being drawn from urban areas. Hence, until India improved the educational opportunities for rural young people, the impacts of the agricultural universities will be somewhat shunted away from one of the intended primary beneficiaries -- rural populations. Research in the new agricultural universities showed signs of becoming oriented to basic research rather than applied. Faculty still believed strongly that personal recognition and advancement would come from a focus on basic research. Even the spectacularly successful area of plant breeding to introduce high yield varieties had a basic research overtone which was in part responsible for the inability of the researchers to assess possible adverse impacts when the technology was applied. The observation that agricultural extension would perform better if it was in the Land-Grant university sphere of influence is a lament heard wherever agricultural development assistance is being applied. The fact is that there has not been a changeover nor will there ever likely be. The Indian universities have made attempts at establishing strong extension education programs which will cater to the needs of the existing extension service through such devices as continuing education courses, appointment of specialists who will act as liaison between the extension service and the university. This work will succeed only if the universities view extension work as a co-equal partner, if the committment to teach off-campus is made, and if universities teach the concept of service to people along with their academic subjects.

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A N N E X Q

JUSTIFICATION FOR WAIVERS

ANNEX Q

Subject: Request for Procurement Source/Origin Waiver from Geographic Code 000 (U.S. only) to Geographic Code 935 (Special Free World)

a)	Cooperating Country:	Yemen Arab Republic
b)	Authorizing Document:	Amendment 8 to Project 279-0052 authorization approving Faculty of Agriculture subproject
c)	Nature of Funding:	Grant Dollars and Yemeni Rials
d)	Description of Commodities and Approximate Values:	See Attachment
e)	Origin:	Italy, U.K., France, Japan
f)	Probable Source:	Yemen Arab Republic

Discussion: The Faculty of Agriculture subproject will institutionalize within the University of Sanaa the establishment of an agricultural faculty, and establish a research and demonstration farm. A portion of the equipment for the research farm will be purchased off-shelf in Yemen but will have originated in the U.K., Italy, Germany, France, or Japan. The need for non-U.S. equipment is based on the general availability of spare parts and service facilities in Yemen for certain kinds of equipment. Furthermore, all of the equipment proposed for off-shelf purchase will be used in agriculture research and demonstration at the Yemeni University. The purpose of the project will be facilitated economically by using equipment that is readily available in country and with which Yemenis are already familiar as to maintenance requirements. Some of the material to be purchased by a local construction contractor for facility erection will likewise be of European or Saudi origin. These items, such as steel reinforcement bars, are readily available in country.

Attachment

Procurement from Code 935 Origin

Item	Est. Cost (U.S. Dollars)
Office Supplies & Equipment	$ 81,000
Two turbine pumps	30,000
Laboratory equipment	50,000
Workshop equipment & tools	30,000
Spray equipment	8,000
Seven Km of low pressure plastic pipeline	30,000
Submains, 9,400m. of 15cm. low pressure pipeline	30,000
TOTAL	$259,000

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

Justification for source/origin, proprietary procurement and single-source waiver for three (3) vehicles

To: Administrator

a)	Cooperating Country:	Yemen Arab Republic
b)	Authorizing Document:	Amendment 8 to Project 279-0052 authorization approving Faculty of Agriculture subproject
c)	Nature of Funding;	Grant Dollars and Yemeni Rials
d)	Description of Commodities and Approximate Values:	Three (3) Japanese-manufactured vehicles valued at U.S. $40,000
e)	Origin:	Japan
f)	Probable Source:	Yemen Arab Republic

Problem: Your authorization is required for a procurement source and origin waiver from A.I.D. Geographic Code 000 (United States) to Geographic Code 935 (Free World), and proprietary procurement and non-competitive waivers to permit the Consortium for International Development (CID), the project's contractor, to purchase three Japanese-origin Toyotas, Daihatsus, or other vehicles of an approximate value of $40,000 from sources within the Yemen Arab Republic.

A study based on five years of cumulative experience, and an extensive survey of local market conditions, and examination of a number of manufacturers, resulted in Toyota and Diahatsus being selected as the manufacturers that best meet contractor requirements. The vehicles manufactured by Toyota have proved to be excellent multi-purpose vehicles for the narrow, rough, unpaved mountain roads. Similarly, the Daihatsus have proven especially suited for administrative and survey work with occasional periods of off-road use. The following points are pertinent:

1. Spare parts for U.S. manufactured vehicles are impossible to obtain locally and there are no reputable repair services available in Yemen.

2. Most travel is on narrow, poorly maintained, unsurfaced roads. Accordingly, vehicles receive hard use, necessitating frequent maintenance and repairs. The size of the U.S. vehicles makes them unsuitable for many of these narrow roads and their suspension systems are often inadequate.

3. Vehicles manufactured by Toyota and Daihatsu are prevalent in Yemen and well suited to local city and rural driving conditions. Local dealers for these vehicles not only carry spare parts but they also have good mechanics and repair facilities.

A proposed amendment to the CID contract permits the purchase of vehicles over the next ten years for project use. The Mission considers the procurement of three vehicles of Japanese origin necessary for the success of the project. There is only one legal supplier of Toyota vehicles in the Sanaa area of Yemen, and one supplier of Daihatsu vehicles.

Pursuant to A.I.D. Handbook 1, Supplement B, Chapter 4, Section 4.6.2.d, you have the authority to waive the requirement that motor vehicles be manufactured in the United States when necessary to carry out the purposes of the Foreign Assistance Act of 1961, as amended. Circumstances meriting such a waiver include the present or projectd lack of adequate service facilities and supply of spare parts for U.S. manufactured vehciles. In general, source/origin waivers, under A.I.D. Handbook 1, Supplement B, Chapter 5, Section 5.B.4a(7) are permitted under circumstances deemed critical to the success of the project objectives. By approving a waiver in this code from Code 000 to Code 935, you will be certifying 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 objctives of the foreign assistance program.

Additionally, pursuant to A.I.D. Handbook 11, Chapter 3, Section 2.2.5.b(1) you are authorized to waive the rule regarding nonrestrictive specifications and approve proprietary procurement when substantial benefits, such as economics in maintenance of spare parts inventories, stronger local dealer organization, better repair facilities, or greter technical familiarity by operating personnel, can be achieved through standardization on a particular brand.

A proprietary procurement waiver does not, however, include authority for negotiation with a single source unless a single source waiver is obtained separately or in conjunction with the proprietary waiver (Section 2.2.6.a(2)). You may approve a single source waiver as a result of special design or operational requirements, necessary equipment or materials which are available from only one source (Section 2.2.6.a(2).

Recommendations:

1. That you find 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 programs, that you waive existing source/origin requirements for this procurement, and that you authorize procurement from Code 935 source and origin.

Approve: _____

Disapprove: _____

Date: _____

2. That you approve a proprietary procurement waiver permitting the purchase by country contract of Toyota and Daihatsu vehicles for project activities within Yemen, pursuant to A.I.D. Handbook 11, Chapter 3, Section 2.2.5.b(1).

Approve: _____

Disapprove: _____

Date: _____

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3. That you approve a single-source waiver permitting the purchase of up to three Toyota, Daihatsu or other Code 935 origin vehicles from the local dealer/distributors in Sanaa, Yemen, pursuant to A.I.D. Handbook 11, Chapter 3, Section 2.2.6.a(2).

Approve: _____

Disapprove: _____

Date: _____

TRANSPORTATION SOURCE WAIVER

Draft Action Memorandum for the Director
Office of Commodity Management

Through: Ms. Antoinette Ford, AA/NE

From: Charles F. Weden, Jr., Mission Diretor, USAID/Yemen

Subject: Request for Transportation Source Waiver from Geographic Code 000 to Permit Financing Transportation Costs on Code 899 Flag Vessels.

A. Cooperating Country: Yemen Arab Republic.
B. Authorization: Project Approval Memo, Faculty of Agriculture Subproject (279-0052).
C. Cargo Description: Various subproject materials and equipment.
D. Cargo Weight/Cube: Not yet established.
E. Freigt Cost: $500,000 (est).
F. Carrier/Flag: United Arab Shipping Co. Code 899.
G. Port: Houston, Texas.
H. Shipper: Oregon State University.
I. Port of Discharge: Hodeidah, Yemen Arab Republic.
J. Attachment: Shippers 7/26/83 telex to COM/TX re this problem.

Discussion: The shipper reports that the only U.S. flag operator on this route, Waterman Steamship Corp., only provides service on inducement, and that their sailings calling at Hodeidah are so infrequent that the supplier cannot support the field in an efficient manner with such service. The University, therefore, requests a waiver of the contract's requirement to use only U.S. flag vessel service to authorize their use of regular monthly service available from the United Arab Shipping Co.

COM/TS confirms that Waterman is the only U.S. flag liner operator to Hodeidah. Its service to this port is provided only on inducement by their LASH vessels, and Waterman advises COM/TS that they must be offered a total of two or more barge loads to be induced to call at Hodeidah. This occurs infrequently and consequently Waterman's service cannot be depended upon for the timely delivery of project materials or household goods.

Section 7B of Supplement B. Handbook 1 provides that under these circumstances, SER/COM may waive the limitations as to eligible transportation costs contained in the authorization and approve financing the costs of transportation on Code 899 flag vessels. The interests of the U.S. are best served by permitting financing of transportation service on an ocean vessel under flag registry of a free work country other than the cooperating country and countries included in Code 941.

Recommendation: That you approve the requested waiver under Redelegation of Authority No. 40.4.

Approved: _____

Disapproved: _____

Date: _____

Attachment: Shippers telex 7/26/83 to COM/TS

A N N E X - R

EIGHTH AMENDMENT TO PROJECT AUTHORIZATION

EIGHTH AMENDMENT

TO

PROJECT AUTHORIZATION

NAME OF COUNTRY: Yemen Arab Republic

NAME OF PROJECT: Agriculture Development Support

NUMBER OF PROJECT: 279-0052

1. Pursuant to Part I, Section 103 (Agriculture, Rural Development and Nutrition) of the Foreign Assistance Act of 1961, as amended, the Agriculture Development Support Project for the Yemen Arab Republic (Y.A.R.) was authorized on May 30, 1979, and amended on September 24, 1979; May 27, 1980; July 11, 1980; August 10, 1982; August 20, 1982; December 17, 1982; and June 1, 1983.

2. In addition to the amounts previously authorized, not to exceed Twenty Nine Million One Hundred Eighty-seven Thousand Three Hundred Eighty-one United States Dollars ($29,187,381) in grant funds---for a new total life-of-project authorized amount of Eighty Two Million Three Hundred Thirty Thousand Nine Hundred Eighteen United States Dollars ($82, 330,918) for the Project---shall be available for the Faculty of Agriculture Subproject authorized herein. These additional funds are to be made available over a ten-year period from the date hereof, subject to the availability of funds in accordance with A.I.D. OYB/allotment process, to finance the foreign exchange and local currency costs of goods and services for the Subproject. Notwithstanding the foregoing, the Project Assistance Completion Date shall be a date eleven years from the date hereof. The Project Definition is hereby further amewnded by adding the following definition of the new Subproject thereto:

The Faculty of Agriculture Subproject will support the establishment within the University of Sanaa of Yemen's first Faculty of Agriculture, which will be responsive to the YAR's agricultural development needs, will be supportive of private and public sector agricultural development, and will have appropriate linkages to the agricultural sector's production and institutional structure."

3. I hereby authorize the initiation of negotiation and execution of an amendment to the Project Agreement, as previously amended, by the officer or officers to whom such an authority has been delegated in accordance with A.I.D. regulations and delegations of authority. The amendment shall be subject tothe following essential convenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate:

A. Conditions Precedent to Disbursement for the Faculty of Agriculture Subproject:

(1) Prior to any disbursement of, or commitment to disburse, A.I.D. funds not specifically approved as a mobilization activity for the Faculty of Agriculture Subproject, the Y.A.R. shall, except as A.I.D. shall otherwise agree in writing, furnish in form and substance satisfactory to A.I.D. advice of appointment of the representative of the University of Sanaa who will serve as the counterpart for the Subproject contractor's demonstration farm manager/engineer.

(2) Prior to the disbursement of, or commitment to disburse, A.I.D. funds under an amendment to the C.I.D. contract providing technical support in furtherance of the Faculty of Agriculture Subproject, the Y.A.R. shall, except as A.I.D. shall otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(a) A schedule for the availiblity of funds necessary to commence and complete the construction of the office/classroom buildings, together with evidence that all such funds have either been firmly committed or will otherwise be available when needed.

(b) Evidence that the University of Sanaa has, or will have, on a timely basis, budgetary resources to support their personnel required for the first year and to cover laborers, operation and development costs connected with the instructional farm.

(c) Evidence that all necessary land and related facilities for the Subproject are available for the purposes for which they are procured.

(d) Evidence of appointment of a Dean of the Faculty of Agriculture, together with a staffing plan for the Faculty's first two years of operation.

B. Covenants

Under this covenant the Grantee shall, on a timely basis, establish a joint working committee composed of the YARG, USAID and any other external donor to meet at least quarterly to discuss implementation issues and coordinate the development of all aspects of the Faculty of Agriculture, including at a minimum, construction, personnel and administrative matters.

C. Sources, Origin and Nationality

Commodities financed by A.I.D. under the project shall have their source and origin in Yemen, the U.S., or countries included in A.I.D. Geographic Code 941 except as A.I.D. may otherwise agree in writing. Except for ocean shipping, the suppliers of commodities or services shall have Yemen, the U.S., or countries included in A.I.D. Geographic Code 941 as their place of nationality, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States or the Yemen Arab Republic.

D. Waivers

Based on the justification contained in Annex Q of the Project Paper, I hereby authorize the purchase of 3 vehicles (valued at $45,000) of code 935 origin through single source/proprietary procurement.

o - 4

Further based on the justification described in Annex Q of the Project Paper, I hereby authorize off-the-shelf procurement in Yemen of up to $259,000 of commodities of Code 935 origin, without regard to their per unit price.

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.

Further, based on the justification described in Annex Q of the Project Paper, I hereby authorize transportation on Code 899 flag vessels from the United States to Yemen Arab Republic of up to $500,000 in goods.

4. In all other respects, the subject Project Authorization, as previously amended, remains in full force and effect in accordance with its terms.

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EIGHTH AMENDMENT

TO

PROJECT AUTHORIZATION

NAME OF COUNTRY: Yemen Arab Republic

NAME OF PROJECT: Agriculture Development Support

NUMBER OF PROJECT: 279-0052

1. Pursuant to Part I, Section 103 (Agriculture, Rural Development and Nutrition) of the Foreign Assistance Act of 1961, as amended, the Agriculture Development Support Project for the Yemen Arab Republic (Y.A.R.) was authorized on May 30, 1979, and amended on September 24, 1979; May 27, 1980; July 11, 1980; August 10, 1982; August 20, 1982; December 17, 1982; and June 1, 1983.

2. In addition to the amounts previously authorized, not to exceed Twenty Nine Million One Hundred Eighty-seven Thousand Three Hundred Eighty-one United States Dollars ($29,187,381) in grant funds---for a new total life-of-project authorized amount of Eighty Two Million Three Hundred Thirty Thousand Nine Hundred Eighteen United States Dollars ($82,330,918) for the Project---shall be available for Phases I and II of the Faculty of Agriculture Subproject authorized herein. These additional funds are to be made available over a ten-year period from the date hereof, subject to the availability of funds in accordance with A.I.D. OYB/allotment process, to finance the foreign exchange and local currency costs of goods and services for the Subproject. Notwithstanding the foregoing, the Project Assistance Completion Date shall be a date eleven years from the date hereof.

   The Project Definition is hereby further amended by adding the following definition of the new Subproject, Phases I and II, thereto:

"The Faculty of Agriculture Subproject, Phases I and II, will support the establishment within the University of Sanaa of Yemen's first Faculty of Agriculture, which will be responsive to the YAR's agricultural development needs, will be supportive of private and public sector agricultural development, and will have appropriate linkages to the agricultural sector's production and institutional structure."

3. It is planned that under Phase I of the Faculty of Agriculute Subproject, A.I.D. will finance, in an amount not to exceed $15,708,942 design and development of a demonstration/teaching farm, training of Yemeni faculty, provision of expatriate faculty until the Yemeni faculty is in place, limited laboratory equipment for the temporary facilities in use as of autumn 1984 (such equipment to be transferred to new facilities in use under Phase II of the Subproject) and an advisor to assist in establishing the Faculty of Agriculture in its temporary facilities.

   It is planned that under Phase II of the Faculty of Agriculture Subproject, A.I.D. will finance, in an amount not to exceed $13,478,439, construction, equipping and staffing of the demonstration/teaching farm, design and supervision of construction of Faculty office/class room buildings, purchase of equipment of Faculty office/classroom buildings and additional technical assistance.

4. I hereby authorize the initiation of negotiation and execution of an amendment, covering Phases I and II, to the Project Agreement, as previously amended, by the officer or officers to whom such an authority has been delegated in accordance with A.I.D. regulations and delegations of authority.

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A. The amendment, as it authorizes the implementation of Phase I of the Subproject, shall be subject to the following conditions precedent:

(1) Prior to the disbursement of, or commitment to disburse, A.I.D. funds under an amendment to the C.I.D. contract providing technical support in furtherance of the Faculty of Agriculture Subproject, Phase I, the Y.A.R. shall, except as A.I.D. shall otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(a) Evidence that adequate temporary facilities are available for housing the Faculty of Agriculture.

(b) Evidence that the University of Sana'a has, or will have on a timely basis, budgetary resources to support their personnel required for the first year and to cover development costs connected with the instructional farm.

(c) Evidence of appointment of a Dean of the Faculty of Agriculture, together with a staffing plan for the Faculty's first two years of operation.

B. The amendment, as it authorizes the implementation of Phase II of the Subproject, shall be subject to the following conditions precedent:

(1) Prior to the disbursement of, or commitment to disburse, A.I.D. funds under an amendment to the C.I.D. contract providing technical support in furtherance of the Faculty of Agriculture Subproject, Phase II, the Y.A.R. shall, except as A.I.D. shall otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(a) A schedule for the availability of funds necessary to commence and complete the construction of the office/classroom buildings, together with evidence that all such funds have been firmly committed.

(b) Evidence that the University of Sanaa has, or will have, on a timely basis, budgetary resources to support their personnel required for the first year of Phase II and to cover laborers, operation and development costs connected with the instructional farm.

(c) Evidence that all necessary land and related facilities for the Subproject are available for the purposes for which they are procured.

(d) An expanded staffing plan for the balance of the life-of-project.

C. Covenants

Under this covenant the Grantee shall, on a timely basis, establish a joint working committee composed of the YARG, USAID and any other external donor to meet at least quarterly to discuss implementation issues and coordinate the development of all aspects of the Faculty of Agriculture, Phases I and II, including at a minimum, construction, personnel and administrative matters.

D. Sources, Origin and Nationality

Commodities financed by A.I.D. under the project shall have their source and origin in Yemen, the U.S., or countries included in A.I.D. Geographic Code 941 except as A.I.D. may otherwise agree in writing. Except for ocean shipping, the suppliers of commodities or services shall have Yemen, the U.S., or countries included in A.I.D. Geographic Code 941 as their place of nationality, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States or the Yemen Arab Republic.

E. Waivers

Based on the justification contained in Annex Q of the Project Paper, I hereby authorize the purchase of 3 vehicles (valued at $45,000) of code 935 origin through single source/proprietary procurement.

Further based on the justification described in Annex Q of the Project Paper, I hereby authorize off-the-shelf procurement in Yemen of up to $259,000 of commodities of Code 935 origin, without regard to their per unit price.

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.

Further, based on the justification described in Annex Q of the Project Paper, I hereby authorize transportation on Code 899 flag vessels from the United States to Yemen Arab Republic of up to $500,000 in goods.

5. In all other respects, the subject Project Authorization, as previously amended, remains in full force and effect in accordance with its terms.

EIGHTH AMENDMENT

TO

PROJECT AUTHORIZATION

NAME OF COUNTRY: Yemen Arab Republic

NAME OF PROJECT: Agriculture Development Support

NUMBER OF PROJECT: 279-0052

1. Pursuant to Part I, Section 103 (Agriculture, Rural Development and Nutrition) of the Foreign Assistance Act of 1961, as amended, the Agriculture Development Support Project for the Yemen Arab Republic (Y.A.R.) was authorized on May 30, 1979, and amended on September 24, 1979; May 27, 1980; July 11, 1980; August 10, 1982; August 20, 1982; December 17, 1982; and June 1, 1983.

2. In addition to the amounts previously authorized, not to exceed Twenty Nine Million One Hundred Eighty-seven Thousand Three Hundred Eighty-one United States Dollars ($29,187,381) in grant funds---for a new total life-of-project authorized amount of Eighty Two Million Three Hundred Thirty Thousand Nine Hundred Eighteen United States Dollars ($82,330,918) for the Project---shall be available for Phases I and II of the Faculty of Agriculture Subproject authorized herein. These additional funds are to be made available over a ten-year period from the date hereof, subject to the availability of funds in accordance with A.I.D. OYB/allotment process, to finance the foreign exchange and local currency costs of goods and services for the Subproject. Notwithstanding the foregoing, the Project Assistance Completion Date shall be a date eleven years from the date hereof.

   The Project Definition is hereby further amended by adding the following definition of the new Subproject, Phases I and II, thereto:

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"The Faculty of Agriculture Subproject, Phases I and II, will support the establishment within the University of Sanaa of Yemen's first Faculty of Agriculture, which will be responsive to the YAR's agricultural development needs, will be supportive of private and public sector agricultural development, and will have appropriate linkages to the agricultural sector's production and institutional structure.

3. It is planned that under Phase I of the Faculty of Agriculture Subproject, A.I.D. will finance, in an amount not to exceed $19,289,376, design and development of a demonstration/teaching farm, training of Yemeni faculty, provision of expatriate faculty until the Yemeni faculty is in place, limited laboratory equipment for the temporary facilities in use as of autumn 1984 (such equipment to be transferred to new facilities in use under Phase II of the Subproject) , purchase and installation of an irrigation system, an advisor to assist in establishing the Faculty of Agriculture in its temporary facilities and a co-farm manager to operate the demonstrative teaching farm.

   It is planned that under Phase II of the Faculty of Agriculture Subproject, A.I.D. will finance, in an amount not to exceed $9,898,005, construction, equipping and staffing of the demonstration/teaching farm, design and supervision of construction of Faculty office/class room buildings, purchase of equipment of Faculty office/classroom buildings and additional technical assistance.

4. I hereby authorize the initiation of negotiation and execution of an amendment, covering Phases I and II, to the Project Agreement, as previously amended, by the officer or officers to whom such an authority has been delegated in accordance with A.I.D. regulations and delegations of authority.

A. <u>The amendment, as it authorizes the implementation of Phase I of the Subproject, shall be subject to the following conditions precedent</u>:

(1) Prior to the disbursement of, or commitment to disburse, A.I.D. funds under an amendment to the C.I.D. contract providing technical support in furtherance of the Faculty of Agriculture Subproject, Phase I, the Y.A.R. shall, except as A.I.D. shall otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(a) Evidence that adequate temporary facilities are available for housing the Faculty of Agriculture.

(b) Evidence that the University of Sana'a has, or will have on a timely basis, budgetary resources to support their personnel required for the first year and to cover development costs connected with the instructional farm.

(c) Evidence of appointment of a Dean of the Faculty of Agriculture, together with a staffing plan for the Faculty's first two years of operation.

The amendment, as it authorizes the implementation of Phase II of the Subproject, shall be subject to the following conditions precedent:

(1) Prior to the disbursement of, or commitment to disburse, A.I.D. funds under an amendment to the C.I.D. contract providing technical support in furtherance of the Faculty of Agriculture Subproject, Phase II, the Y.A.R. shall, except as A.I.D. shall otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(a) A schedule for the availability of funds necessary to commence and complete the construction of the office/classroom Buildings, together with evidence that all such funds have been firmly committed.

(b) Evidence that the University of Sanaa has, or will have, on a timely basis, budgetary resources to support their personnel required for the first year of Phase II and to cover laborers, operation and development costs connected with the instructional farm.

(c) Evidence that all necessary land and related facilities for the Subproject are available for the purposes for which they are procured.

(d) An expanded staffing plan for the balance of the life-of-project.

C. Covenants

Under this covenant the Grantee shall, on a timely basis, establish a joint working committee composed of the YARG, USAID and any other external donor to meet at least quarterly to discuss implementation issues and coordinate the development of all aspects of the Faculty of Agriculture, Phases I and II, including at a minimum, construction, personnel and administrative matters.

D. Sources, Origin and Nationality

Commodities financed by A.I.D. under the project shall have their source and origin in Yemen, the U.S., or countries included in A.I.D. Geographic Code 941 except as A.I.D. may otherwise agree in writing. Except for ocean shipping, the suppliers of commodities or services shall have Yemen, the U.S., or countries included in A.I.D. Geographic Code 941 as their place of nationality, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States or the Yemen Arab Republic.

E. Waivers

Based on the justification contained in Annex Q of the Project Paper, I hereby authorize the purchase of 3 vehicles (valued at $45,000) of code 935 origin through single source/proprietary procurement.

Further based on the justification described in Annex Q of the Project Paper, I hereby authorize off-the-shelf procurement in Yemen of up to $259,000 of commodities of Code 935 origin, without regard to their per unit price.

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.

Further, based on the justification described in Annex Q of the Project Paper, I hereby authorize transportation on Code 899 flag vessels from the United States to Yemen Arab Republic of up to $500,000 in goods.

5. In all other respects, the subject Project Authorization, as previously amended, remains in full force and effect in accordance with its terms.

EIGHTH AMENDMENT

TO

PROJECT AUTHORIZATION

NAME OF COUNTRY: Yemen Arab Republic

NAME OF PROJECT: Agriculture Development Support

NUMBER OF PROJECT: 279-0052

1. Pursuant to Part I, Section 103 (Agriculture, Rural Development and Nutrition) of the Foreign Assistance Act of 1961, as amended, the Agriculture Development Support Project for the Yemen Arab Republic (Y.A.R.) was authorized on May 30, 1979, and amended on September 24, 1979; May 27, 1980; July 11, 1980; August 10, 1982; August 20, 1982; December 17, 1982; and June 1, 1983.

2. In addition to the amounts previously authorized, not to exceed Twenty Nine Million One Hundred Eighty-seven Thousand Three Hundred Eighty-one United States Dollars ($29,187,381) in grant funds---for a new total life-of-project authorized amount of Eighty Two Million Three Hundred Thirty Thousand Nine Hundred Eighteen United States Dollars ($82,330,918) for the Project---shall be available for Phases I and II of the Faculty of Agriculture Subproject authorized herein. These additional funds are to be made available over a ten-year period from the date hereof, subject to the availability of funds in accordance with A.I.D. OYB/allotment process, to finance the foreign exchange and local currency costs of goods and services for the Subproject. Notwithstanding the foregoing, the Project Assistance Completion Date shall be a date eleven years from the date hereof.

   The Project Definition is hereby further amended by adding the following definition of the new Subproject, Phases I and II, thereto:

III-2

"The Faculty of Agriculture Subproject, Phases I and II, will support the establishment within the University of Sanaa of Yemen's first Faculty of Agriculture, which will be responsive to the YAR's agricultural development needs, will be supportive of private and public sector agricultural development, and will have appropriate linkages to the agricultural sector's production and institutional structure."

3. It is planned that under Phase I of the Faculty of Agriculture Subproject, A.I.D. will finance, in an amount not to exceed $21,298,082, design and development of a demonstration/teaching farm, training of Yemeni faculty, provision of expatriate faculty until the Yemeni faculty is in place, limited laboratory equipment for the temporary facilities in use as of autumn 1984 (such equipment to be transferred to new facilities in use under Phase II of the Subproject) purchase and installation of an irrigation system, purchase of farm equipment, an advisor to assist in establishing the Faculty of Agriculture in its temporary facilities, a co-farm manager to operate the demonstration farm and a team leader.

   It is planned that under Phase II of the Faculty of Agriculture Subproject, A.I.D. will finance, in an amount not to exceed $7,889,299, construction and staffing of the demonstration/teaching farm, design and supervision of construction of Faculty office/class room buildings, purchase of equipment of Faculty office/classroom buildings and additional technical assistance.

4. I hereby authorize the initiation of negotiation and execution of an amendment, covering Phases I and II, to the Project Agreement, as previously amended, by the officer or officers to whom such an authority has been delegated in accordance with A.I.D. regulations and delegations of authority.

A. <u>The amendment, as it authorizes the implementation of Phase I of the Subproject, shall be subject to the following conditions precedent</u>:

(1) Prior to the disbursement of, or commitment to disburse, A.I.D. funds under an amendment to the C.I.D. contract providing technical support in furtherance of the Faculty of Agriculture Subproject, Phase I, the Y.A.R. shall, except as A.I.D. shall otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(a) Evidence that adequate temporary facilities are available for housing the Faculty of Agriculture.

(b) Evidence that the University of Sana'a has, or will have on a timely basis, budgetary resources to support their personnel required for the first year and to cover development costs connected with the instructional farm.

(c) Evidence of appointment of a Dean of the Faculty of Agriculture, together with a staffing plan for the Faculty's first two years of operation.

B. <u>The amendment, as it authorizes the implementation of Phase II of the Subproject, shall be subject to the following conditions precedent</u>:

(1) Prior to the disbursement of, or commitment to disburse, A.I.D. funds under an amendment to the C.I.D. contract providing technical support in furtherance of the Faculty of Agriculture Subproject, Phase II, the Y.A.R. shall, except as A.I.D. shall otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(a) A schedule for the availability of funds necessary to commence and complete the construction of the office/classroom buildings, together with evidence that all such funds have been firmly committed.

(b) Evidence that the University of Sanaa has, or will have, on a timely basis, budgetary resources to support their personnel required for the first year of Phase II and to cover laborers, operation and development costs connected with the instructional farm.

(c) Evidence that all necessary land and related facilities for the Subproject are available for the purposes for which they are procured.

(d) An expanded staffing plan for the balance of the life-of-project.

C. Covenants

Under this covenant the Grantee shall, on a timely basis, establish a joint working committee composed of the YARG, USAID and any other external donor to meet at least quarterly to discuss implementation issues and coordinate the development of all aspects of the Faculty of Agriculture, Phases I and II, including at a minimum, construction, personnel and administrative matters.

D. Sources, Origin and Nationality

Commodities financed by A.I.D. under the project shall have their source and origin in Yemen, the U.S., or countries included in A.I.D. Geographic Code 941 except as A.I.D. may otherwise agree in writing. Except for ocean shipping, the suppliers of commodities or services shall have Yemen, the U.S., or countries included in A.I.D. Geographic Code 941 as their place of nationality, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States or the Yemen Arab Republic.

E. Waivers

Based on the justification contained in Annex Q of the Project Paper, I hereby authorize the purchase of 3 vehicles (valued at $45,000) of code 935 origin through single source/proprietary procurement.

Further based on the justification described in Annex Q of the Project Paper, I hereby authorize off-the-shelf procurement in Yemen of up to $259,000 of commodities of Code 935 origin, without regard to their per unit price.

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.

Further, based on the justification described in Annex Q of the Project Paper, I hereby authorize transportation on Code 899 flag vessels from the United States to Yemen Arab Republic of up to $500,000 in goods.

5. In all other respects, the subject Project Authorization, as previously amended, remains in full force and effect in accordance with its terms.