

PREPARATION OF AN
AGRICULTURAL SECTOR ASSESSMENT
FOR THE YEMEN ARAB REPUBLIC:
A RESEARCH DESIGN

by

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July 15, 1980

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USAID/Yemen is expected to complete an Agricultural Sector Assessment by September 1981. The purpose of this document is to provide the rationale for the USAID Program for Agricultural Development Support in the Yemen Arab Republic. This note identifies the inputs which will be required for that document.

The crucial input required for an Agricultural Sector Assessment for the Yemen Arab Republic is a policy decision on the principal thrust of the Agricultural Development Support Program. The major alternatives for the Program are well known. Strengths and weaknesses of the various alternatives have been elaborated in various Design Team documents, including the Baseline Study Field Report, the Core Subproject Paper, the draft Subsistence Farms Development and Management Subproject Paper, and Issues and Alternative Strategies for Project 0052. While additional research might make minor contributions to reducing existing uncertainties about project payoffs, the real need is for the will to make hard choices between possible activities whose major differences lie in the kinds of payoffs they offer. The record of the debate which precedes that choice together with existing Design Team documents will surely provide much of the rationale needed for the Agricultural Sector Assessment statement.

Preparation of an Agricultural Sector Assessment statement will also require the results from research proposals which have been described in various Project 0052 documents. Among those studies are:

- a. Task 6 of the Core Subproject Workplan. "Analyze the management structures, practices, and staffing patterns of MOA, MOE, TDA, and other YARG agencies with responsibilities for agricultural affairs." Analysis of the research and extension services will be an especially important input to the process of preparing of the Agricultural Sector Assessment document.

- b. Task 1 of the document Toward a Design for the Socio-Economic Research Component for Project 0052. "Monitor published economic data, collaborate with knowledgeable observers of Yemeni economic conditions, and observe carefully while in the field to identify changes in economic variables which alter existing planning assumptions." Particularly important are an updating of data and analyses of wages, investment, crop production, the government budget, and real GDP growth by sector, GDP data has not been revised since publication of the 1976/77 data although the CPO is expected to release in the near future GDP data for the years 77/78 and 78/79. It is also important to assess IBRD and UNDP intentions for future assistance efforts, particularly since there exists a possibility that those institutions will not maintain current support levels once existing agreements expire.
- c. Task 2 outlined in Toward a Design for the Socio-Economic Research Component for Project 0052. "Project for ten years into the future the supply and demand for trained personnel and identify gaps between supply and demand."
- d. An update of A Study of Yemen's Exports, Imports, and Balance of Trade, CID Report No. 1, Part VII, M, No. 3.
- e. An assessment of the likely direction to be taken in the YARG's Second Five Year Plan for the period 1982-1986. Preliminary discussions on that plan have begun, discussions which are unlikely to lead to a final report before the fall of 1981.

The additional information identified above, when combined with existing CID Design Team reports, will provide a sound basis for the Agricultural Sector Assessment due by September 1981. Among the early decisions to be made by

the Country Program Director is a time schedule for carrying out the research identified above which is compatible both with the need to complete the Agricultural Sector Assessment by September 1981 and other Project 0052 priorities. Suggested scopes of work and time schedules for most of the research proposals are contained in the Core Workplan and in the document, Toward a Design for the Socio-Economic Research Component for Project 0052. The Country Program Director will probably also want to make an early decision about whether responsibility for preparation of the Agricultural Sector Assessment should be assigned to a Core Team member or whether it would be more appropriate to identify a TDY specialist for the task. Preparation of the final document will require 2-3 person months of time in addition to the resources required for research tasks a-e.

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SUMMARY OF OUTPUTS

IN YEMEN

by

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For the Period

May 10 - July 17, 1980

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June 10, 1980

Tracy Atwood, AGR

Scope of Work for Donald Heckerman Summer 1980

Prepared for the USAID/Yemen Research Committee

1. Analyze the baseline study data to develop a strategy for U.S. agricultural technical assistance. Some factors to consider would be the priority and relationship between programs that address immediate vs. long term problems, manpower availability and the implications for USAID assistance to agricultural areas. The analysis should also identify possible projects which could be developed by USAID which would attract other donor funding.
2. Identify economic issues which may or may not be in the baseline study, but which will effect the agriculture sector over the next ten to twenty years. List the economic research which will be required to analyze these issues. Asses (sic) the capability of personnel in Yemen to do the economic research.
3. Prepare an overall macro economic analysis which will be appended to the baseline study or will become part of the first overall O52 workplan. This economic analysis should review the total investment plans vis a vis agriculture, waqf (sic) trends, labor availability, and rate of technological change. The analysis should review the trends for the next five years and suggest the capital, labor, and agricultural practices which may be expected to be used in agricultural production.
4. Suggest the steps necessary to obtain an agricultural sector assessment by October 1981.
5. Provide economic analysis and assistance to the AIYS research project as requested.
6. Develop a research design to determine if farmland is going out of cultivation and if there is a further deterioration of the terraces. If it is determined that this trend is serious then analyze the cost benefit ratio of various programs which might be used to reverse the trend.

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Written Reports

- A. Implications for Agricultural Assistance of Alternative Economic Development Prospects in the Yemen Arab Republic.
- B. Issues and Alternative Strategies for Project 0052.
- C. Toward a Design for the Socio-Economic Research Component for Project 0052.
- D. Preparation of an Agricultural Sector Assessment for the Yemen Arab Republic: A Research Design.
- E. Statistical Tables.

Correlation Between Scope of Work and Written Reports

SCOPE OF WORK	WRITTEN REPORT
<u>Item Number</u>	<u>Letter</u>
1	B
2	A,C
3	A
4	D
5	Oral Discussions
6	C

TOWARD A DESIGN FOR THE
SOCIO-ECONOMIC COMPONENT
FOR PROJECT 0052

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July 16, 1980

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Introduction

The Core Team and the On-Campus components will require considerable knowledge about the Yemen Arab Republic if Project 0052 is to be successful. The Design Team Baseline Field Study Report, the Social Soundness Analysis, and some of the Individual Team Member Reports reflected initial efforts to generate the socio-economic data and analyses required for Project 0052. This draft is part of a continuing effort to summarize the information which is available and to identify the socio-economic information systems and analyses which will be helpful in justifying, designing, operating, evaluating, and continuously redesigning an Agricultural Development Support Program for the Yemen Arab Republic. The primary objective was to identify a broad range of types of information and analyses. Hopefully, this draft will provoke those who follow to check the research design for completeness and to help identify any remaining gaps.

Additional data and analyses are valuable because they facilitate rational decisionmaking. If data and analysis were free, it would presumably be desirable to collect and analyze every conceivable bit of information which could be used. Information, however, is rarely free, and thus we are forced to consider whether any particular level of data collection is warranted as well as to identify least cost procedures for collecting any particular bit of information. While these statements may appear so obvious as to be platitudinous, they have clear implications for research decisions. Every suggestion for research is by necessity a budget matter and researchers' proposals should be evaluated by the same standards as are proposals for such action proposals as plant breeding experiments or direct extension assistance to farmers. It is not enough to say that a particular database is "needed" or that a special study would be "useful". If resources are to be allocated rationally, researchers must compete against

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all possible activities for their funds and must be held responsible for finding the least cost way of obtaining a particular data set.

Reasons for a Socio-Economic Program Component

Some possible reasons for engaging in socio-economic analysis for the Yemen Arab Republic are to:

1. Identify changes in economic, environmental, and social conditions which alter existing planning assumptions.
2. Carry out special studies to fill gaps in socio-economic information of critical importance to programming agricultural assistance.
3. Obtain the information and analyses required for the effective design of proposed subprojects and measure changes in socio-economic conditions as an input into the process of monitoring and evaluating program performance.
4. Prepare periodic agricultural sector assessments and other analyses which USAID/Yemen requires.

Some High Priority Research Tasks

Task 1:

Monitor published economic data, collaborate with knowledgeable observers of Yemeni economic conditions, and observe carefully while in the field to identify changes in economic variables which alter existing planning assumptions.

Problem:

The Baseline Field Study Report identified a set of constraints which restrict development of the Yemeni agricultural sector. After identifying the efforts of other donors and USAID priorities, the Baseline Report offered a strategy for relaxing certain key constraints. Underlying the

constraints and the strategy were a set of planning assumptions. If conditions should change so that the assumptions underlying the Program are not relevant, it would be necessary to redesign the Program.

Objective of Research Task:

Identify, on a timely basis, changes which could alter existing planning assumptions and initiate program reevaluation.

Scope of Work for the Researchers:

Regularly monitor:

- a. Labor migration and remittance patterns which may have implications for future wage rates and availability of investment funds.
- b. Wage rates and employment conditions which may have implications for agricultural production costs.
- c. Balance of payments and foreign exchange reserve changes which may have implications for availability of imported inputs and markets for agricultural products.
- d. Government revenue potential and expenditure plans which may have implications for the ability of the YARG to finance local cost components of the Program and eventually to assume responsibility for the entire Program.
- e. Changes in the structure of economic activity (such as discovery of oil) which may have implications for the planning assumption that agriculture will remain an important activity in rural Yemen.
- f. Changes in farm size, land ownership, farm mechanization, farming techniques and cropping and livestock production patterns, and other changes in agricultural technology which may have implications for the design of direct assistance to farmers.

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- g. Public and private expenditure patterns which indicate the extent to which increased income is being used for improvements in the quality of life.
- h. Planned levels and composition of assistance from other donors which have implications for USAID allocations.
- i. Changes in private and public investment patterns which affect the agricultural sector and changes in the capacity of the credit system to finance investment.
- j. Changes in domestic consumption patterns for foods and fibers which alter planning assumptions about markets for products of Yemeni farms.
- k. Distribution of population between rural and urban locations which may have implications for assistance to rural areas.
- l. Changes in the age, sex, and occupational composition of the rural population and changes in rural income distribution which may have implications for the design of agricultural assistance.
- m. Rates of population increase which may alter basic assumptions about future labor markets, per capita income, and national food and fiber consumption.

If substantial alterations in planning assumptions are detected, the researchers should initiate the process of redesigning Program activities.

Resources Required:

If an agricultural economist is assigned to the Core Team, this person could be given responsibility for these tasks. Because of many opportunities to combine these research activities with other assignments, the agricultural economist could accomplish these with two person weeks per year devoted to data collection and analyses with another person week required for report preparation. If no one on the Core Team is qualified

to carry out these tasks, it will be necessary to bring to Yemen a TDY specialist. In that case five person weeks of TDY time would be required for data collection, analysis, and report preparation.

Work Schedule:

Reports should be prepared in advance of the Annual Program Review. Depending on the data of the Annual Program Review, it may be necessary to update the reports in preparation for the agricultural sector assessment, which is to be completed by October 1981.

Task 2:

Project for ten years into the future the supply and demand for trained personnel and identify gaps between supply and demand.

Problem:

One of the major constraints to Yemeni development identified in the Baseline Field Study Report was the shortage of trained personnel at all levels. As a result, the Core Subproject contains substantial resources for U.S. and in-country training. The Ibb Agricultural Training Center Subproject and the projected Surdud, Sana'a Livestock and Faculty of Agriculture Subprojects are designed to provide substantial in-country training. Staffing requirements for Yemeni agricultural institutions are constantly changing. One problem is to determine whether projected training matches requirements for trained personnel. A second problem is to identify whether (or when) trained Yemeni personnel will be available to staff subprojects and end-of-subproject life.

Objective:

Quantify the gaps between the projected supply and demand for trained

personnel over the next ten years and apply the results to program training allocations and to subproject counterpart requirements.

Scope of Work for the Researchers:

- a. Identify the number of Yemeni students studying in educational institutions at all levels. Where possible, identify the names, specializations, and expected graduation dates for all Yemeni beyond the high school level and make this information available to all 0052 subprojects.
- b. Summarize current staffing patterns in Yemeni agricultural institutions together with training levels, years of experience of existing personnel, and incentives for attracting and retaining skilled personnel.
- c. Project personnel requirements for all Yemeni agricultural institutions, including MOA, extension services, agricultural credit institutions, research stations, special projects, and teaching staff at agricultural schools.
- d. Project the likely supply of students flowing into and out of educational institutions, taking into account the number able to meet admission requirements, the number of educational positions available in-country, and the plans of other donors to provide training opportunities outside Yemen.
- e. Identify the gaps between projected supply and demand, taking into account plausible attrition rates for trained personnel in Yemeni agricultural institutions.
- f. Identify the numbers of Yemeni personnel required to staff 0052 subprojects at end-of-subproject life and determine the likelihood that these personnel will be available.

- g. Track the post training careers of 0052 participant trainees and agricultural secondary school students to determine their contributions to agricultural development in Yemen.

Resources Required:

The Core Team agricultural education specialist is ideally placed to collect data on students in the education pipeline. Since this information is routinely compiled by the Ministry of Education, this effort would require no more than two person days per year. The specialist could also easily obtain projections of the supply of students flowing into and out of educational institutions. This activity might require three person days per year. Summarizing current staffing patterns and projecting the demand for trained personnel requires detailed knowledge of the personnel requirements of Yemeni agricultural institutions. This information could be obtained by synthesizing information obtained from the Baseline Field Study Report, from the UNDP Final Report on Project No. YEM/73/005, from Task 6 of the May 80-June 81 Core Subproject Workplan, from the CPO manpower unit, and by consulting with MOA and CPO Planning Officials as they prepare the Second Five-Year Plan for the period beginning January 1982. Efforts to summarize current staffing patterns and to project demand for trained personnel could consume up to five person weeks of time. Quantifying the gap, determining the availability of Yemeni personnel to staff subprojects, and report preparation would require another two person weeks of effort. These tasks could be done most efficiently by a member of the Core Team. Two days per year of Core Team time are needed to track the careers of 0052 participant trainees and agricultural secondary school students into the post training period.



Work Schedule:

Reports should be prepared in advance of the Annual Program Review and, if necessary, updated in preparation for the agricultural sector assessment due by October 1981.

Task 3:

Assess the condition of terrace maintenance and determine the feasibility of incentives for terrace repair and restoration.

Problem:

Casual observation in the Yemeni countryside reveals a large number of terraces which are apparently abandoned. Many of these abandoned terraces, as well as other terraces in current use, are being eroded due to a lack of maintenance. Rising wages may well have led to land abandonment, lack of maintenance, and the gradual destruction of a formerly valuable capital asset, terraced lands. There is fear that the breaching of high level terraces will lead to accelerating erosion which will eventually destroy productive terraces at the lower level, erode waterways, and perhaps even irreparably damage the system of spate irrigation in the lower wadi reaches. As a consequence, the potential benefits from a program of terrace repair and restoration are unusually large.

The costs of a program of terrace repair and restoration are also potentially large. Abandonment and lack of repair are prima facie evidence that private maintenance efforts are not profitable. While the public benefits which accrue to maintenance exceed the private benefits to the extent of potential downstream damage, the absence of private incentives for efficient decisionmaking makes public funding necessary. Because optimal allocation of funds for repair and restoration depends heavily

on the particular rainfall and runoff characteristics of individual mountain slopes, the administrative requirements of a repair and restoration program are likely to be large and to contain the potential for widespread corruption. In addition, public assistance for repair and restoration may reduce the level of private efforts. As a consequence, the subsidies required to stimulate appropriate levels of repair and restoration are potentially very large.

Objective in Phase One:

Determine for limited areas of Yemen whether destruction of valuable land resources is imminent.

Scope of Work for the Researchers in Phase One:

- a. From personal observation, assess the extent of terrace erosion.
- b. From personal observation and interviews, assess the rate at which damaged terraces are being repaired.
- c. Compile a photographic and written record of a sample of locations to be used as a baseline for future damage assessment.
- d. Submit a written report to the Country Program Director.

Resources Required for Phase One:

These tasks can be accomplished by the Design Team Watershed Management Specialist. By integrating these tasks with his other efforts, the specialist could accomplish the work with perhaps two additional days for report preparation.

Work Schedule:

Tasks a-d will be completed before the Design Team Watershed Management Specialist leaves Yemen, probably sometime in September or October 1980.

Disposition:

The Country Program Director will determine if and when to initiate Phase Two.

Objective in Phase Two:

Conduct a preliminary feasibility study on terrace repair, including developing estimates of costs and benefits.

Scope of Work for the Researchers:

- a. For representative target areas, estimate costs for restoration or repair of damaged terraces; also project costs of maintaining restored terraces for a ten year period.
- b. Use results from other Project 0052 (see Task 4) research efforts to estimate the direct economic benefits over at least a ten year period, from use of restored or repaired terraces for agricultural production.
- c. Estimate the economic benefits occurring downstream from restored or repaired terraces for at least a ten year period.
- d. Compare the economic costs and benefits of a program of terrace repair and restoration, and present the results in a written report to the Country Program Director.

Resources Required for Phase Two:

The services of an agricultural engineer or watershed management specialist will be required for two weeks to accomplish Task a. Tasks b, c, and d will require no more than one week of the time of an agricultural economist, provided that data described in Task 4 on the viability of small plot agriculture is available.

Work Schedule:

Task a can be completed anytime between November 1980 and November 1981. (The timing may well depend on when a specialist may be in Yemen to perform other tasks.) If Tasks b, c, and d are to utilize as inputs the results from Task 4, they cannot be initiated before November 1981 when the preliminary results of Task 4 are expected to be available. (Note that acceleration of this schedule will require that substantially larger amounts of resources be devoted to the data collection efforts described in Task 4.)

Disposition:

The Country Program Director will determine if and when to initiate Phase Three.

Objective in Phase Three:

Carry out a large scale survey of terrace damage, do a detailed feasibility study and design a subproject for terrace repair and restoration.

Task 4:

Collect and analyze data reflecting decisionmaking of individual farming units.

Problem 4a:

If subprojects offering direct assistance to Yemeni farmers are to fulfill the stated purposes at minimum cost, considerable effort needs to be devoted to designing the subprojects, to continual monitoring to ensure that underlying conditions have not changed and that inputs and outputs are on schedule, and to end-of-project evaluation. These efforts will require considerable data for individual farming units.

Problem 4b:

Over the last eight years Yemeni farmers have experienced radical changes in relative factor costs and in demand patterns due to the availability of foreign exchange to finance food imports and expanding markets for new crops. In addition, Yemeni farmers received their first introduction to modern agricultural techniques. In the face of such radical changes it is not clear where Yemeni comparative advantage in agricultural production lies. In particular, one cannot necessarily assume that the crops and animals now being produced reflect comparative advantage. One cannot even assume that some cultivated land, particularly the smaller and more remote terraces, are economically viable in the long run.

Problem 4c:

Countrywide figures on imports of tractors, other agricultural equipment and irrigation pumps, and other data on tubewells provide information about the rate at which Yemeni farmers are accumulating real capital. Aggregate data on fertilizer and pesticide imports provide some indication of working capital requirements. Records of the Agricultural Credit Fund and the Agricultural Credit Bank indicate the volume of investment financed by public credit institutions. Thus, data sources are available to provide information on how important components of agricultural credit and investment have changed in the recent past. Unfortunately, this is not very useful in allowing analysts to predict how agricultural investment will respond to greater credit availability or to reduced remittance flows.

Objective 4a:

Collect and analyze data which will permit efficient design, monitoring, and evaluation of all subprojects which provide direct assistance to farmers.

Objective 4b:

Obtain data on actual costs of production and net returns on different agricultural products and make projections based on labor costs, cropping and animal husbandry patterns, and technologies which will reasonably be available within five years. It is important to pay particularly close attention to the viability of small plot agriculture and to the special characteristics of the livestock-feedgrains-forage subsystem.

Objective 4c:

Collect farm level data which will allow analysts to make inferences about the effects of changes in credit availability and remittance flows on agricultural investments.

Alternative Strategies for Accomplishing the Research Objectives:

A rational data collection program must consist not just of objectives as set out above, but also consider costs of data collection, communalities between data collection efforts and other Project 0052 activities, financial constraints, and alternative qualities of data collected. Consider a series of issues relevant to research design.

Issue 4a: Timing of Research and Action Activities.

It is conventional to say that collection of baseline data ought to precede action programs. While the position is familiar, it is often difficult to determine whether this position is based on the assumption that there are no economies to be achieved from simultaneous data collection and action programs or whether this is an assertion that proper research design requires that baseline data not be contaminated by the effects of the programs to be evaluated and that this principle must be

maintained at any price. If for some reason data collected side by side with an action program is of higher quality and/or is less expensive, there exist clear tradeoffs between efficiency of data collection and good evaluation methodology.

Issue 4b: Must Data Collection and Action Activities be Carried Out by Different Persons?

Project proposals often specify that field research is to be carried out by social scientists and that direct assistance efforts are to be staffed by agronomists and extension and water management specialists. The dictum of Adam Smith that "specialization is limited by the extent of the market" seems to be relevant here. If the work load is sufficiently large that specialists are fully occupied with affairs of their own specialty, it may indeed be efficient to staff a project with specialists. If the task is of smaller size, it may be extremely expensive to employ specialists. An alternative is to hire generalists who are capable of performing in more than one capacity. Or, the nature of the tasks may dictate that a generalist can more efficiently carry out more than one function. For example, it may be possible to consult with farmers about their water management problems and simultaneously inquire about field size. (Indeed, the farmer might provide a more accurate measure of field size if he thought that the information was somehow associated with his water management problem.) Of course, it may turn out that the person selected is poorly suited for carrying out more than one task or perhaps more interested in one task than the other. These, however, are problems which perhaps can be resolved by appropriate personnel selection, training, and motivation. When substantial potential economies exist, it would seem

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wise to attempt first to select, train, and motivate personnel to be generalists rather than to conclude that rigid specialization of tasks is the route to be taken.

Issue 4c: Organization of Project 0052 Socio-Economic Research Efforts.

It is presumably noncontroversial to suggest that the Core Team should be responsible for the research efforts described above in Tasks 1, 2, and 3. More controversial is whether database development for the purpose of design, monitoring, and evaluation of subprojects should be specified by subproject designers, funded by subproject papers, and controlled by subproject leaders, or whether all these functions should be assigned to the Core Subproject and controlled by the Country Program Director. The principal argument for attaching these activities to individual subprojects is that AID/W insists that efforts to collect baseline data and data for project evaluation be included in and be funded by the relevant subproject documents. The principal argument for attaching these functions to the Core is one of efficiency. As the statement of Task 4 implies, one basic data set for individual farm units has many potential uses. It is likely to be applicable not just for monitoring and evaluating a particular subproject but also for designing and monitoring the entire agricultural sector program. Data from one subproject may, for example, be extremely useful to designers of other subprojects. Core Team personnel are more likely to be cognizant of these interdependencies and motivated to carry out data collection efforts which do not duplicate efforts or otherwise waste resources. As the number of subprojects expands, the potential economies from centralized data collection efforts grow. Centralization of efforts also holds the possibility of permitting

much larger and more sophisticated data collection efforts than could ever be justified for individual subprojects. While it is not impossible that coordination among semiautonomous subproject data collection efforts could result in similar economies, experience teaches that it is certainly less likely.

A Cost Effective Approach to Collection of Baseline Data for the Subsistence Farms Development and Management Subproject:

The most pressing data collection problems facing Project 0052 are the twin needs to generate the information required to select cooperator farmers and to establish a baseline for the Subsistence Farms Development and Management Subproject. The practical problems of generating data for this subproject, scheduled for activation in October 1980, must be solved as soon as possible. The goal of the research design proposed in this section is to offer a cost effective approach to data collection which simultaneously satisfies the subproject's data requirements, contributes substantially to the database required for overall 0052 design and monitoring, and establishes a precedent for subproject data collection which is appropriate for the larger 0052 program now beginning to emerge. This proposed research design is based on assumptions about the cost of data collection, the value of additional information, the practical problems of data collection in Yemen, tradeoffs between different objectives for data collection, and the advantages of a centralized socio-economic research function. Hopefully, the exact character of these assumptions will be transparent to the reader. It is understandable that others who make different assumptions will produce different research designs (which hopefully are cost effective, i.e., result in the lowest possible cost for a given level of data quality and timeliness).

There are three purposes for data collection for the Subsistence Farms Development and Management Subproject, selection of cooperator farmers for the subproject, collection of baseline data to be used in monitoring and evaluation of the subproject, and a contribution to Project 0052 database requirements. The timing of these payoffs differ sufficiently to create distinct tradeoffs between the objectives. Project managers require information on the identity of farmers willing to cooperate with team extension specialists and, if the number of these potential cooperators exceed the number which can be assisted, sufficient information on those farmers to allow a choice to be made among them. Principal criteria for choice include the farmer's ability and willingness to adopt improved agricultural practices, the likelihood that his participation will maximize "spread" effects, and whether he meets the target group description as a "subsistence farmer". During the initial stages of the subproject the priority problem will be to identify at least four farmers in each target area who are willing to cooperate. If more than four are available, the second priority is most likely to be identification of those who will maximize initial spread effects. As the activity becomes established (i.e., no longer threatened by the risk of total rejection by Yemeni farmers), first priority should shift to ensuring that cooperator farmers are indeed members of the target group. This top priority may well emerge in the second year of subproject life.

Data is also valuable as a baseline to be used in monitoring and evaluating the subproject. Ideally, baseline data should be collected early enough in the life of the activity that it is not "contaminated" by the effects of the activity. (Assuming that the effects of the activity are indeed beneficial, the difficulty with using contaminated data is that

the benefits of the activity are underestimated. Data collected at an earlier stage of the project would reveal a lower level of agricultural performance and hence attribute to the project larger benefits.) Conflicting with this reason for early data collection is the reluctance of the typical Yemeni farmer to reveal any information about farm size, profits, or assets. Researchers familiar with the problems of data collection from rural residents suggest that outsiders are likely to be refused such data, or, if offered, the data supplied is likely to be inaccurate. The most attractive technique for overcoming this understandable reluctance on the part of Yemeni farmers to provide information is to first gain the confidence of farmers in the ability of team members to assist them and then convince the farmers that the team's ability to help them solve water management problems, for instance, is contingent upon knowing such things as the size of the field to be irrigated and last year's yields. Such an approach necessarily takes time and risks the possibility that data on farm inputs and outputs will be contaminated by earlier contact with the team.

To satisfy, in a cost effective way, the data requirements and practical constraints set out above, the author proposes particular data collection procedures. The essence of the proposal is that during the first year of project life, data collection will be integrated with direct extension assistance to farmers and will be carried out by full-time team members with minimal TDY assistance. The key ingredients for success of this approach are that some team members be generalists, that team members fully understand and appreciate the importance of carefully collecting and recording the prescribed data, and that someone on the Core Team regularly monitor the data collection process and have available the resources to correct quickly any emerging problems..

The first task of the team should be to identify cooperator farmers. Team members should have available to them a preliminary profile of desirable cooperator farmer traits. This could be prepared in the United States by an experienced short-term consultant in one-half day, or, alternatively, it could be prepared by a team member, at least one of whom will surely be an experienced extension specialist already knowledgeable about the principles of identifying cooperator farmers. Conversations between team members and local Yemeni extension agents or other informants is the most likely way to obtain names of potential cooperators with an interest in using the assistance of the team and who are most likely to maximize spread effects within the community. Following initial direct contacts with potential cooperators, team members will use the predetermined profiles to select cooperators. It is possible that this process will be repeated and improved upon throughout the first year as team members adjust to the emerging relationship between the subproject and Yemeni farmers.

Once a preliminary set of cooperator farmers have been selected, the process of systematic data collection will begin. In preparation for this occasion a specialist in data collection and use will have spent perhaps one day refining, prioritizing, and establishing recording procedures for the data categories contained in Appendix D of the Subsistence Farms Subproject Paper. (These inputs need not necessarily be prepared in Yemen.) Armed with prepared forms and other written instructions prepared by the specialist and prepped by perhaps a half-day orientation session, these team members will begin a trial and error process of identifying the most effective technique for obtaining information from farmers.

It is essential that the team leader or another Core Team member regularly monitor the data collection process and be prepared to take

action to correct any shortcomings of the evolving system. Corrective actions might range from brief discussions with team members to calling in a TDY social scientist to work with the team for whatever time is needed to assure adequate data collection.

The hallmarks of this approach are its initial commitment to low cost data collection and the monitoring efforts needed to identify problems. If problems with the approach do indeed develop, resources will be available for bringing in whatever expertise appears to be warranted. At best, the approach should produce at lower cost the same information identified in Appendix D and, at worst, it will succeed in generating at the same cost the results forthcoming from the procedures outlined there. These results are most likely to be accomplished if the Country Program Director is entrusted with the authority and the resources needed to monitor and, if necessary, intervene in the data collection process. Thus the success of the approach is highly dependent upon the assumption that the Core Team is able to function in the manner envisaged in the Core Subproject Paper.

Further into the life of the project it will become increasingly valuable to obtain data on noncooperating farmers. This need may arise from concern that available cooperator farmers are not members of the target group, or it might be deemed important to have data which permits comparisons between the performance of cooperator and noncooperator farmers. Other possible reasons for obtaining information on farmers not cooperating with the Subsistence Farms Subproject is its use in designing other subprojects or to ensure that the total data set is appropriate for objectives b and c identified on page 13. At this point it will be necessary for the Core Team to develop a proposal for the most efficient

methods for additional data collection. This proposal, together with a revised workplan for the socio-economic research effort, should be available no later than November 1981.

Analysis of Farm Unit Data:

- a. Conduct a review of secondary sources for data on production costs and net returns in Yemeni agriculture. Sources to be searched include previous studies by IBRD agricultural missions, other donors, research station data, and the MOA and CPO statistical studies groups.
- b. Where possible, update existing studies by adjusting factor costs and market prices.
- c. Use data collected from cooperator farmers to calculate production costs for important farm products and net returns to farming.
- d. Project farm costs and farm prices into the future using different scenarios on labor costs, demand patterns, and rates of adoption of improved technologies. Compute net returns for each scenario and reach conclusions about the viability of different types of agriculture, paying particular attention to small plot agriculture and the livestock-feedgrains-forage subsystem.
- e. Analyze sample data on net wealth of farming units, access to credit sources, availability of nonfarm sources of income such as remittances, farm size, and tenancy conditions to determine the effects of credit availability, nonfarm income, and tenancy patterns on agricultural investment.
- f. Identify remaining gaps in data on farm units.

Resources Required:

Task a will require the efforts of a documents researcher for two

person weeks. Tasks b, c, d, e, and f will require six person weeks of the time of an agricultural economist and an additional person week for report preparation.

Work Schedule:

The report of the documents researcher should be available by September 1981. The report of the agricultural economist should be completed by November 1981.

Task 5:

Assess the state-of-knowledge on the role of Yemeni women in agricultural production.

Problem:

The already large role of women in traditional Yemeni agricultural production has expanded as a consequence of increased job opportunities for males in the Arabian Peninsula. Because of social restrictions on communication with Yemeni women, any program of direct assistance to Yemeni farmers must be based on reliable information about the role of Yemeni women in agricultural production. Also needed are recommendations for practical procedures for offering technical assistance to women as agricultural producers.

Objective:

Assess the adequacy of data available on the role of women in agricultural production, identify any additional data needs, and identify practical procedures for offering technical assistance to women as agricultural producers.

Scope of Work for the Researchers:

- a. Survey the literature on the role of Yemeni women as agricultural producers and identify any remaining data gaps.
- b. Prepare a research design for obtaining any additional data which is cost justified.
- c. Identify practical procedures for offering appropriate technical assistance to women as agricultural producers. Recommended procedures should be consistent with the purposes of existing and planned sub-projects for direct assistance to Yemeni farmers and should be compatible with the overall budget constraints imposed upon those activities.

Resources Required:

Tasks a, b, and c would be best performed by a female agriculturalist with practical experience in the problems of communicating with women in Middle Eastern cultures. These tasks will require three person weeks of library and field research with another person week required for report preparation.

Work Schedule:

A report should be available by June 1981.

Budget for Tasks 1-5

<u>Task</u>	<u>Personnel Inputs</u>	<u>Total Cost</u>
Task 1	3 person weeks of Core staff time* or 5 person weeks of TDY time**	\$ 11,745 16,368
Task 2	8 person weeks of Core staff time	31,320
Task 3 Phase 1	2 days of Design Team time	743
Task 3 Phase 2	2 person weeks of TDY time by agricultural engineer	8,570
	2 person weeks of TDY time by agricultural economist	8,570
Task 4 Data Collection Low Cost Option	1 1/2 person days of U.S. based specialist time	336
	2 person weeks of field staff time	7,830
	1 person week of Core staff time	3,915
Task 4 Data Collection Maximum Cost	2 person months of TDY time by social scientist	25,280
	1 person week of Core staff time	3,915
Task 4 Data Analysis	2 person weeks of TDY time by documents researcher	8,570
	6 person weeks of TDY time by agricultural economist	19,710
Task 5	4 person weeks of TDY time	14,140

* Personnel costs for Core staff member with base salary of \$36,000 per year and full maintenance costs including local transportation. Monthly rate is \$15,660.

** Personnel costs for TDY staff with base salary of \$30,000 per year plus overhead, per diem, local and international transportation. Total for one month assignment is \$14,140, slightly less for longer periods.

Some Special Studies with Lower Priority

1. Markets for purchased inputs. Cost and availability of fertilizer, pesticides, pumps, tractors, machinery, spare parts and service.
2. The cotton fibers--domestic cotton textile system as a case study in government regulation.
3. A statistical study of agricultural productivity over time in Yemen and in comparison with other countries. Patterns in output per hectare and output per manhour.
4. Labor migration, agricultural production, foreign assistance and income distribution in Yemen, a statistical study.
5. Problems, opportunities, and prospects for agricultural exports and import substitution for imported foods and fibers.
6. Studies of local, regional, and international markets for Yemeni agricultural products.
7. Description, problems, and prospects for food processing, transportation, storage, and marketing systems.
8. Opportunities for agricultural production, credit, marketing, and purchasing cooperatives.
9. A program for improving the collection, processing, and dissemination of agricultural statistics.
10. Changing status of cultivated land due to irrigation and land abandonment.

ISSUES AND ALTERNATIVE STRATEGIES
FOR PROJECT 0052

by

Donald G. Heckerman
CID Design Team Economist

N O T E - DRAFT REPORT: NOT FOR GENERAL DISTRIBUTION

The opinions stated in this report are the author's
only and are not necessarily those of CID.

July 15, 1980

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LIST OF ACRONYMS

CARTO	Central Agricultural Research and Training Organization
CID	Consortium for International Development
FY	Fiscal Year
GDP	Gross Domestic Product
IBRD	International Bank for Reconstruction and Development
LCPP	Livestock Credit and Processing Project
MOA	Ministry of Agriculture
MOE	Ministry of Education
UNDP	United Nations Development Program
USAID	United States Agency for International Development
YARG	Government of the Yemen Arab Republic

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A SUGGESTED OUTLINE FOR THE BUSY READER

Read pages 1, 2, 17-20, and 48-59. Tables 1 (page 18) and 3-10 (pages 49-56) summarize many of the budget alternatives available to Project 0052.

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Introduction

It is important to recognize that Yemen is not a typical developing country. By and large, Yemen has been spared the distortions which hamper broad-based development efforts in so many other countries. Urban/rural, centralization/decentralization, employment and income distribution distortions are minimal or, at worst, much less serious in Yemen than in the typical developing country. Because of opportunities for male workers to migrate to high paying jobs in Saudi Arabia, wage rates for unskilled labor are quite high. Because of foreign job opportunities unemployment is not a problem, and income is widely distributed, at least among households with able-bodied males. Central government influence outside the urban centers is weak and, as a result, local communities most often take the initiative in providing services such as water, roads, and schools. Private enterprise is vibrant and operates with little or no government interference or subsidized competition from government enterprises. Because many of the best jobs are located outside Yemen, there has been less pressure to migrate to cities. Much of the Yemeni population is rural with most migrants preferring to use their own villages as bedroom communities rather than move their families to the city.

The absence of many of the typical distortions which accompany development simplifies the task of designing an agricultural development support program. The program is relieved of the difficulties of attempting to alleviate the existing effects of very powerful socio-economic forces. New programs are, of course, not alleviated of the responsibility to avoid creating or contributing to unemployment, income distribution, centralization, and urbanization problems. But this responsibility is much less demanding than the requirement to contribute to the alleviation of deeply imbedded distortions.

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Having cleared the air by identifying a series of issues which are less important for Yemen than in most developing economy settings, we are free to turn to a discussion of program issues that are relevant to the Yemen context. These issues are set out in the following sections. Included are alternative goals for an agricultural assistance program, environmental factors, and future constraints to agricultural development. Following a lengthy consideration of these issues, the discussion turns to a brief description of possible program components. Since existing budget limitations make it impossible to implement each possible component, the next step is to identify alternative strategies in the face of limited resources. There follows a summary of the potential, beneficiaries, technical feasibility, required YARG contributions, and possible alternatives for each program component. Another section identifies alternative programs which represent a coherent approach to programming and, in addition, satisfy FY 82 budget constraints. The final section explores the possibility that some program components might be financed by other donors.

Alternative Goals for an Agricultural Assistance Program

Development of a strategy for assistance to the Yemen Arab Republic should begin with an examination of goals. There exists a wide range of conceivable goals, and it is unlikely that all can be satisfied with the resources available. One can expect that the different actors, including USAID, the YARG, and recipients of assistance, will apply different priorities to choices among the goals. These issues are identified and discussed below.

One of USAID's goals can be stated as seeking to improve the quality of life of people in developing countries, with special emphasis on the needs of the least fortunate. Quality of life, of course, has several dimensions. Such diverse elements as health, freedom to control one's own destiny, access to

goods and services, and conservation of natural resources contribute to quality of life.

For developing countries, increased production and earned income is a necessary prerequisite to providing the goods and services required to improve the quality of life. Increased production by itself, however, is not sufficient. Increases in production and earned income should occur in a context which does not contribute to distortions such as a bias toward urbanization, centralization, or unemployment. Increases in income should be broadly shared among individuals and regions and, if possible, should help to alleviate existing distortions in income distribution. Increased income should also result in an appropriate allocation between private and public goods. In the case of Yemen this surely means adequate resources for public health, education, and rural roads.

It has been argued in another Design Team report (Implications for Agricultural Assistance of Alternative Economic Development Prospects in the Yemen Arab Republic, pp. 6-8) that nonwelfare assistance programs are unlikely to raise the incomes of the "poorest of the poor" when wages rates are determined by foreign work opportunities. When migration creates abundant job opportunities for unskilled laborers, any remaining cases of very low family income are most likely traceable to problems which are not amendable to increases in production and earned income. Production oriented programs are also unlikely to benefit most unskilled workers who have only their labor to sell. It is unrealistic to expect that production oriented assistance programs could succeed in raising the wages of unskilled labor; this result would occur only if the assistance program were massive enough to overwhelm the effects on the demand for labor of activities in oil rich Arabian Peninsula countries.

The inevitable conclusion of this analysis may be disturbing to some

readers. The conclusion is that programs aimed at increasing production will not materially benefit the poorest of the poor and programs which assist the the poorest of the poor will not increase production. These results necessarily follow when there are abundant employment opportunities for unskilled laborers. Under these conditions program planners are offered a mutually exclusive choice between production and income distribution. It is unlikely that a single program will achieve material amounts of each.

Any serious discussion of the goal of higher income must recognize the familiar tradeoff between present and future income. This issue often affects the choice between programs which yield immediate returns but have little long run effect on the economy and programs which generate few immediate payoffs but eventually result in persistent increases in agricultural production. An example of an activity with quick but fleeting effects would be a plant protection expert who comes to Yemen to deal with a single outbreak of plant disease. Contrast the effects of this activity to that of a plant breeding program which after a ten year effort produces and disseminates a superior sorghum variety. USAID has traditionally emphasized activities such as education, institution building, and agricultural research which yield few immediate results but are capable of bringing considerable change in the long run.

In addition to the goal of increasing production and earned income, USAID must be concerned with visibility. It is important that beneficiaries recognize that USAID is concerned with the quality of life in developing countries and that visible U.S. efforts are underway to improve the quality of life. Thus it is important not only that USAID in fact makes useful contributions to the quality of life but, in addition, that American contributions be visible. This objective is especially relevant for Yemen, where it is vital for American political interests that the Yemeni be aware of American assistance.

In planning assistance efforts it is important to recognize that the YARG also has goals. Many of those goals can be summarized as increasing the quality of life. It is particularly important, however, to identify cases in which YARG goals are different from or perhaps even conflict with those of USAID. Thus we will concentrate on differences rather than on similarities, for differences wherever they exist impose constraints on USAID policy options.

Modern government is a new phenomenon in Yemen. As a consequence the YARG is relatively weak and feels compelled to be concerned with its image among the people. Additional pressure results from the Arab tradition of permitting any commoner to address his petition to high officials, a custom which exerts immense pressure upon officials to solve problems as quickly as possible. For whatever the reason, the MOA is much more impatient for visible results than is USAID, with the result that the YARG challenges USAID proposals for agricultural research and other programs whose benefits are most likely to occur in the distant future (which sometimes seems to include anything beyond two years from the present). It also appears that the MOA is more concerned about the problems of farmers located near the capital than those located further away. One wag has suggested that the MOA's concern for a region's problems is inversely proportional to the driving time from that area to Sana'a.

The MOA measures benefits somewhat differently than is described in AID's Handbook Number Three. The MOA concept of benefits is not unlike what Hubert Humphrey remembered of New Deal Days, "The important thing was that the government was there doing something." This attitude has several implications for evaluation of assistance efforts, including MOA assessment of the benefits of training. Rather than perceiving training as an investment in human capital which yields benefits after some delay, many Yemeni perceive the benefits of training as beginning immediately upon award of the scholarship.

At least some MOA officials put a much higher priority on solving their own administrative problems than seem deserved when measured by a goal such as increasing the quality of life. When asked for needs for assistance, it is not unusual for MOA officials to mention first cash to spend on such things as transportation and photocopying, technicians to solve the administrative and operational problems of a state farm which absorbs the time of that particular official, and for help in defending a particular official's turf. Officials also are greatly concerned with temporary fixes for staffing difficulties such as obtaining supplemental funds to "top off" salaries.

One of the key stated goals of the Yemeni First Five Year Plan was to move toward food self-sufficiency. This, it should be noted, is not the same as the goal of increasing production. Indeed, vigorous pursuit of a policy of import substitution will likely result in less production than will a policy of support for exports and import substitutes based on relative profit opportunities. While it is possible to argue for a policy of food self-sufficiency as insurance against the vicissitudes of international commerce, it must be understood that such a choice invariably has costs in terms of lower production and earned income than would otherwise be possible. It is clear that to some extent the Yemeni have opted for such a policy. The research efforts of CARTO are addressed almost exclusively to the problems of reducing production costs of import substitutes.

Environment

In less than 20 years Yemen has changed from a closed society, which the ruling Imam controlled by limiting entry from the outside world, into an open society where hundreds of thousands of Yemeni workers move out of and into the country each year, where a vast array of imported goods are available in village

suks, and where modern western technologies are eagerly embraced and sometimes indiscriminately applied to Yemeni situations. It is difficult to find any aspect of the Yemeni economy that has not been affected by these sweeping changes.

The dominant force driving changes in the Yemeni economy over the last decade has been expanded job opportunities for unskilled labor in oil rich Arabian Peninsula countries. These opportunities have induced approximately one third of the male labor force to migrate. As a result wage rates have risen dramatically, unemployment has virtually disappeared, substantial foreign exchange reserves have been accumulated, and imports of every conceivable good produced anywhere in the world have soared. Despite the undeniable improvements in the standard of living which have occurred, Yemen retains many of the characteristics of the poorest of countries. The labor force is largely unskilled, and the level of public services in the form of health, sanitation, education, and roads have lagged behind the level of private goods and services.

Yemeni agriculture has not been sheltered from these forces. While the agricultural sector remains the largest single source of Gross Domestic Product, the share of agriculture has shrunk from 50% of GDP in 1972-73 to 35% in 1976-77. This decrease in the share of agriculture in domestic output occurred because real output in the agricultural sector has remained essentially unchanged since 1972-73 while output in virtually all other sectors grew rapidly. Over the same period the agricultural labor force has declined, making large productivity increases in agriculture necessary just to maintain constant output.

Constraints on Agricultural Development

The 1979 CID Design Team identified a series of broadbased constraints

which restrict the growth of agricultural production. These constraints are identified and discussed in Section 4.3 of the Baseline Field Study Report. It is possible to classify them as:

1. constraints which restrict current agricultural production and income, and
2. conditions which will eventually constrain agricultural production and require long lead times if they are to be eased.

There are two broad categories of constraints which restrict current agricultural production and income. The first is the difficulties farmers face in managing the new technological and resource combinations which are becoming available. It is difficult to imagine farmers anywhere facing more changes during the last 15 years than the Yemeni farmer has experienced. Twenty years ago he lived in a subsistence economy which was the result of centuries of adaptation to labor intensive methods of producing a dominant crop, sorghum. The typical Yemeni farmer of 20 years ago did not know that chemical fertilizers and tractors existed. He scarcely considered crops such as wheat, alfalfa, fruits, or vegetables. Within the space of 20 years the Yemeni farmer has been introduced to a whole array of crops and techniques with which he has had little experience. Within the last eight years these farmers have seen real labor costs quadruple while remittances have made possible investments which the farmer of an earlier era did not even know existed, e.g., tractors, tubewells, diesel pumps. At the same time rising incomes have created markets for additional agricultural products. Increases in agricultural output will necessarily be elusive while Yemeni farmers struggle to find the most efficient combination of factors, crops, and agricultural techniques.

The second broad category of constraints which restrict current agricultural production and income can be identified with weaknesses in supporting

institutions, including agricultural education, research, extension, administration, credit, land tenure, and marketing. Supporting public institutions in education, research, extension, and administration are often fledgling or nonexistent. Where they exist, they often are heavily dependent upon expatriate experts not only for policy advice but for day-to-day operating decisions. All too frequently there is little coordination among institutions, narrowly defined specialities, and regions. Contributing to these inadequacies in public institutions and making amelioration more difficult is a lack of trained personnel in all disciplines and at all levels. These weaknesses make it difficult for agricultural institutions to provide Yemeni farmers with the technical assistance required to increase agricultural production.

The fundamental problem underlying credit inadequacies is the continued observance of a prohibition on the payment of interest between Moslems. As long as this religious injunction prevails, private institutions for bringing together willing Moslem borrowers and lenders can never evolve. The next best alternative may be governmental support for credit, but this immediately raises the problem of sources of financing as well as the already mentioned difficulties in staffing and managing public institutions. With tenancy ratios ranging from 15% in the central highlands to 50% in the Tihama, there is the clear possibility that share cropping arrangements provide inadequate incentives for tenants to invest and to assume the higher costs and risks inherent in modernizing agricultural production.

Yemen also lacks a modern processing, distribution, and marketing network for domestically produced agricultural commodities. Nowhere is this problem likely to be so acute as in the emerging domestic and export markets for fruits and vegetables. While the existing elaborate distribution and marketing network for qat demonstrates that indigenous private entrepreneurship is fully

capable of solving these problems when large profit opportunities exist, it is nevertheless true that creation of other distribution networks will be expensive and in the meantime will reduce incentives for the production of fruits and vegetables.

Among the conditions which will eventually constrain agricultural production and require long lead times if they are to be eased is the continually deteriorating resource base, including soils and quantity and quality of groundwater. Recent trends in wage rates and remittance flows threaten to accelerate deterioration of the natural resource base. The high cost of labor has led to land abandonment and to a reduction in terrace maintenance. There is a fear that the breaching of neglected high level terraces will lead to accelerating erosion which will eventually destroy productive terraces at the lower level, erode waterways, and perhaps even irreparably damage the system of spate irrigation in the lower wadi reaches. Lack of financial resources previously prevented widespread exploitation of underground water reserves. Now, however, remittance flows are helping to finance tubewells, with the result that groundwater resources are being rapidly depleted in some areas. In other areas the most evident effect of excessive pumping is deteriorating water quality. The worst case scenario for Yemen over the next two decades is dismal, with the possibility that the deterioration of soil and water will eventually result in large output declines.

Another condition which will eventually constrain agricultural production and requires long lead times if it is to be eased is the lack of basic agricultural research which will result in plants, animals, and technologies adapted to Yemen's soils, climatological conditions, and water resource constraints. In Yemen the most promising opportunities for "biological and/or chemical engineering" appear to lie in the development of crops suited for dryland areas.

Development of improved techniques for producing existing crops and animals in such areas, the use of new crops and animals especially adapted to limited water regimes, and/or the identification of drought tolerant germplasm within conventional crops known for arid land adaptability would allow output increases over a large part of the Yemen Arab Republic.

This section has emphasized the constraints to further agricultural development in Yemen. These constraints are formidable. However, they should not be overemphasized. On the plus side are the relatively equal and wide spread distribution of remittances which provide investment funds, muted equity issues, and dynamic entrepreneurship. With appropriate assistance designed to relax key constraints, the potential exists for substantial increases in agricultural production.

Program Components

During 1979 and 1980 CID personnel have logged nearly two person years of time in Yemen in an effort to design a sector wide approach to an Agricultural Development Support Program for the Yemen Arab Republic. Their recommendations are included in the CID Yemen Title XII Program Report No. 1 (dated September 10, 1979) and in draft copies of reports and project papers in preparation during the summer of 1980. This section identifies activities proposed by the CID Design Teams.

1. Support to Yemeni Educational Institutions and Other Training Activities.
 - a. Agricultural Secondary Education. One aspect of the program is a series of projects which will supply expatriate faculty and training for Yemeni faculty counterparts for a group of agricultural secondary schools. The training aspect of the project is designed to make available within eight years of school opening sufficient Yemeni faculty to replace virtually all the professionals supplied by USAID. It is anticipated that this

group of agricultural secondary schools will provide the middle level trained support personnel required for staffing the extension service, research facilities, and the MOA. The first of these agricultural secondary schools, the Ibb Agricultural Training Center, opened in October 1979. During the 1979-80 school year approximately 50 students were enrolled. When fully operational, this school is expected to enroll 270 tenth, eleventh, and twelfth grade students. Other schools include the Surdud Agricultural Secondary School with a capacity for 189 students, scheduled to open in September 1981, and perhaps the Sana'a Livestock School, scheduled to open in September 1982, and the Saadah Agricultural Secondary School, which is still in the planning stage.

b. University Faculty of Agriculture. The YARG has indicated that at a later date a formal request for USAID support in staffing a university faculty of agriculture will be forthcoming. The opening of a university program of agriculture may come as early as September 1984. These university programs will eventually have the capacity to provide most of the bachelor's level agricultural training required for Yemen's future. It is anticipated that Project 0052 assistance will include staffing by a non-Yemeni faculty for a transition period, training for Yemeni faculty counterparts, and perhaps support facilities such as laboratory equipment, computer software, and library materials.

c. In-Service and Out-of-Country Training. Until domestic educational institutions reach capacity, significant amounts of in-service and out-of-country training will be required to provide the trained personnel needed to staff these new educational institutions as well as to upgrade the skills of personnel and fill staffing gaps of existing institutions. The

Core Subproject includes support for in-service training, English language training, and out-of-country training. In addition, each additional subproject is expected to include out-of-country training components for counterparts and other specialists who will be required to staff subproject activities after CID personnel depart.

2. Direct Assistance to Yemeni Farmers. CID Design Teams have concluded that a top 0052 priority is to use extension methods to teach farm management practices directly to Yemeni farmers while simultaneously helping to train Yemeni extension personnel to assist with and eventually to assume responsibility for the activities after CID personnel have left Yemen. The objective is to assist the Yemeni farmer in learning to combine the new technologies and factor availabilities in the most efficient way.

a. Subsistence Farms Development and Management. A Subproject Paper is in preparation which proposes to fund a team of experts to provide a farm systems approach to the problems of farmers with fewer than two hectares. Included on the four person team are a plant breeder who will work mainly at research stations and three extension specialists with skills in water management, agronomy, weed control, and plant protection who will work primarily with cooperator farmers. Most of the efforts of this team will be concentrated in the highlands with some work in the Tihama.

b. On Farm Water Management. The Agricultural Water Resources draft Project Identification Document contains a proposal for extension assistance to farmers who use irrigation water. Most of these farmers are located in the lower wadi reaches of the Tihama, al Jowf, and Mareb. The activity is designed to develop the managerial skills needed to allow

Yemeni farmers to apply those water management and cropping system techniques which have proven effective elsewhere. In the early stages of the activity the three person expatriate teams will concentrate on teaching field leveling techniques, optional timing patterns for field irrigation, and soil probe techniques for determining optimum application of irrigation water. Once Yemeni farmers have accepted these techniques, field teams will assist with advice on fertilizer application and cropping patterns which will further increase the farmers' incomes. Also included in the activity are small amounts of technical assistance on fruit and vegetables harvesting, processing, and marketing and organizational and managerial assistance to farmer cooperatives.

c. Integrated Watershed Management. The demonstration of an integrated system of forest, range, and livestock management is designed to renovate selected rangeland and forest areas in the upper watershed of the wadis, which are steadily deteriorating as a result of continuing livestock grazing overuse and past removal of forest trees for fuel. The strategy is to field a three person team who will work with local communities to offer increased forage and fuel, while accomplishing soil stabilization through planting of grasses, shrubs, and trees, and teaching proper management practices.

3. Institutional Support to the MOA and MOE. CID Design Teams have identified some specific areas in which USAID can directly assist the MOA and MOE in their missions while simultaneously helping to strengthen their capacity to perform these functions by themselves.

a. Water Inventory and Policy. The MOA has indicated that USAID assistance in identifying the status of present and predicted future water

resources and the formulation of policy resulting in optimal use of those resources is a top priority item. An inventory of water resources--a water resource survey, an aquifer modelling effort designed to predict sustainable yields, depletion rates, and deterioration of water quality--is planned to generate those inputs needed for the formulation of alternative water policies. A team of Yemeni and CID personnel will collect available climatological, hydrological, and geological data necessary for modelling the aquifer. After sufficient data are available, it will be incorporated into the aquifer model program. The water policy activity is designed to assist the MOA in the formulation of a viable national water policy.

b. Policy Analysis and Planning. Another area targeted at this time for special institution building efforts is the Planning Directorate of the MOA. The capacity of the MOA to carry out agricultural sector analysis, program planning, and evaluation is limited. The primary reason for this limitation is the shortage of adequately trained personnel. In addition to in-service and out-of-country training, the Core Subproject contains resources for short-term consultants which could be made available to the Planning Directorate whenever the Country Program Director and the MOA conclude that such assistance is appropriate.

c. Agricultural Documentation and Learning Center. The MOA recognizes the need for a Documentation Center to properly maintain and catalogue their own growing numbers of documents, as well as various useful documents from other sources, and to establish an efficient system for retrieving and making available these documents to the persons who need them. Also, at the present time, the MOA does not have suitable facilities for producing the kinds of materials that can be used by radio, television,

and other media for providing information to the public on agricultural research results and government policies and programs. A series of short-term consultancies is planned initially to help develop plans for the center.

d. Technical Backstopping Services to the MOA. The Core staff will review requests for technical services from the MOA. Where the need for limited short-term assistance is justified, the Core will make available directly to the MOA or to a project activity of another donor, the appropriate American expertise.

e. Policy Planning and Other Technical Assistance for Agricultural Education. The MOE faces the task of planning for and opening a large number of schools, including possibly three agricultural secondary schools, over the next few years. CID Design Teams have proposed offering to the MOE a full-time expert to assist with these tasks.

4. Project Design and Mobilization. Design Team findings and discussions with MOA officials indicated several areas in which the Core Team should proceed to develop subprojects. In addition, continual monitoring by the Core Team of the agricultural sector and consultation with YARG may identify additional program requirements. The Core Subproject contains resources for identifying and developing subprojects and for providing mobilization assistance to additional subprojects as judged necessary.

5. Managerial, Administrative, Technical and Logistic Support for All Subprojects. The Country Program Director will be responsible for overall field coordination of the Program and for providing administrative, technical, and logistical support for each subproject. The Core Subproject has been provided with the resources required to accomplish these tasks.

Program Resources and Costs for Fiscal Year 1982

The preceding section has offered a brief description of 0052 activities which have been recommended by CID Design Teams as priority activities and for which the YARG has indicated substantial interest (formally in some cases, informally in others). This section contains FY 1982 cost estimates for each of these activities as well as indicative funding limits supplied by USAID/Yemen.

The total costs estimated for these activities for optimal operational levels in FY 82 is \$16,635,000. Table 1 contains estimated costs for individual program components. The cost estimates for the Core, Ibb, Surdud and Subsistence Farming Management and Development Subprojects are the result of a detailed review process conducted by CID Design Teams and USAID/Yemen. Cost estimates for the On Farm Management, Integrated Watershed Management, and Water Inventory and Policy activities are, on the other hand, "ballpark estimates" constructed by the author from estimates contained in the draft Agricultural Water Resources Project Identification Document.

Table 1 contains the results of breaking down cost estimates of individual subprojects into functional expenditure categories. Subproject documents contain individual line items for the cost of participant training, making it a simple exercise to tabulate these costs separately. Formal budget documents, do not, however, contain the information required to break down Core Subproject cost estimates into such functional categories as 0052 management, administration, and support; project design and mobilization; and institutional support costs. The estimates presented are based on the author's notes from Design Team discussions of the Core Subproject Paper. The first step was to identify estimates of person years of specialist inputs into the institutional support and project design and mobilization functions. These estimates for FY 82 are two person years for the institutional support function and .5 person

Table 1

Optimal Expenditures by Function for FY 82

<u>Function</u>	<u>Amount (\$000)</u>	<u>Amount as Proportion of Total</u>
Educational Institutions and Other Training Activities	\$ 5,347	.32
Agricultural Secondary Education (without PT*)	3,118	.19
Ibb	1,983	.12
Surdud	1,135	.07
Sana'a	-0-	.00
Saadah	-0-	.00
Faculty of Agriculture	-0-	.00
Participant Training	2,229	.13
Core	872	.05
Ibb	514	.03
Surdud	199	.01
Subsistence Farms	44	.00
On Farm Water	300	.02
Integrated Watershed	100	.01
Water Inventory and Policy	200	.01
Direct Assistance to Yemeni Farmers (without PT)	5,560	.33
Subsistence Farms Subproject	1,390	.08
On Farm Water Subproject	2,780	.17
Integrated Watershed Subproject	1,390	.08
Institutional Support to MOA and MOE	3,028	.18
Water Inventory and Policy	2,000	.12
Policy Analysis and Planning for MOA & MOE	771	.05
Agricultural Documentation & Learning Center	47	.00
Technical Backstopping Services to the MOA	210	.01
Project Design and Mobilization	403	.02
Support for all Subprojects (overhead costs)	<u>2,297</u>	<u>.14</u>
TOTAL	\$16,635	1.00

* PT = Participant Training

years for the project design and mobilization function. The amounts reported in Table 1 include the direct costs of supporting these personnel together with commodity and miscellaneous costs directly associated with those functions. All remaining Core Subproject costs are reported as 0052 program management and administration costs. (The reader should be aware that no concerted effort has been made to determine whether this level of management and administration costs is appropriate to support all the activities included in Table 1. The author's guess is that the \$2,297,000 level is somewhat inadequate.)

It should be noted that the cost estimates reported in Table 1 are program operating costs. They contain little or no provision for start up costs for individual activities such as unusual amounts of commodities or construction. It should also be noted that resources for FY 82 operation of continued activities in horticulture are not included.

USAID allocations to Project 0052 for FY 82 are scheduled for an "optimum" level of \$8,621,000 and a "most likely" level of \$6,157,000. These programmed expenditure levels stand in stark contrast to optimal expenditures of \$16,635,000 for the entire Agricultural Development Support Program. It is obvious that program managers face some very difficult choices among activities described above even if the costs of most of them are sharply pared down. The next sections address these problems of choice.

Analysis of Individual Activities

Difficult choices among proposed 0052 activities seem inevitable. The objective of this section is to assist the process of making choices by providing a detailed analysis of each activity. The first step is to identify as carefully as possible for each activity its potential, intended beneficiaries, technical feasibility, support required from YARG for its success, and its dependency

on specific future economic scenarios for its success. Also identified is the author's estimate of whether the activity can stand alone or whether it requires other 0052 activities to achieve maximum effectiveness. Finally, alternatives for accomplishing the same objectives are considered. The emphasis will be upon identifying less expensive alternatives. Each reader can judge for himself/herself whether the less expensive alternative results in a lower quality activity or whether, on the other hand, it simply eliminates unnecessary "gold-plating."

1. Provision of Interim Faculty and Training for Yemeni Faculty Counterparts for Agricultural Secondary Schools

Potential. The objective of this activity is to provide the middle level technicians required to staff the extension service, research facilities, and MOA administrative units. It is anticipated that the best of these students will receive university educations and eventually rise to top level administrative positions within Yemeni agricultural institutions. Thus, the objective of this activity is to begin meeting within three years the great need of agricultural institutions for intermediate level technicians and, in the long run, perhaps 20 years, to provide the cadre of top level administrators and technical specialists for agricultural education, research, and extension activities in Yemen. It can be fairly said that these schools offer the single best alternatives for ensuring that the leadership of Yemeni agricultural institutions remains in the hands of persons with legitimate experience in agriculture. If this outcome is reasonable, then it would surely be a significant American achievement to be associated from the beginning with such an influential group of institutions.

Beneficiaries. The direct beneficiaries of the activity are the secondary

school students who attend and the Yemeni faculty counterparts who receive additional formal education and on-the-job training. The activity will indirectly benefit those who receive improved services provided by the better trained middle and top level administrators, extension, and research specialists. It should go without saying that the size of the latter benefits are difficult to forecast and, later, to measure objectively.

Technical Analysis. It is surely feasible to design an agricultural school program, recruit and orient expatriate faculty, administer the academic program, provide out-of-country and on-the-job training to Yemeni counterpart faculty, and provide students with an excellent education. While there clearly exist potential difficulties i. offering vocational agricultural courses to boys from Ibb and Taiz cities and in maintaining an appropriate balance between vocational and college preparatory curricula, these problems are not insoluble given the administrative and teaching talent and resources currently available to the Ibb Subproject. It should also be possible to design enrichment programs for students and eventually alumni--including counseling with students during their summer practical experiences, sponsoring refresher and extension conferences for alumni, and periodic faculty visits to alumni in their own job locations--which will assist them to become excellent practitioners. These extras will surely also help to reinforce school loyalties which, in turn, can make an important contribution to improved agricultural services throughout Yemen. Many of the benefits, including graduates who function effectively in responsible positions and viable all-Yemeni educational institutions, will occur only after the passage of considerable time.

Required YARG Contributions. The success of the activity in reaching both its short-run goal of graduating qualified students and its long-run goal of all-Yemeni staffing, administration, and financing requires substantial YARG

contributions. The YARG must recruit qualified students, recruit competent and interested faculty counterparts, compensate faculty sufficiently to keep them on the job, and refrain from transferring them to other government positions where their contributions could be substantial. Long run success also requires YARG budget support for supplies, repairs, and other necessary costs of operating schools. It is also necessary that the YARG succeed in recruiting and retaining a large share of graduates into government service if the quality of agricultural support services is to be improved. Long run success also requires sufficient MOE administrative flexibility to permit sufficient curricular and procedural flexibility to operate a quality institution. The MOE bureaucracy has sent disconcerting signals about their intention to determine minute details of school curricular and operational procedures. While the extremely able expatriate faculty will probably succeed in maintaining an excellent educational program despite such bureaucratic barriers, it is less obvious that younger Yemeni faculty members with less independence, experience, and self-confidence will be equally successful.

Activity's Dependence on Particular Socio-Economic Conditions for Success.

Success of this activity is highly dependent upon the assumption that agriculture will remain an important sector in Yemen. The entire rationale for specialized training is that it can be applied to increase agricultural productivity. If Yemen is expected to become a predominantly urban society producing nonagricultural goods and services and/or if increasing numbers of Yemeni find employment in neighboring countries, this activity would constitute a misallocation of resources. Societies which offer mostly job opportunities of the kind mentioned above would be best served by education programs which emphasize the basics and/or offer nonagricultural vocational skills.

Dependence on Other 0052 Activities. This activity, provided that it receives sufficient administrative and logistic support as well as adequate communication and collaboration with the YARG, can succeed in the absence of other 0052 activities in Yemen. Appropriate institutional support to the MOA would make it possible for graduates to make an even greater contribution, but such institutional support is not a prerequisite to making a substantial contribution to improved MOA services in the long run.

Alternatives to the Level of Support Represented in Table 1. Among the cost reducing alternatives to be considered are (a) no USAID support; (b) provide scholarships to agricultural secondary schools elsewhere in the Arab world; (c) reduce annual expenditures at each school; and (d) accelerate the schedule for transition to an all Yemeni faculty.

a. No USAID Support. This option is presumably applicable only to the Surdud, Sana'a, and Saadah schools since USAID has a contractual agreement with MOE to staff the Ibb school and to train Yemeni faculty counterparts. While USAID has made no formal commitments on the Surdud school, it has apparently delivered informal expressions of interest for the Surdud and perhaps also the Sana'a schools to the IBRD and MOE. These informal expressions of interest could not be costlessly withdrawn, but the author is unable to assess precisely the nature of those costs. If USAID assistance is not forthcoming, both the Surdud and Sana'a schools, where construction is already underway, would most likely open on or near schedule with financial support from the YARG and perhaps with limited assistance from the IBRD or one of the Arab development funds. The most likely staffing patterns would consist of recent Egyptian college graduates with little or no teaching or agricultural work experience. A decision not to support the Surdud and Sana'a schools would likely close off for USAID the opportunity

to provide leadership in agricultural secondary education. USAID would be relegated to the role of a donor supporting a single regional institution.

b. Provide Scholarships to Agricultural Secondary Schools in Other Arab Countries. The cost of educating students using expatriate faculty is very high. For example, the USAID portion of the projected Ibb FY 82 budget, excluding participant training, totals \$1,981,000. Table 2 gives the USAID costs per student based on different numbers of students. These USAID costs, which do not include capital costs or operating and Yemeni staffing costs borne by the YARG, are significantly larger than the full costs of sending Yemeni students to agricultural secondary schools outside Yemen. These costs should be compared with total academic year costs of \$2,500 (including travel, tuition, books, living allowances) to send Yemeni students to Egypt for university agricultural education.

Sending Yemeni students out of the country has several disadvantages. Their experience with practical agriculture would be less applicable to the special problems of agriculture in Yemen. There could be sizeable social costs associated with separating 14 to 17-year-old boys from their families for an entire year. Finally, such an arrangement would not provide the intended institution building efforts. Even though USAID could continue to provide training to prospective Yemeni faculty, there would not be available the developed curriculum, the traditions, and the opportunities for practice teaching which result from USAID assistance in providing an experienced expatriate faculty for a number of years. Despite these advantages, USAID support for out-of-country education should not be ignored as a viable alternative.

Table 2

Total FY 82 USAID Ibb School Costs per Student

<u>Total Number of Students</u>	<u>Cost Per Student</u>
270	\$ 7,337
250	7,672
200	9,905
150	13,206

c. Reduce Annual Expenditures for Each School. Using the Ibb FY 82 proposed budget as an example, total USAID expenditures are \$2,497,000, with \$514,000 allocated to participant training and \$1,983,000 allocated to cover operations at Ibb. The three largest budget items are \$1,155,000 for expatriate payroll, travel, and transportation, \$514,000 for participant training, and \$387,000 for on-campus payroll and support. Participant training alternatives will be discussed in the next section. Of the remaining largest items, expatriate payroll, travel, and transportation represents 46% of total expenditures and on-campus payroll and support costs represents 15% of the total.

On-campus costs seem unusually high. They are one-third larger than Core Subproject on-campus costs, prima facie evidence that they could be cut substantially without damaging the program.

The largest single target for cost cutting measures are expatriate staff costs. Two possible options exist, reducing the number of faculty and hiring faculty willing to work for lower salaries. Average cost per expatriate faculty member is \$128,000 in FY 82 dollars. After adjusting for the Team Leader's salary and benefits which are substantially higher than that of other faculty, the cost savings of reducing the faculty by one person is about \$115,000. It may be possible to reduce the size of the expatriate faculty by one or even two persons without substantial damage to the curriculum, particularly since faculty members with the training and experience represented by the Ibb faculty are fully capable of teaching in more than one area. This alternative should be considered for FY 82, when curriculum development will have been largely accomplished thus freeing faculty for more student contact hours. A second option would be to hire faculty willing to work for lower salaries. Cost savings from salary

reductions are, because of benefits and overhead, equal to 176% of the reduction in base pay. A salary reduction of \$10,000 will reduce total costs by \$17,600. The implication of these cost data seems to be that reducing numbers of faculty is a much more likely source of cost savings than reducing salary levels for individual positions. It is likely that one can maintain a higher quality program by employing a smaller number of highly qualified individuals than by using a larger number of less well-qualified persons.

d. Accelerate Training and Shorten the Period in Which Expatriate Faculty are Utilized. Substantial savings are possible over the life of the project if Yemeni faculty could assume full teaching responsibilities at an earlier date. Each person year of acceleration of complete teaching responsibilities by Yemeni faculty reduces USAID costs by about \$128,000 in FY 82 dollars. This section identifies alternatives for accelerating this process which minimize the impact on program quality.

While the Ibb Subproject Paper is not explicit about the time required for selection, training, and supervised teaching for prospective Yemeni faculty, it seems reasonable to assume that approximately five and one-half years are required for each faculty member. This estimated time period includes approximately one year for selection and orientation to the Ibb school philosophy, one year to acquire English language proficiency, two and one-half years for M.S. training in the United States, and a final year of supervised teaching under the tutelage of an experienced faculty member. (After nine months of operation at Ibb none of the Yemeni faculty counterparts have begun English language training.) If program managers could succeed in shortening this process by one year for each of nine

Yemeni teachers, total program cost savings would approach \$1,200,000 in FY 82 dollars, i.e., the entire payroll, travel, and transportation budget for one year.

Let us consider options for accelerating the process of turning over full teaching responsibilities to Yemeni faculty counterparts. These options can be classified as reducing selection and orientation time, reducing the time required for English language training, reducing the time required to acquire appropriate skills and credentials, and reducing the time required for supervised teaching experiences.

Large cost savings will accrue to efforts to shorten the selection and orientation period, particularly if Project 0052 assists with institution building in the Surdud, Sana'a, and Saadah schools. It is important that the process be initiated immediately for all Yemeni faculty for each school. While it may be difficult to accelerate the turnover schedule for the Ibb school by shortening the time required for selection and orientation, it would not be necessary to program such lengthy turnover schedules for the additional schools if selection and orientation for the other schools begins now. Such an approach would require the complete cooperation and considerable effort on the part of the MOE. The number of Yemeni with B.S. degrees and an interest in agriculture is not large, and locating and inducing them to participate in the agricultural secondary schools program will not be easy. One possibility is for Ibb expatriate teachers and MOE officials to tour Arab universities in search of Yemeni in B.S. programs who can be persuaded to request assignment to agricultural secondary schools upon their return to Yemen. Another approach would be to attempt to obtain draft exemptions for secondary school teachers. While no one believes that success in these efforts would be easy or assured,

the payoffs are quite large, more than \$100,000 in FY 82 dollars per person year of accelerated turnover. USAID may be in a position to exert considerable leverage on the MOE to accomplish these objectives. If the MOE can be made to understand that USAID assistance with the Surdud, Sana'a, and Saadah schools is conditional upon their willingness to help reduce USAID costs, they may decide that it is in their interest to assist. If necessary, formal pressure could be applied in the form of strong conditions precedent or memoranda of understanding for the Surdud Subproject. Even better, informal discussions with the MOE about the most acceptable ways to accelerate turnover could begin immediately.

Another significant delay is encountered in English language training. It would be useful to rethink whether proficiency in English is absolutely necessary for each Yemeni faculty counterpart. In addition, the possibility of special incentives for faculty counterparts to pass their English qualifying exams in a short period of time should be explored.

The most lengthy delays in turnover arise from the projected two and one-half years required to obtain an M.S. degree plus one year of practice teaching. Serious consideration should be given to relaxing these requirements for each and every faculty counterpart. It is conceivable that some combination of short-term, out-of-country training plus on-the-job training would result in virtually the same level of proficiency as that produced by existing plans. Serious thought should be given to finding creative ways of developing the same or nearly the same level of proficiency in a shorter period of time. Yet another possibility is to offer special incentives to Yemeni counterparts who complete their M.S. requirements more quickly. Personal observation has convinced the author that many foreign students take a long time to complete their requirements because their

standard of living as students exceeds the standard they expect to achieve when they return home. In such cases financial incentives for early completion could be very cost effective.

The effect of these possible program changes have ambiguous effects on total costs of participant training. Some of the possibilities would raise participant training costs and others would lower them. The proposal to recruit and train as soon as possible all faculty counterparts for the Surdud, Sana'a, and Saadah schools would move forward in time participant training costs without affecting life-of-subproject costs (when inflation is ignored). While increased participant training costs cannot be ignored, the possible savings are so large that they are likely to exceed almost any conceivable increase in training costs.

Yet another approach to accelerating turnover is to use financial incentives to attract qualified Yemeni who have migrated or who are employed elsewhere in Yemen. Such people apparently exist. While it is currently fashionable to argue that "topping off" salaries is unwise, the policy deserves rethinking in this particular case. If a \$10,000 subsidy per year is successful in attracting to agricultural secondary teaching qualified Yemeni not otherwise available, the \$100,000 plus savings per year will allow many years of subsidized salary for the person. Refusal to "top off" because it does not contribute to sustainable institution building makes institution building objectives very expensive.

Finally, it should be noted that accelerated turnover does not necessarily imply a cutoff in total assistance as soon as possible. It is conceivable that the optimal program consists of eight expatriates in the first year which are reduced to three by the fourth year and then maintained at that or a slightly reduced level for another five years. These

matters surely deserve more careful thought than can be supplied by this issues paper. The principal objective here is to raise the issues for the overall evaluation which surely must take place.

2. Participant Training, Including English Language, Short and Long-Term Out-of-Country and In-Service Training

Potential. The objective of this activity is to provide the skilled personnel required for increasing the capacity of Yemeni agricultural institutions to provide better services to their clients. Training programs present one of the few opportunities for direct donor action to relax one of the most pervasive and severe constraints inhibiting Yemeni agricultural development. U.S. based and English language training programs also offer a rare opportunity for Yemeni to become intimately acquainted with American institutions and values. The MOA has emphasized that English language training is also needed to give their personnel access to the technical information, correspondence, and verbal skills required to carry out their daily tasks.

Beneficiaries. The direct beneficiaries of the activity are the Yemeni selected for training opportunities. Indirect beneficiaries are the clients of agricultural institutions who receive improved services as a result of better trained personnel.

Technical Analysis. There are few risks associated with sponsoring long-term out-of-country training. Reputable American universities are skilled at evaluating student credentials and at providing education to those found qualified. There is virtually no risk that these trainees will be unable to return to useful occupations in Yemen; Yemen's absorptive capacity for skilled personnel is so large that any conceivable number of graduates will be utilized in either the public or private sector. There is considerable risk that returnees

will opt for private employment in Yemen or elsewhere on the Arabian Peninsula rather than return to public institutions. (The determinants of the ability of government to compete for graduates is discussed below.) There is some uncertainty about how many Yemeni possess the educational background required for out-of-country degree programs, but this does not necessarily imply that programs should initially be restricted in size. One approach which has much to recommend it is to launch a large scale recruiting program in order to identify and offer training to all qualified students. If insufficient numbers of qualified students are found or if institutions are unwilling to release existing qualified employees for out-of-country training, unspent funds can be allocated to other, lower priority activities.

If insufficient numbers of qualified students are available for degree programs and/or if specialized nondegree training is considered more cost efficient, short-term nondegree programs should be considered. The success of such programs is more likely to depend on the project's ability to evaluate the needs and the abilities of candidates and to direct candidates to appropriate courses. For degree programs the universities can be relied upon to evaluate students' credentials and to offer appropriate training. In the case of nondegree programs, it is much more important that the capacity to perform these functions be built directly into the Core Subproject. It should be recognized that the cost savings associated with short-term programs are less substantial if students require English language capability before participating. Since developing English language capability is relatively expensive and time consuming, it may turn out that after making such an investment, it would be best to send the student for long-term training.

A necessary prerequisite for successful in-service training is a careful assessment of training needs and intensive monitoring of in-service training

efforts to ensure that training objectives are being accomplished. If these conditions are met, in-service training can be an extremely cost effective way to solve specific personnel requirements that inhibit the effectiveness of institutions.

Required YARG Contributions. The success of this activity requires substantial support from the YARG. The YARG must participate in identifying students for training and, if they are currently employed by the government, be willing to release them from their existing responsibilities while continuing to compensate them. It appears that the YARG is willing to meet these requirements, at least within rather broad limits, for the YARG certainly understands the acute need for trained personnel. If institution building efforts are to be successful, the YARG must find a way to create sufficient financial incentives to induce returning trainees to accept positions with public institutions. It is also necessary that the existing bureaucracy be sufficiently flexible that skilled personnel are allowed to function effectively. It is not certain that the YARG will be able to compete for the services of returning trainees. While substantial progress has been made recently to raise government salaries, the YARG still finds it necessary to insist that returnees from YARG sanctioned training programs are obligated to accept public service employment. It is inevitable that such policies will result in lowered morale and in high turnover as returnees eventually find a way to evade these requirements.

Activity's Dependence on Particular Socio-Economic Conditions for Success. Many of the skills learned in training programs are applicable to a wide set of socio-economic conditions and employment opportunities. Indeed, certain types of training are among the most flexible of capital "investments". Skills made available to trainees often increase the trainee's productivity in a wide set of environments and even increase the person's ability to respond effectively

to environmental changes. Thus it can be argued that general purpose training represents the best possible response to uncertainty about future conditions.

Training efforts which seek to increase agricultural skills, on the other hand, are heavily dependent for their success on the assumption that agriculture will remain a viable industry. And the more specific the agricultural skills learned, the more likely that those skills will be rendered less valuable by different economic conditions which demand different technologies.

In summary, the value of training is not necessarily dependent upon a particular set of socio-economic conditions. Whether existing training is made obsolete by changed conditions depends very much on the nature of that training.

Dependence on Other 0052 Activities. Of all the activities listed in Table 1, long-term out-of-country training is least dependent for its success upon the complementary effects of other 0052 efforts. If the project is willing to rely heavily upon U.S. universities for admission standards and for training content, very little support is needed. The activity could be supervised by a part-time training officer whose principal functions would be to obtain from the YARG lists of nominees and to assist the nominees with the process of gaining admission to a university and solving the logistics problems of embarking for the United States. While the effectiveness of returning trainees might be increased marginally by the existence of USAID institution building efforts in Yemen, it is arguable that the most cost effective way to solve problems of reentry is to provide training which will allow the returnees to solve these problems for themselves.

Since it is less likely that selection for short-term out-of-country training can be successfully delegated to university admission offices, more inputs from the training officer are required to ensure success. The information needed to identify YARG personnel for short-term training and to determine the

most suitable type of training would naturally be available to expatriates assisting with institution building efforts. This would also be true for the information needed to carry out successful in-service training efforts. Thus short-term out-of-country and in-service training efforts have the best chance for success if they are managed by personnel engaged in institutional support efforts.

It is unknown at this time whether the English language training activity requires the support of other 0052 activities. It is possible that little effort is required to recruit students and that a reliable contractor can be found to assume complete responsibility for implementation. If, on the other hand, a qualified contractor is unavailable at reasonable cost, it would be necessary for the 0052 support function to mount a major effort to organize, staff, and administer English language training courses.

Alternatives to the Level of Support Represented in Table 1. Cost reducing alternatives to be considered include (a) reduced program size; (b) substitution of short-term out-of-country training, in-service training, conferences, and seminars for long-term out-of-country training; (c) utilization of Arab language training institutions rather than English language institutions; and (d) special incentives to trainees for early completion.

a. Reduced Program Size. It is feasible to operate training programs at different levels. The size of the program could be reduced by limiting participation to any particular number of participants, including zero. Since candidates who are best able to benefit from training are likely to be the first to be included, large scale training programs experience diminishing returns in comparison to smaller training programs.

As USAID assistance changes, other donors could be expected to partly offset USAID efforts. For example, IBRD funds currently finance short and

long-term out-of-country training for MOA personnel. An increase in USAID assistance to the levels reflected in Table 1 will surely result in a reduction or reallocation of IBRD resources in Yemen. Several Arab countries have determined they can make a contribution to Yemen's development by allocating Bachelor of Science training positions in their own universities for Yemeni students. In the absence of USAID assistance for B.S. trainees, it is not inconceivable that sufficient Arab scholarships would be available to finance the education of almost every qualified Yemeni student. It is less obvious that Arab scholarships could substitute for planned USAID assistance for M.S. study, especially when effectiveness is measured by quality as well as quantity.

b. Substitution of Short-Term Out-of-Country Training, In-Service Training, Conferences, and Seminars for Long-Term Out-of-Country Training. A carefully designed and well managed program of short-term out-of-country and in-service training supplemented occasionally with in-country conferences and seminars could be an effective substitute for much of the planned long-term out-of-country training. While trainees would not receive the credentials which accompany B.S. and M.S. training, a series of shorter training experiences might result in nearly the same improvement in job performance. Another advantage of this approach is that potential MOA personnel would spend less time out-of-country and thus would be available for longer periods of duty in Yemen institutions.

c. Utilization of Arab Language Training Institutions Rather than English Language Institutions. The need for English language competency as a prerequisite for out-of-country training imposes considerable costs and results in substantial delays in completion of training. Building sufficient

English language capability can easily absorb one year of time and sufficient resources to finance an entire year of out-of-country training. Tuition and maintenance costs also differ by several orders of magnitude with approximately \$3,000 required per annum for an Egyptian agricultural university and \$11,000 required for a B.S. program in the United States. Whether these substantial differences in costs can be justified depends on one's assessment of quality differences in educational programs and of the value to the United States of Yemeni with a command of the English language and an opportunity for firsthand exposure to America.

d. Special Incentives to Trainees for Early Completion. The possibility of financial incentives for early completion of training programs for agricultural secondary school Yemeni faculty were discussed on page 29. Such a possibility is equally relevant (or irrelevant) to all out-of-country training programs.

3. Direct Assistance to Yemeni Farmers

Potential. This category of assistance is the only one from Table 1 which directly benefits lower income persons and the only one except for participant training whose benefits accrue directly to Yemeni individuals. This report has previously identified the problems Yemeni farmers face in using their resources efficiently to increase agricultural production and earned income. Given the dynamic entrepreneurship and the openness to new approaches which is characteristic of many Yemeni farmers and the many known opportunities for increasing productivity, teams of CID specialists from the On Farm Water Management and Subsistence Farms activities could, within two or three years, have a major impact on the production and profits of cooperator farmers. In addition, longer term efforts to train Yemeni extension agents and to assist MOA officials

could succeed in institutionalizing within the Yemeni extension system the capability of providing similar assistance to large numbers of farmers throughout Yemen. The Integrated Watershed Management activity aims at nothing less than demonstration in the long run of an incentive capable approach to halting soil erosion, reforesting cut over areas, and restoring the productivity of the land.

Beneficiaries. Directly benefiting from these activities will be farmers who volunteer to accept assistance from team field specialists and those who attend demonstrations. Possible indirect beneficiaries are farmers who learn of superior agricultural techniques from their neighbors and the extension trainees who receive personal satisfaction and/or financial rewards from association with the activity. In the longer run a great many Yemeni farmers may benefit from the improved agricultural practices being demonstrated by the Yemeni extension system. The primary beneficiaries of the Integrated Watershed Management activity are likely to be rural dwellers in the next generation.

Technical Analysis. Included in this effort is assistance to farmers who use groundwater for irrigation, to farmers in rainfed areas, and to villagers who need assistance in providing firewood and forage and in controlling soil erosion. Because of differences among these activities each will be discussed separately. Common issues will be raised in the final paragraphs.

The On Farm Water Management activity is scheduled to emphasize in the beginning techniques for field leveling, optimal timing patterns for field irrigation, and use of soil probes for determining optimum application of irrigation water. Design Team members generally agree that this activity offers greater prospects for immediate increases in agricultural production than any other possible activity. Team specialists should succeed within two or three years in assisting cooperator farmers to make major progress in water use. Since these techniques are scale neutral and require at most a few more hours

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of farmers' time and simple equipment, every category of farmer (large, small, owner-operator, tenant) can benefit from these techniques. Once these techniques have been accepted and applied, team personnel will turn to more complicated farming systems issues including cropping patterns, fertilizer use, and changes in field size. Without special attention to credit availability, landholding patterns, and marketing problems, some farmers may not be able to benefit from these assistance efforts. It is also probable that additional results at this stage will be more difficult to achieve and more sensitive to activity design and skill of team members. Reduced certainty about effectiveness also applies to team success in training Yemeni extension service counterparts.

The proposed Subsistence Farms Development and Management Subproject will apply a farming systems approach to the problems of small (less than two hectares) farms, an activity which will devote most of its attention to rainfed agriculture. The subproject will first offer assistance to producers of sorghum and then eventually move toward a more comprehensive farming systems approach. As with the On Farm Water Management activities, initial gains are more certain than those anticipated for later stages of the activity.

The starting point for design of the Integrated Watershed Management activity is the assumption that village demands for forage and fuel must be satisfied before soil erosion can be halted and the process of land restoration can begin. Because the Integrated Watershed Management activity deals with problems of soil erosion, rangeland restoration, and reforestation, its time horizon is necessarily long. Three to five years will be required before significant results are visible. Since this activity addresses problems of use of village common areas for forage and fuel, its success requires cooperation of several farmers, perhaps of entire villages. This need for collective effort will surely result in delays and perhaps even in failure. The prospective long run

gains, however, are enormous. The activity attempts nothing less than demonstration of an incentive capable approach to solve the serious problem of deforestation and soil erosion.

Staffing each of these activities will likely prove more difficult than for any other proposed 0052 activities. Since team members must communicate directly with farmers, it is essential that they be able to speak and understand Arabic early in the life of each activity. The remote location of two of the activities, On Farm Water Management and Integrated Watershed Management, are such that team members will likely be unable to maintain their principal places of residence in Sana'a or Taiz. To be located away from either Sana'a or Taiz means that acceptable schools for dependents and elementary health care will not be available nearby. Morale problems are inevitable as team members and their family members will not have ready access to members of the international community in Yemen. The On Farm Water Management team will surely be forced to live in the Tihama where high temperatures, high humidity, and blowing dust result in living conditions which many consider intolerable. These problems will be exacerbated if USAID/Yemen is unable to obtain approval for decent housing (such as large mobile homes) for team members. It seems to be the informal consensus of 1979 and 1980 Design Team members that staffing problems may be so serious as to undermine the viability of the proposed On Farm Water Management activity. In short, it may turn out to be impossible to staff the activity with the greatest potential for quick improvements in agricultural productivity.

Required YARG Contributions. Direct benefits to farmers from contact with team members require only that the YARG grants permission to work with Yemeni farmers. Extensive YARG cooperation, participation, and financial resources are required, on the other hand, if the Yemeni extension system is to acquire

eventually the capacity to provide these services to the farmers without outside assistance. To the extent that CID teams are unable to reach all farmers directly or indirectly through farmer-to-farmer communication channels, extensive YARG participation in institution building is required if the activities are to be successful. It is unknown at this time what the level of YARG participation will be. The MOA has not indicated that it is unwilling to participate. On the other hand, the author cannot recall a single instance in which a Yemeni official has initiated the suggestion that USAID assist the YARG with these problems. While MOA officials sometimes nod enthusiastically when the activities are mentioned, another familiar response is neither agreement nor disagreement. MOA officials on at least one occasion urged CID to consider additional effort in the highlands and to deemphasize the Tihama, a suggestion which conflicts with Design Team assessments of where the greatest opportunities for assistance lie.

Activity's Dependence on Particular Socio-Economic Conditions for Success.

Since these activities concentrate on water use and upon farming systems approach to extension efforts, they are unlikely to be undermined by socio-economic changes. It is unlikely that water will become so abundant that its efficient use becomes unimportant; if anything, water will become more scarce. The essence of a farming systems approach is to assist the farmer in identifying and using the factor proportions, cropping patterns, and agricultural techniques which are most appropriate for prevailing conditions. A farming systems approach will assist farmers in adapting to any environment. Only if conditions make agriculture unprofitable under any circumstances will socio-economic changes undermine the success of these activities.

Dependence on Other 0052 Activities. The direct assistance aspect of the activities will require logistical support from Project 0052. The institution building aspects, on the other hand, will require extensive training efforts,

regular communications, and close coordination with the MOA, and probably also some of the institutional support efforts evaluated below. In brief, these activities, if they are to be institutionalized, require major 0052 efforts on most fronts.

Alternatives to the Level of Support Represented in Table 1. Among the cost reducing alternatives to be considered are (a) reduced staffing and (b) concentration on assistance to the Yemeni extension system.

a. Reduced Staffing. Except for the On Farm Water Management activity where Table 1 expenditure levels presume support for two distinct teams, it is not possible to reduce expenditures significantly without destroying the teams' abilities to provide effective assistance to farmers. Rather than reduce team size, it would seem best to abandon entire activities. It is possible to combine the Subsistence Farms and On Farm Water Management activities to field two teams with one team concentrating on the highlands and the second team located in the Tihama. Two teams, each consisting of two and one-half persons, plus a plant breeder could be fielded for \$2,000,000 in FY 82. Adding or eliminating Subsistence Farm and On Farm Water Management teams is unlikely to provoke offsetting responses on the part of other donors. Direct extension assistance to Yemeni farmers has never been popular among foreign donors and it is unlikely that USAID decisions will affect the activities of other donors. This is not necessarily the case with the Integrated Watershed Management activity. There is a possibility that the Livestock Credit and Processing Project may decide to devote its considerable resources to range management. The approach to intervention now being considered by the Livestock Credit and Processing Project is remarkably similar to that envisaged in the draft Agricultural Water Resources Project Identification Document for the

Integrated Watershed Management activity. Before design of this activity proceeds much further, someone should assess the likely extent of the LCPP effort and offer a judgment on whether additional Project 0052 efforts are warranted.

b. Concentration on Assistance to the Yemeni Extension System. Staffing levels and projected costs for these activities could be reduced considerably if direct assistance to farmers was abandoned and efforts were directed toward equipping the Yemeni extension system to carry out these activities. Using the Yemeni extension system to make direct contact with farmers might allow budgets to be cut by as much as two-thirds. A possible approach to On Farm Management would be to delay implementation until 1985 when the first graduates of the Surdud Agricultural Secondary School would become available to offer simple on farm water management techniques to farmers. It is conceivable that the Yemeni extension system could eventually develop the capacity for teaching farmers simple techniques without direct 0052 assistance to farmers. It is less likely that Yemeni extension personnel will succeed in providing comprehensive assistance in applying optimal farming systems within the next five - eight years. The level of sophistication required for such efforts is clearly beyond the capabilities of existing extension personnel.

4. Institutional Support for the MOA and MOE

Potential. With direct assistance it would be possible to improve the functioning of the MOA and MOE during the interim until sufficient Yemeni are trained and recruited to plan, implement, and manage government services without outside assistance. Effective institution building efforts will also create institutional policies and practices which will allow these new Yemeni

personnel to function effectively. Special areas for assistance include MOE requirements to plan for, open, and manage agricultural secondary schools. The MOA could benefit from assistance in agricultural policy analysis and planning, particularly during preparation of the next five year plan. It is hoped in addition that the Core Team can succeed in helping the MOA to understand that policy analysis, planning, and evaluation is a continuous process and that a permanent capacity to carry out these functions is needed. Perhaps the greatest opportunity for improvement in YARG policy making lies in the area of water policy. It appears that uncontrolled competition for groundwater supplies is depleting nonreplaceable water resources at a rapid rate. The MOA has urgently requested USAID technical assistance in helping it take the leadership in establishing a national water policy for the Yemen Arab Republic. There is a possibility that USAID assistance can play a crucial role in helping to allocate rationally over time the nation's scarce water resources. It is hoped that CID and the MOA will be able to establish a long-term relationship which will endure beyond the 0052 phases sustained by USAID funding. This long-term relationship will give the MOA access at any time to the broad spectrum of expertise and training opportunities which American land grant universities have to offer. In addition to these opportunities to improve the functioning of public institutions in supporting agricultural development, this activity probably represents USAID's best opportunity to establish visibility and maintain a presence at the ministerial level within the YARG.

Beneficiaries. Indirect recipients of benefits are the clients of agricultural institutions who receive improved services as the result of institutional support efforts.

Technical Analysis. Success in providing institutional support will depend in great part upon the judgment and political skills of the Core Team members

charged with responsibility for this activity. The difficult task of earning the trust and confidence of MOA officials is complicated by the presence of an IBRD advisory group in the MOA who appear to be overly jealous of their privileged positions and perhaps uneasy about their own personal futures. It is possible that timely assistance with inventorying Yemen's water resources and advice on the formulation of a national water policy will go a long way toward earning the required trust and confidence of MOA officials.

USAID will have less control over the outputs of their institutional support efforts than is customary for USAID activities. Core Team members involved in institutional support will necessarily serve in an advisory capacity in the MOA. In this position they cannot reasonably expect to control the outputs which result from their technical studies and advice. Core Team members will inevitably become entangled in the day-to-day operating problems of the MOA including bureaucratic struggles with other agencies and details of managing state farms as well as with decisions on national water policy. They cannot expect to remain aloof from the bureaucratic chores while reserving their efforts for preparing their counterparts for epochal policy choices. Neither can they be certain that their inputs will not be used in support of some disastrous policy choice or to the disadvantage of individual Yemeni deserving of assistance.

For better or worse, institutional support for the YARG will necessarily be a force for centralized control. Power and decision making in Yemen is decentralized in part because the YARG lacks the capacity to plan and implement policies, including policies which intervene in and replace private decision making. Successful institutional support will increase the capacity of the YARG to carry out such policies.

The design of this activity presumes that USAID will delegate to the contractor the authority to deal on a day-to-day basis with the YARG without close

USAID supervision. If USAID chooses to participate in all contractor-YARG discussions on a day-to-day basis, it will be necessary for USAID to assign a USAID/Yemen officer who is available to share MOA offices with the Core Team on a six-day-a-week basis. Perhaps it goes without saying that it will be extremely difficult to evaluate ex post success of institutional support efforts. The net contribution of such assistance is virtually impossible to measure from conventional objective data.

Required YARG Contributions. YARG officials must trust Core Team members, admit them into their confidence and decisionmaking circles, and understand what kinds of assistance the Core Team offers.

Activity's Dependence on Particular Socio-Economic Conditions for Success. Assumptions underlying this activity are that agriculture will remain a viable sector and that improved public services can contribute to increases in agricultural productivity. As long as these conditions exist, the Core Team can adapt its assistance so that it is appropriate for prevailing socio-economic conditions.

Dependence on Other 0052 Activities. The success of this activity is highly dependent upon receiving support from other 0052 activities. It is most likely that the 0052 program must achieve success in some other activity such as the Ibb school or On Farm Water Management (or be perceived as instituting greatly desired activities) before its offer of institutional support is accepted. If institutional support is to be phased out, training assistance must be available to develop the trained personnel who will eventually perform the functions with which the Core Team assists.

Alternatives to the Planned Level of Support Represented in Table 1. There are no compelling reasons why any one of the activities listed in Table 1 under institutional support require that the other activities be supported. It should

also be possible to operate any of the activities at any particular level. For example, the Water Inventory and Policy activity could absorb \$2,000,000 per year or it could be limited to a two week TDY visit of a water policy expert.

In the absence of detailed knowledge of YARG requirements and the way in which institutional support assistance will be utilized by the YARG, it is extremely difficult to estimate the marginal productivity of adding additional TDY or full-time personnel to the Core Team. It is likely that only well informed individuals such as the Country Program Director will possess the information needed to make this judgment. There does exist a notion that "sweetners" such as the Agricultural Documentation Center and technical backstopping services are needed to induce the MOA to accept policy assistance, but this remains an untested hypothesis.

5. Project Design and Mobilization

This activity is so familiar to readers that to discuss it would be to belabor the obvious. Only one point will be made. If available 0052 resources are fully allocated to other activities, it would be a waste of resources to design and mobilize other activities for which financing is unavailable. Given existing budget constraints and design schedules it is likely that project design and mobilization efforts will be needed for FY 81 but not for FY 82.

6. Support for All Subprojects

Insufficient support will surely doom any 0052 activity to failure. Each activity requires representation at the highest levels of the MOA or MOE, regular communication with operating elements of the ministries, periodic monitoring and evaluation, and day-to-day managerial and logistic support. The appropriate levels for such support are managerial problems which are best considered elsewhere. Consideration of these matters will end with the observation that the

requirements for support services are roughly proportional to the number of 0052 personnel in Yemen, and that the \$2,297,000 level reported in Table 1 is probably more than sufficient to support an \$8,600,000 FY 82 program.

Choosing Among Activities to Select a Program

The preceding sections offered a discussion of individual activities which was intended to assist the reader in forming judgments about possible payoffs and potential difficulties for each activity. While that discussion is relevant to the problem of choosing a program, it is incomplete. Formulating a total program ultimately requires making choices among activities. It is necessary to compare one activity to another and determine their relative importance. This section offers examples of choices among activities.

Tables 3 - 10 summarize key options for resource allocation which satisfy (approximately) the \$8,600,000 FY 82 "optimum" budget limitation. Among the options are:

- (1) Activities for which approved or draft subproject papers exist (Table 3),
- (2) Maximum direct assistance to Yemeni farmers plus the participant training and institution building efforts needed to create YARG capacity to continue the efforts (Table 4),
- (3) Maximum commitment to participant training and to institution building in agricultural education (Table 5),
- (4) Maximum commitment to institutional support for the MOA accompanied by one highly visible field activity (Table 6),
- (5) Maximum commitment to natural resources conservation and restoration (Table 7),
- (6) YARG's preferred activity set (Table 8),

Table 3

OPTION 1

Activities for which Approved or Draft Subproject Papers Exist

<u>Function</u>	<u>Amount (\$000)</u>	<u>Amount as Proportion of Total</u>
Educational Institutions and Participant Training	\$ 3,413	.40
Agricultural Secondary Education (without PT*)	1,983	.23
Ibb	1,983	.23
Surdud	-0-	.00
Sana'a	-0-	.00
Saadah	-0-	.00
Faculty of Agriculture	-0-	.00
Participant Training	1,430	.17
Core	872	.10
Ibb	514	.06
Surdud	-0-	.00
Subsistence Farming	44	.00
On Farm Water	-0-	.00
Integrated Watershed	-0-	.00
Water Inventory and Policy	-0-	.00
Direct Assistance to Yemeni Farmers (without PT)	1,390	.16
Subsistence Farming	1,390	.16
On Farm Water	-0-	.00
Integrated Watershed	-0-	.00
Institutional Support to MOA and MOE	1,028	.12
Water Inventory and Policy	-0-	.00
Policy Analysis and Planning for MOA & MOE	771	.09
Agricultural Documentation Center	47	.00
Technical Backstopping Services to the MOA	210	.02
Project Design and Mobilization	403	.04
Support for all Subprojects (overhead costs)	<u>2,297</u>	<u>.27</u>
TOTAL	\$ 8,531	1.00

* PT = Participant Training

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Table 4

OPTION 2

Maximum Direct Assistance to Yemeni Farmers Plus the
Participant Training and Institution Building Efforts Needed
To Create YARG Capacity to Continue the Efforts

<u>Function</u>	<u>Amount (\$000)</u>	<u>Amount as Proportion of Total</u>
Educational Institutions and Participant Training	\$ 844	.10
Agricultural Secondary Education (without PT*)	-0-	.00
Ibb	-0-	.00
Surdud	-0-	.00
Sana'a	-0-	.00
Saadah	-0-	.00
Faculty of Agriculture	-0-	.00
Participant Training	844	.10
Core	400	.05
Ibb	-0-	.00
Surdud	-0-	.00
Subsistence Farming	44	.00
On Farm Water	300	.03
Integrated Watershed	100	.01
Water Inventory and Policy	-0-	.00
Direct Assistance to Yemeni Farmers (without PT)	5,560	.63
Subsistence Farming	1,390	.16
On Farm Water	2,780	.32
Integrated Watershed	1,390	.16
Institutional Support to MOA and MOE	400	.05
Water Inventory and Policy	-0-	.00
Policy Analysis and Planning for MOA & MOE	-0-	.00
Agricultural Documentation Center	-0-	.00
Technical Backstopping Services to the MOA	200	.02
Extension Administration	200	.02
Project Design and Mobilization	-0-	.00
Support for all Subprojects (overhead costs)	<u>2,000</u>	<u>.23</u>
TOTAL	\$ 8,804	1.00

* PT = Participant Training

Table 5

OPTION 3

Maximum Commitment to Participant Training
and to Institution Building in Agricultural Education

<u>Function</u>	<u>Amount (\$000)</u>	<u>Amount as Proportion of Total</u>
Educational Institutions and Participant Training	\$ 4,831	.64
Agricultural Secondary Education (without PT*)	3,118	.41
Ibb	1,983	.26
Surdud	1,135	.15
Sana'a	-0-	.00
Saadah	-0-	.00
Faculty of Agriculture (Design & Mobilization)	200	.03
Participant Training	1,713	.23
Core	1,000	.13
Ibb	514	.07
Surdud	199	.03
Subsistence Farming	-0-	.00
On Farm Water	-0-	.00
Integrated Watershed	-0-	.00
Water Inventory and Policy	-0-	.00
Direct Assistance to Yemeni Farmers (without PT)	-0-	.00
Subsistence Farming	-0-	.00
On Farm Water	-0-	.00
Integrated Watershed	-0-	.00
Institutional Support to MOA and MOE	500	.07
Water Inventory and Policy	-0-	.00
Policy Analysis and Planning for MOA & MOE	-0-	.00
Agricultural Documentation Center	-0-	.00
Technical Backstopping Services to the MOA	-0-	.00
Human Resources Policy, Planning, & Backstopping	500	.07
Project Design and Mobilization	-0-	.00
Support for all Subprojects (overhead costs)	<u>2,000</u>	<u>.27</u>
TOTAL	\$ 7,531	1.00

* PT = Participant Training

Table 6

OPTION 4

Maximum Commitment to Institutional Support for MOA
Accompanied by One Highly Visible Field Activity

<u>Function</u>	<u>Amount (\$000)</u>	<u>Amount as Proportion of Total</u>
Educational Institutions and Participant Training		
Agricultural Secondary Education (without PT*)		
Ibb		
Surdud		
Sana'a		
Saadah		
Faculty of Agriculture	-0-	.00
Participant Training	1,372	.16
Core		
Ibb		
Surdud		
Subsistence Farming		
On Farm Water		
Integrated Watershed		
Water Inventory and Policy		
Field Activity	500	.06
Direct Assistance to Yemeni Farmers (without PT)		
Subsistence Farming		
On Farm Water		
Integrated Watershed		
Institutional Support to MOA	3,028	.36
Water Inventory and Policy	2,000	.24
Policy Analysis and Planning for MOA	771	.09
Agricultural Documentation Center	47	.01
Technical Backstopping Services to the MOA	210	.03
Project Design and Mobilization		
Support for all Subprojects (overhead costs)	2,000	.24
One Highly Visible Field Activity (e.g., Ibb or Subsistence Farms--On Farm Water)	<u>2,000</u>	<u>.24</u>
TOTAL	\$ 8,400	1.00

* PT = Participant Training

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Table 7

OPTION 5

Maximum Commitment to Natural Resource Conservation and Restoration

<u>Function</u>	<u>Amount (\$000)</u>	<u>Amount as Proportion of Total</u>
Educational Institutions and Participant Training	\$ 500	.06
Agricultural Secondary Education (without PT*)	-0-	.00
Ibb		
Surdud		
Sana'a		
Saadah		
Faculty of Agriculture		
Participant Training	500	.06
Core		
Ibb		
Surdud		
Subsistence Farming		
On Farm Water		
Integrated Watershed	500	.06
Water Inventory and Policy		
Direct Assistance to Yemeni Farmers (without PT)	4,000	.47
Subsistence Farming	-0-	.00
On Farm Water	-0-	.00
Integrated Watershed	2,000	.24
Pilot Project on Terrace Maintenance	2,000	.24
Institutional Support to MOA and MOE	2,000	.24
Water Inventory and Policy	2,000	.24
Policy Analysis and Planning for MOA & MOE	-0-	.00
Agricultural Documentation Center	-0-	.00
Technical Backstopping Services to the MOA	-0-	.00
Project Design and Mobilization	-0-	.00
Support for all Subprojects (overhead costs)	<u>2,000</u>	<u>.24</u>
TOTAL	\$ 8,500	1.00

* PT = Participant Training

Table 8

OPTION 6

YARG's Preferred Activity Set

<u>Function</u>	<u>Amount (\$000)</u>	<u>Amount as Proportion of Total</u>
Educational Institutions and Participant Training	\$ 4,118	.47
Agricultural Secondary Education (without PT*)	3,118	.35
Ibb	1,983	.22
Surdud	1,135	.13
Sana'a	-0-	.00
Saadah	-0-	.00
Faculty of Agriculture	-0-	.00
Participant Training	1,000	.12
Core		
Ibb		
Surdud		
Subsistence Farming		
On Farm Water		
Integrated Watershed		
Water Inventory and Policy		
Direct Assistance to Yemeni Farmers (without PT)	-0-	.00
Subsistence Farming		
On Farm Water		
Integrated Watershed		
Institutional Support to MOA and MOE	2,700	.31
Water Inventory and Policy	2,000	.23
Policy Analysis and Planning for MOA & MOE		
Agricultural Documentation Center	100	.01
Technical Backstopping Services to the MOA	400	.05
Contingency Fund for Financial Emergencies	200	.02
Project Design and Mobilization		
Support for all Subprojects (overhead costs)	<u>2,000</u>	<u>.23</u>
TOTAL	\$ 8,818	1.00

* PT = Participant Training

Table 9

OPTION 7

Something of Everything

<u>Function</u>	<u>Amount (\$000)</u>	<u>Amount as Proportion of Total</u>
Educational Institutions and Participant Training	\$ 3,500	.41
Agricultural Secondary Education (without PT*)	2,000	.24
Ibb		
Surdud		
Sana'a		
Saadah		
Faculty of Agriculture		
Participant Training	1,500	.18
Core		
Ibb		
Surdud		
Subsistence Farming		
On Farm Water		
Integrated Watershed		
Water Inventory and Policy		
Direct Assistance to Yemeni Farmers (without PT)	2,000	.24
Subsistence Farming		
On Farm Water		
Integrated Watershed		
Institutional Support to MOA and MOE	1,000	.12
Water Inventory and Policy		
Policy Analysis and Planning for MOA & MOE		
Agricultural Documentation Center		
Technical Backstopping Services to the MOA		
Project Design and Mobilization		
Support for all Subprojects (overhead costs)	<u>2,000</u>	<u>.24</u>
TOTAL	\$ 8,500	1.00

* PT = Participant Training

Table 10

OPTION 8

Lean Funding of Each Activity in FY 82 with Design and
Mobilization Efforts which will Allow Rapid Program Expansion in FY 83

<u>Function</u>	<u>Amount (\$000)</u>	<u>Amount as Proportion of Total</u>
Educational Institutions and Participant Training	\$ 3,700	.44
Agricultural Secondary Education (without PT*)	1,500	.18
Ibb		
Surdud		
Sana'a		
Saadah		
Faculty of Agriculture		
Participant Training	2,200	.26
Core		
Ibb		
Surdud		
Subsistence Farming		
On Farm Water		
Integrated Watershed		
Water Inventory and Policy		
Direct Assistance to Yemeni Farmers (without PT)	1,500	.18
Subsistence Farming		
On Farm Water		
Integrated Watershed		
Institutional Support to MOA and MOE	500	.06
Water Inventory and Policy		
Policy Analysis and Planning for MOA & MOE		
Agricultural Documentation Center		
Technical Backstopping Services to the MOA		
Project Design and Mobilization	800	.09
Support for all Subprojects (overhead costs)	<u>2,000</u>	<u>.24</u>
TOTAL	\$ 8,500	1.00

* PT = Participant Training

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- (7) Something of everything (Table 9), and
- (8) Lean funding in FY 82 activities with design and mobilization efforts which will allow rapid program expansion in FY 83 (Table 10).

Option One identifies activities for which approved or draft subproject papers exist. This option represents a default position. In the absence of additional initiatives, Option One will most likely be carried out. It should also be understood that the YARG has been apprised of the staffing levels reflected in Option One budget data and may take exception if these activities are eliminated or reduced in scope. For these reasons, Option One has to be considered a likely outcome.

Option Two, Three, Four, and Five budget maximum efforts in activities for direct assistance to farmers, participant training and institution building in agricultural education, institutional support for the MOA, and natural resources conservation and restoration, respectively. In each case the proposed budgets take into account the particular interdependencies of each activity with other 0052 sponsored activities. These interdependencies were identified in an earlier section of the paper. It is assumed that \$2,000,000 is sufficient to provide managerial, administrative, and logistic support in each case.

Option Six represents an effort to quantify YARG preferences for USAID assistance. Such an effort is difficult, for the YARG, of course, does not speak with one voice. For example, neither MOE nor the MOA officials would likely agree on the allocation of resources between agricultural secondary education which is under the supervision of the MOE, and remaining activities, which are targeted on MOA concerns. Option Six reflects the MOA's expressed concern that assistance with water inventory and policy has been assigned the highest priority. It also reflects the author's assessment that the MOA is

little interested in using USAID resources for direct assistance to Yemeni farmers and to institution building in the field, such as in the extension system. The large allocations for the Agricultural Documentation Center, technical backstopping, and contingency fund for financial emergencies reflect expressed concerns of a large number of MOA officials.

Option Seven is an example of spreading resources thinner across different activities in order to include each major activity. (It is revealing to compare Options One and Seven. They are quite similar.) A suboption (not included in Table 9) would be to further spread resources among more projects by using budget allocations for individual activity areas to fund a larger number of subactivities. For example, the \$2,000,000 allocated to staffing agricultural secondary schools could be stretched to allow expatriate staffing and participant training for both the Ibb and Surdud schools. The \$2,000,000 allocation for direct assistance to Yemeni farmers could be used to finance components of both the Subsistence Farms Development and Management Subproject and the On Farm Water Management Subproject.

Option Eight consists of operation of Option Seven on a skeletal basis for FY 82 with the savings used to lay the foundations for rapid program growth in FY 83. The funds saved by reducing the Option Seven budget are used for the design, mobilization, and preproject participant training required to permit rapid program expansion in FY 83. (The reader may have noted that Options Two through Seven exclude project design and mobilization funds on the assumption that FY 83 total allocations will not provide sufficient resources for program expansion.)

The Possibility of More Severe Budget Limitations

Options One through Eight were based on the assumption that about \$8 million

would be available to finance Project 0052 FY 82 activities. In fact, USAID's FY 82 budget submission requests an "optimum" expenditure level of \$8.6 million. The "most likely" budget level for FY 82, however, is only \$6.2 million. Thus there exists a very strong possibility that Project 0052 will be forced to adhere to a much more severe budget limitation than that indicated in Options One through Eight.

It is doubtful whether it is possible to pare down individual activities contained in Options One through Eight to the \$6.2 million level and still maintain a viable program. For example, it is difficult to imagine how it would be possible to reduce each of the activity expenditure levels in Option One by an average of 25% and still have a viable program. Decisionmakers should consider cutting out an entire activity such as participant training or Subsistence Farms Development and Management rather than try to operate each activity at such a low level as to ensure that none can succeed.

Possible Contributions of Other Donors in Financing Table 1 Activities

It is apparent that USAID funds sufficient to finance all the activities listed in Table 1 will not be forthcoming. Before concluding that some of these needs will go unmet, it is useful to consider whether other donors might be available to help to finance the activities listed in Table 1. Possible responses of other donors include displacement of existing or contemplated support as well as increased assistance. These responses are discussed below.

It is important to recognize that other donors are already engaged in activities listed in Table 1 and that others have at one time or other considered similar activities. Existing IBRD institution building efforts in the MOA and CARTO provide considerable participant training and institutional support to those organizations. It is possible that the net effect of USAID assistance in

these activities will be to displace IBRD expenditures with little net effect on total expenditures for participant training and institutional support. It is also possible that USAID support for the Integrated Watershed Management activity might result in the diversion of Livestock Credit and Processing Project funds from similar efforts. While only USAID has expressed interest in providing expatriate faculty and participant training for the agricultural secondary schools, it is conceivable that upon withdrawal of USAID support the IBRD or one of the Arab development funds would move to partially replace USAID efforts.

Other potential activities identified in the Baseline Study Field Report where other donors are likely to provide at least limited assistance in the future include credit systems and agricultural database development. The IBRD has long recognized the needs for such assistance and in the absence of efforts by other donors will provide at least partial support for these activities. (The IBRD institutional support team in the MOA apparently understands the displacement principle. They have on numerous occasions suggested that USAID assistance in agricultural database development would be welcome.)

Each of the cases mentioned above involves a sophisticated donor with confidence in its own capacity to identify Yemeni needs and to plan and implement its own assistance programs. Such donors are likely to have many more attractive assistance opportunities than there are funds to finance the opportunities. Under these circumstances USAID efforts are most likely to result in displacement of the efforts of other donors rather than in a significant augmentation of total effort. In particular there is, in the author's opinion, a nonnegligible probability that USAID efforts in Yemen will over the next five years displace IBRD and UNDP contributions. Because rapid income growth in Yemen has lifted per capita income levels above the cutoff points which the UNDP and IBRD use to identify countries with the greatest needs, those aid giving institutions are

reexamining their commitments to Yemen. If, simultaneously, USAID commitments to similar activities are increasing, the IBRD and UNDP will find it easier to redirect their assistance efforts to other countries. While this displacement effect is unlikely to reduce UNDP and IBRD inputs during the life of existing projects, renewal of project commitments is less likely.

There may exist other donors who would be willing to increase their assistance efforts to Table 1 activities as a result of USAID inputs. Donors who lack confidence in their ability to identify opportunities for assistance and to design and implement viable projects might be willing to increase their assistance to Yemen if they were offered the opportunity to participate in activities designed by USAID. Other donors with limited amounts of funds may also prefer to participate in large USAID designed activities rather than carry out their own small assistance programs. A list of such donors would include the Netherlands, Sweden, and several of the Arab development funds.

It is unlikely that CID efforts to identify and design attractive activities will in itself be sufficient to attract the participation of other donors. Specialists in grantsmanship are quick to point out that detailed knowledge of the interests (or, more exactly, whims in many cases) of potential donors is at least as important to success as carefully documented needs and well designed action programs. While CID Design Teams have been quite successful in identifying opportunities for assistance and are well advanced in designing assistance activities, they have acquired precious little knowledge about the interests and whims of the smaller, less sophisticated potential donors. Success in identifying other donors willing to participate in USAID designed programs will surely require much effort, most likely supplied by the Core Team. Two possible approaches to the problem include, first, contacting potential donors directly and, second, convincing the YARG to approach potential donors with specific

suggestions for assistance. Either approach, to be successful, would surely require expansion of the Core Team to staff these efforts.

Participation in any of the activities listed in Table 1 might appear attractive to potential donors. Other activities not included there which are worthy of donor consideration are credit assistance to small farmers, a program for repair and restoration of deteriorating terraces, the test wells and meteorological and stream flow monitoring equipment needed to expand the database required to model aquifers, and the capital and operating costs required to operate research stations. Serious consideration ought to be given to the question of whether Project 0052 should devote resources to the task of identifying potential donors and assisting them to find projects which are suited to their interests and capabilities.

IMPLICATIONS FOR AGRICULTURAL ASSISTANCE
OF ALTERNATIVE ECONOMIC DEVELOPMENT PROSPECTS
IN THE YEMEN ARAB REPUBLIC

by

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Introduction and Summary

The most striking characteristic of the Yemeni economy is change. In less than twenty years Yemen has changed from a closed society, which the ruling Imam controlled by limiting entry from the outside world, into an open society where hundreds of thousands of Yemeni workers move out of and into the country each year, where a vast array of imported goods are available in village suks, and where modern western technologies are eagerly embraced and sometimes indiscriminately applied to Yemeni situations. It is difficult to find any aspect of the Yemeni economy that has not been affected by these sweeping changes. Yemeni agriculture certainly has not been sheltered from rapid change. Indeed, changes in the rest of the economy have forced change upon agricultural producers. The purpose of this report is to attempt to identify the forces which will determine whether rapid change will continue in Yemeni agriculture and the future directions and extent of that change.

Current economic conditions in Yemen are dominated by the opportunities for Yemeni to work outside the country and by the availability of imported goods within Yemen. These conditions have a dominant influence on Yemeni wage rates, employment, earned income, and production, including the volume and composition of agricultural production.

When workers are willing to migrate in response to economic incentives, the most important influence on wage rates and earned income is likely to be economic conditions in the receiving countries, conditions which are beyond the influence of events in Yemen. Domestic employment and production, on the other hand, can be affected by policies applied within Yemen.

The principal beneficiaries of production oriented assistance efforts are those who have sources of income from other factors in addition to their raw labor inputs. When job opportunities at relatively high wages are abundant,

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poverty is attributable to large family size, poor health, age, preference, or lack of opportunity. Under these circumstances welfare programs, not assistance in raising production, are most likely to succeed in aiding the poorest of the poor.

Opportunities for foreign employment have dealt a double blow to Yemeni agricultural producers. Yemeni producers of internationally traded agricultural products have suffered from migration due to the resulting high wage costs and the favorable terms of trade (brought about by large remittances) which make imported goods cheap relative to domestically produced goods. As a result agricultural production has remained stagnant since 1973, in sharp contrast with nonagricultural output which has expanded rapidly in response to the sharp rise in the demand for nontraded goods fueled by rapid increases in income.

Whether differential growth rates between agricultural and nonagricultural sectors continue depends in part on whether the adjustment to the disturbance of 73-75 is largely completed. Evidence of recent convergence in sectoral growth rates suggests that the period of adjustment is nearing an end. In the absence of expanded opportunities for migration, the agricultural sector is the best candidate for the task of engine of expansion for continued economic growth. In particular, the prospects for increased agricultural production seem brighter than those for industry.

Under existing circumstances assistance to the agricultural sector is likely to be most successful if it concentrates on helping Yemeni farmers to economize on scarce factors, including labor and water, and in producing crops for which Yemeni producers have some protection from the rigors of international competition.

Plans for long term assistance efforts should be based not just on existing economic conditions but should also take into account possible future changes in those conditions. Among the alternative scenarios considered are changes in foreign assistance levels and changes in migration opportunities. Increases in wage rates on the Arabian Peninsula and increases in foreign assistance levels will tend to bring further increases in wage rates, further improvements in Yemen's terms of trade, and make it even more difficult for Yemeni agricultural producers to compete. Declining Arabian Peninsula wage rates, restrictions on migration, and decreased foreign assistance levels will lower wage rates, drive up the price of imported foods, and increase profit opportunities for Yemeni agricultural producers.

The precise effects of changes in real wages and in the terms of trade on the volume and composition of agricultural production depends heavily on the government's policy response to the loss of foreign exchange which will surely accompany deterioration in real wages and the terms of trade. Policy responses will largely determine the relative incentives for food exports, food import substitutes, and nonfood import substitutes. A very real danger for agricultural producers is that the government will attempt to use exchange controls or discriminatory tariffs to keep the price of imported foods low and, as a consequence, discourage agricultural production in Yemen.

The design of direct assistance to farmers is particularly sensitive to the underlying determinants of labor costs and composition of output. This is true when agricultural assistance takes the form of development of new seeds and plants and extension assistance with cropping patterns and other agricultural practices. The design of assistance in the form of improved farm water management techniques and training programs are, on the other hand, less sensitive to alternative scenarios.

Other scenarios considered are forced or self-imposed food self-sufficiency, gradual abandonment of preferences for a subsistence lifestyle and for local meats and cereals, and the deterioration of soil and water resources.

The most likely scenario is judged to be that of slightly declining real wages, a slight deterioration of Yemen's terms of trade and a slight increase in incentives for agricultural production. One cannot rule out the possibility of an abrupt deterioration of real wages and the terms of trade and sharp increases in agricultural incentives. While the implications of these forecasts for the volume of agricultural production are clear, the implications for the composition of agricultural production are clouded by an inability to predict the government's policy response to the loss of foreign exchange reserves and the response of Yemeni consumption patterns to declining real income. Thus it is difficult to recommend designs for agricultural assistance which are sensitive to the composition of agricultural output.

One possible approach to the design of agricultural assistance in the face of uncertainty about future events is to emphasize programs such as training and on farm water management whose success are less sensitive to uncertainty about future economic conditions. A second approach is to carry out a wide spectrum of agricultural research, which includes end products appropriate for a variety of environments, with the full understanding that some, perhaps most, of the products of research will not be economically viable in whatever environment happens to occur. Another component of the strategy is to build in capabilities for continuous program monitoring and redesign so that assistance efforts can be modified to reflect emerging conditions.

Prevailing Conditions: Wage Rates, Employment, Income, and Domestic Production
in an Economy Dominated by Internationally Mobile Labor and Goods

Economic conditions in Yemen are dominated by the international mobility of Yemeni labor and the mobility of international goods which flow into Yemen. This section identifies the expected effects of labor and goods mobility on Yemeni wage rates, employment, income and domestic production. Also identified are the implications of these results for the volume and composition of agricultural production in Yemen and for the design of an agricultural assistance program.

Employment opportunities for Yemeni are dominated by opportunities to work on the Arabian Peninsula. With the rapid growth of migration in the post-1972 period as Yemeni workers were lured outside the country by high wages, wage rates in Yemen have risen dramatically (see Table 10). In effect, wage rates in Yemen are determined by, and rise and fall in response to, wage rate changes on the Arabian Peninsula.

Even when wage rates are determined by outside influences, the levels of employment and production inside Yemen depend in large part upon local conditions. Since Yemeni wage rates are in effect determined by outside employment opportunities, the number of workers who choose to work in Yemen will be determined by the productivity of Yemeni land and capital stock and upon the demand for products such as services and specialized food crops (e.g., qat) which are unique to Yemen. Improved production techniques, and new products including fruits, vegetables, and qat which can compete with readily available imported goods, will result in increased employment in Yemen and reduced migration to jobs outside Yemen.

In an economy where unskilled labor is the single greatest productive asset, income of individuals is likely to be dominated by the level of the

wage rate. Thus, where labor is mobile, the most important influence on income is likely to be economic conditions in the receiving countries, conditions which are beyond the influence of events in Yemen. Under these circumstances relatively low family income can be traced directly to the lack of a sufficient number of able bodied males available to earn income for the family.

Assistance to the poorest of the poor in an economy with numerous job opportunities is not necessarily compatible with a commitment to increasing production and earned income. Since poverty can be attributed to a scarcity of available family workers, poverty must be attributed to large family size, poor health, age, preference, or lack of job opportunities. Only the latter can be alleviated by programs which increase production. If, for example, divorced women are discriminated against in village labor markets, special programs designed to assist these women as self-employed producers will help to raise their incomes. If farmers remain on the land to eke out a living because of a need to care for an ailing parent, to assist with management of family affairs, or because of a perceived inability to cope with problems which must be solved before outside employment can be found, a program of technical assistance to small farmers might allow them to increase their incomes¹. Even in these cases, however, abundant job opportunities nationwide will tend to ameliorate the plight of those with relative lack of opportunity. There is considerable evidence from many cultures that the relative position of those

¹ As a practical matter, when good jobs are abundant, it is very difficult to determine whether people remain in low paying jobs because of tastes or lack of opportunity. People who prefer the special diets, patterns of work and leisure, and traditional values associated with subsistence agriculture will choose to remain in the subsistence sector even if they knew how to find a job in Sana'a or Jeddah and if they did not suffer in those labor markets from discrimination. It is doubtful whether there exists data which would allow trained, objective observers to determine in many cases whether low income is due to tastes or to lack of opportunity.

who suffer discrimination because of race, caste, or marital status is most improved during periods when unskilled labor is scarce. When labor is scarce, employers find it extremely expensive to indulge their prejudices and consumers are less particular about who provides them with services. Also it should be noted that not everyone must leave their own communities to take advantage of expanded job opportunities. Migration by those most willing to relocate tends to create job opportunities in the sending communities, enabling those least willing to migrate to have access to either part-time or full-time high wage employment near home.

Consider the identity of the main beneficiaries of assistance efforts which raise production and earned income. Assistance which increases production (but which cannot alter wage rates) necessarily raises the incomes of immobile factors of production. For example, land rents rise as a result of natural resource conservation and the profits of entrepreneurs, including farmers, rise when they use more capital, more efficient technologies, or shift production to more profitable goods. Thus the principal beneficiaries of production-oriented assistance efforts are those who are likely to have sources of income from other factors in addition to their raw labor inputs.

Another point worth noting is that when employment opportunities are readily available, assistance programs are unlikely to make anyone significantly worse off. Anyone displaced from his occupation by the indirect effects of an assistance program will have access to other employment opportunities.

To summarize, when labor is mobile, job opportunities must be considered abundant. Under these circumstances, nonwelfare assistance programs are:

- (a) unlikely to affect the wellbeing of wage earners, a relatively large share of the population,
- (b) unlikely to lower significantly anyone's income, and

(c) likely to raise the incomes of owners of immobile factors and human capital, i.e., those relatively well off.

Labor mobility also has implications for the ability of Yemeni producers to compete in markets where goods are traded internationally. Migration and accompanying remittances result in abundant foreign exchange for purchasing imported goods. Yemeni producers of these internationally traded goods suffer doubly from migration due to the resulting high wage costs and the favorable terms of trade which make imported goods cheap relative to domestically produced goods.

The response of agricultural production to these shocks was to decline initially and then stabilize at approximately the production level of 72-73. Table 12 contains data on value added in 71-72 constant prices of the agricultural sector for the period 69-70 to 76-77. The data reveal a steady increase in production from 69-70 through 72-73 and a steady decline from 74-75 through 76-77. While national accounts data are not available for more recent years, production data on individual crops (see Table 4) reveal stability or moderate increases in output from 76-77 to 78-79. (If qat production were included, larger increases would result.) Revised data on fisheries output (see Table 8) reveals a sharp increase from 74-75 through 77-78. Recent data on livestock and forestry production is unavailable. Within the crops category there has been a substantial decline in production of sorghum/millet, barley, and cotton and sharp increases in production of maize, fruits, and vegetables.

The rate of growth of constant price nonagricultural value added accelerated between 72-73 and 76-77 to 13.4% annually in comparison with a 69-70 to 72-73 annual rate of growth of 9.0%. This rapid growth was led by the finance and banking sector with a 33% per annum rate of growth, construction at 17% per annum, trade at 14% per annum and government and industry at 13% annual growth rates.

It is apparent that increased work opportunities on the Arabian Peninsula after 72-73 had quite different effects on the agricultural and nonagricultural sectors. Agricultural output stagnated and nonagricultural production was stimulated to more rapid growth. As a result, agricultural output declined from 53% of Gross Domestic Product in 72-73 to 41% in 76-77.

Parallel events were occurring in sectoral employment. A World Bank Research Team has estimated that between February 1975 and February 1979 employment of Yemeni outside the country approximately doubled and nonagricultural domestic employment increased by 28%. During the same period agricultural employment declined by 13.5%. As a result of these changes agricultural employment declined from 57% of the national labor force to 40%.

The domestic production patterns of the last six years are precisely what one would expect when large increases in income are accompanied by greatly expanded availability of foreign exchange and on improved terms of trade. Rapidly expanding income results in large increases in expenditures. To the extent that consumers prefer goods readily available in foreign markets ("traded" goods in the jargon of the international economist), imports will rise and domestic producers of such traded goods as grains, meat, and cotton will find it very difficult to compete with foreign producers. Local producers of goods not readily traded internationally because of distance and time delays in delivery (i.e., "nontraded" goods) will experience a sharp increase in demand. The rapid expansion of the banking and finance, construction, trade, and government sectors fits this pattern well. A careful examination of industrial expansion reveals that its growth is largely attributable to expansion of soft drink bottling and ice cream and biscuit manufacturing, industries which receive substantial natural protection from imported goods. The change in the composition of agricultural production (declines or stagnation in

cereals, cotton, coffee, and meat and large increases in qat and fresh fruits and vegetables) also are consistent with anticipated patterns.

Whether differential growth rates between agricultural and nonagricultural sectors continue depends in part on whether the adjustment to the disturbance of 1973-75 is largely completed. It is reasonable to conclude that the process of adjustment to the disturbances of 73-75 is well advanced. As a consequence, there is reason to believe that growth rates for domestic agricultural and non-agricultural production will tend to converge, provided there are no further disturbances.

Differential growth rates can be expected to persist if foreign earnings and remittances continue to grow. If labor force growth in Yemen continues, if labor productivity in agriculture stagnates, and if real wages on the Arabian Peninsula remain constant or rise, there will be tendency for additional emigration. Additional foreign earnings and remittances will lead to further increases in the demand for nontraded goods, allowing those sectors to continue to grow. With agricultural productivity stagnant and induced demand for nontraded goods growing because of growing remittances, differential growth rates will continue. On the other hand, if remittances, the driving force in economic development over the last six years, stabilize and agricultural productivity is also stagnant, economic growth will end.

A key implication of this analysis is that continued growth of the Yemeni economy requires a leading sector whose rate of expansion will spill over into other sectors. One possible source of this growth is continued expansion of remittances. In the absence of continued increases in remittances, another engine of expansion is needed. Continued expansion is most likely to come from increased productivity in some sector which will allow that sector to lower prices and thereby expand its market share. If this expansion of production

replaces imports and/or if it can succeed in increasing exports, it can generate increases in aggregate production and income which will spill over into increased demand for nontraded goods, thereby stimulating additional production and economic growth.

There are several reasons why one might expect the agricultural sector to be the most likely source of productivity changes and growth in the Yemeni economy in the future. One reason is the large increase in productivity in the recent past. While value added in agriculture has apparently remained approximately unchanged in comparison with 72-73, there have been large declines in the agricultural labor force. Employment in agriculture declined 14% between 1975 and 1979 (and surely by more between 1973 and 1979 although this must remain conjectual since labor market estimates for Yemen were first made in 1975 in conjunction with the first census in modern times). Consequently, labor productivity in agriculture has shown substantial improvement in the last decade. Increased access to groundwater and modern diversion dams in wadis have surely contributed to this productivity together with more mechanization and improved agricultural techniques. This rate of innovation is likely to continue, particularly if judicious amounts of technical assistance are made available to Yemeni farmers.

The prospects for increased agricultural production seem brighter than those for industry. While there undoubtedly are some opportunities for industrial outputs which can substitute for imports, the vicious cycle of economies of scale coupled with the relatively small Yemeni market will surely limit those opportunities. Agriculture, on the other hand, seems less hampered by the existence of small units. Yemeni farmers have demonstrated their ability to use small plots to produce profitably fruits, vegetables, and qat.

It can also be argued that agricultural producers are better equipped than

industrial producers to use successfully the largely unskilled Yemeni labor force. Small amounts of technical assistance in agriculture are more likely to increase the productivity of Yemeni workers than would a similar amount of assistance in training workers for urban jobs. Management of industrial enterprises also requires a much larger change in Yemeni skills than does agricultural management, where small improvements in skills in areas already familiar to farm decision makers can result in large output increases. Then too there are substantial social costs associated with industrial expansion. Such expansion requires changes in lifestyle and large capital investments in housing and public services which would be unnecessary if workers remained in their villages. The relatively small amounts of capital required for increases in agricultural productivity (in comparison to industrial requirements) can more easily be generated by the imperfect capital markets which exist in Yemen. (For an analysis of Yemeni capital markets see Section 4.3 of the Baseline Study Field Report.) Many farm families have the option of sending temporarily a family member to Saudi Arabia to generate the funds needed for investment. For all these reasons, agriculture appears more likely than industry to serve as an engine of further economic growth. Growth in agriculture also seems more desirable to the Yemeni as evidenced by the tentative objectives established for the Second Five Year Plan.

As long as wage rates remain high and imported food is available at low prices, assistance to the agriculture sector is likely to be most successful if it concentrates on helping Yemeni farmers to economize on scarce factors, including labor and water, and in producing crops for which Yemeni producers have some protection from the rigors of international competition. Among the latter are fresh fruits and vegetables produced for Yemeni and western Saudi Arabian markets. Also included are lambs and poultry marketed live in Yemen.

In these markets distance and time delays provide substantial protection from competition with foreign markets. Technical assistance which allows Yemeni farmers to raise output per person and output per cubic meter of water will allow Yemeni farmers to economize on scarce resources and thus permit them to compete in markets for agricultural products.

It was suggested above that technical assistance to agriculture offers the best opportunity to increase production in Yemen. An alternative would be to support basic and vocational education programs which would increase the ability of the Yemeni to earn higher incomes anywhere on the Arabian Peninsula, including Yemen. It is conceivable that helping Yemeni to learn the three R's and technical skills like welding and auto repair will equip them to earn higher salaries outside the country than they could earn by remaining in agriculture in Yemen. An added advantage of this approach is that the skills can be utilized either in Yemen or elsewhere while payoffs to agricultural technical assistance are dependent on the assumption that those obtaining the skills will remain in agriculture.

Choosing between these alternative types of assistance is not easy. While plausible arguments for either can be made, it is impossible to quantify economic costs and benefits of each approach with sufficient accuracy to permit a choice between them. In addition, the two approaches have different implications for the nature of society in the future. The basic vocational education program equips recipients to live in an urban environment, perhaps outside Yemen. Technical assistance to agriculture has, on the other hand, a rural bias with emphasis on production in Yemen. Thus, in addition to possibly different conventionally calculated cost-benefit ratios, the two approaches are likely to encourage quite different patterns of social and economic development.

First Alternative Scenario: Decline in Opportunities for
Employment on the Arabian Peninsula

The preceding section identified some of the effects of an increase in opportunities for employment on the Arabian Peninsula. Included were rising real wages and an improved terms of trade for Yemen, diminished incentives for agricultural production in Yemen, incentives for introducing labor saving technologies, and a bias in agricultural production toward products which are most protected from foreign competition by distance and time delays in shipping. In this section we consider the implications of declining real wages (for unskilled labor on the Arabian Peninsula and/or a deliberate Saudi policy of reducing the number of Yemeni workers allowed to enter Saudi Arabia. There is evidence that real wages for unskilled labor on the Arabian Peninsula are beginning to level off. Some analysts believe that there is a significant probability that within the next five years the Yemeni economy will experience the effects of declining real wages earned by migrant laborers and/or limits on the number of Yemeni workers in Saudi Arabia¹. In this section we consider the implications for agricultural assistance of such an event. Here we consider only the equilibrium effects of declining real wages and ignore the implications of gradual versus abrupt changes in opportunities for migration, transitional balance of payments difficulties, and the possibility of imposition of exchange controls or changes in the effective protection afforded by tariff rates. The effects of these adjustment problems will form the basis for the next scenario.

¹ For the flavor of the debate over the future prospects for migration opportunities, see Near East Labor Migration: Implications for AID Policy, Proceedings of a Conference held in Washington, June 5-6, 1979. For further discussion of prospects, see Lee Ann Ross, "Current Trends in Yemeni Remittances and Migration," November, 1979.

Among the likely effects of declining opportunities for migration are

- (a) Falling real income for every individual for whom the sale of labor is an important source of income.
- (b) Increased needs for foreign assistance to support income.
(Note, however, that no form of assistance will affect the earnings of unskilled laborers as long as Yemeni wage rates are dominated by Arabian Peninsula rates.)
- (c) Increased unemployment during the transitional stage which may become permanent if some workers are unwilling to work for lower wages.
- (d) Expanding domestic production and employment as local producers take advantage of cheaper labor and the increased demand for locally-produced goods due to a deterioration in Yemen's terms of trade.
- (e) Increased agricultural production with special incentives for exportable and import substitute products. (For a list of Yemen's food imports, see Table 13. Among the most important are fruits and vegetables, cereals, meat, and dairy products.)
Indeed a brief review of the Yemeni economy reveals few potentially exportable products outside the agricultural sector.
For the foreseeable future all Yemeni imports must be financed by remittances, donor assistance, and agricultural exports.
- (f) A movement toward labor intensive crops and methods and reduced incentives for mechanization and consolidation of farming units.
- (g) A slowdown or reversal of the trend away from subsistence agriculture.
- (h) Increased production on marginal lands.

- (i) Reduced competitiveness of agricultural products which are dependent upon imported components such as tractors, fuel, irrigation hardware, chemical fertilizers and pesticides, baby chicks, and livestock feeds.

Agricultural assistance efforts appropriate for this scenario differ somewhat from those appropriate for the preceding scenario. This scenario requires more assistance to subsistence farmers and more emphasis on cereals and meat production. A farming systems approach to extension assistance must emphasize crops and technologies appropriate for a lower wage economy. Assistance for production of fruits and vegetables remains important because of export and import substitution possibilities. Assistance to farmers in economizing on water use is largely unaffected by the alternative scenario, since water will remain a scarce factor in either scenario.

Second Alternative Scenario: Decline in Opportunities for Employment on the Arabian Peninsula Result in Discriminatory Foreign Exchange Controls or Changes in Tariff Structure

As the preceding scenario indicated, falling wages on the Arabian Peninsula can be expected to result in lower income for all Yemeni workers, whether employed inside or outside the country. Reduced remittances and a deteriorating balance of payments can also be expected. The manner in which Yemeni authorities respond to the deteriorating balance of payments and the resulting loss of foreign exchange reserves can have a significant effect on the size and composition of agricultural production. These possible effects are identified in this section.

The implicit assumption of the preceding scenario was that loss of foreign exchange reserves did not change the relative incentives for production of

export goods versus import substitutes. It also assumed that the tariff structure which affects the distribution of production between agricultural and non-agricultural products remains unchanged. Balance-of-payments adjustment which avoids these complications could be achieved either by a devaluation of the Yemeni rial to halt the losses of foreign exchange reserves or by a monetary policy which allows the money supply to decline as foreign exchange reserves decline, a policy which will eventually result in lower domestic prices and balance-of-payments equilibrium via the classic price-specie-flow mechanism originally described by David Hume. Note, however, that the government may find it difficult either to devalue the rial or to allow the money supply to decline. Neither option is pleasant.

Achieving a decline in the money supply will be particularly difficult given the existing structure of government revenues. Declining wages mean less income and, ultimately, fewer imports. Government revenues, however, are heavily dependent upon customs receipts. Thus, declining wages will likely result in declining government revenues. The government will find it very difficult to bring about a corresponding decrease in government expenditures at the precise time that returning migrants will be clamoring for public sector jobs. The government will be pressed to create money to finance government deficits, an action which exacerbates the loss of foreign exchange reserves.

Devaluation will not be popular either. Devaluation necessarily results in higher import prices, including the price of imported food, and a further decrease in the standard of living. In the worst case, the decline in government revenues results in permanent government deficits and a continued increase in the money supply, which in turn results in higher prices, continuous balance-of-payments deficits and chronic currency devaluation.

Difficulties in controlling the loss of foreign exchange reserves may lead

to changes in tariff structures or to exchange controls which in turn affect incentives for agricultural production. In order to avoid the rise in imported food prices which results from devaluation, the government may attempt to deal with the loss of foreign exchange by imposing a system of exchange controls which gives preferential treatment to food imports or by resorting to higher import duties on nonfood imports. Either policy alternative reduces incentives for the production of agricultural products for both export and import substitute markets. By keeping the price of imported food artificially low, production of import substitutes is discouraged. By not allowing the rial to depreciate, potential producers of exportable goods are not encouraged. The net effect of either of these policies would be to encourage production of non-agricultural import substitutes as a method of solving the balance-of-payments problem. The implications of such a policy for agricultural producers are clear. Agricultural producers would face lower wage rates than that under the current high wage, high remittance scenario, but product prices would be similar.

Another possibility is that the government will resort to across-the-board tariff increases or to exchange control systems which treat all types of imports evenhandedly. These policies will create incentives for the production of import substitutes of both agricultural and nonagricultural products while creating few incentives for production for export markets. Yet another option is that the government will adopt a new tariff structure which tends to equalize tariff rates by raising rates on currently exempt categories (primarily food imports). Equalization of tariff rates would raise tariffs on food imports and result in especially strong incentives to agricultural producers of import substitutes.

A final consideration comes from recognizing that certain agricultural

producers rely heavily on imported inputs, including tractors, fuel, irrigation apparatus, chemical fertilizers and pesticides, and mixed feeds. Any changes in tariff structure or the imposition of discriminatory exchange controls could have drastic effects on profit opportunities if policy changes discriminate against imported inputs.

To summarize, the government's response to loss of foreign reserves is a key determinant of incentives for agricultural producers. Money supply reduction and currency devaluation tend to create comparable incentives for producers of import substitutes and exports. Since agricultural producers are likely to be more responsive to these incentives than are producers of non-agricultural goods, one can expect a substantial increase in agricultural production. Exchange controls and discriminatory tariff increases create few incentives for export producers and are likely to provide the greatest incentives to producers of nonagricultural import substitutes. Indeed, studies of alternative foreign trade regimes reveal that the government's approach to foreign exchange crises is one of the most important determinants of the size and structure of the agricultural sector¹.

An understanding of how the agricultural sector is affected by the government's response to loss of foreign exchange reserves is an important input into the design of agricultural assistance. One contribution of foreign assistance efforts would be to help Ministry of Agriculture officials understand that foreign trade systems which subsidize food imports can have devastating effects on incentives for domestic agricultural producers. The designers of assistance efforts must also recognize that different exchange rate systems can have very important effects on the volume and composition of agricultural production. If

¹ See, for example, the National Bureau of Economic Research Studies of Foreign Trade Regimes edited by J. Bhagwati and A. Krueger.

policy changes precipitated by foreign exchange crises are a realistic possibility, designers of assistance programs should attempt to predict what policy responses will be in order to develop in advance agricultural assistance efforts which will be most useful.

Third Alternative Scenario: Change in Assistance Support from Foreign Donors

Grants and low cost loans are an important source of foreign exchange inflows into the Yemeni economy (see Table 14). Most of these funds flow to the government, which uses them to finance construction projects and as general budget support. Since the construction and government services sectors absorb directly few imported components, the effects of an increase in assistance funds is to increase government expenditure levels and eventually to increase domestic employment and domestic production. This section explores the indirect effects on agricultural production of changes in the level of foreign assistance.

Changes in foreign assistance levels would affect Yemeni agricultural producers primarily through two channels, by altering the terms of trade and by domestic employment effects which may alter wage rates. Increased assistance brings in foreign exchange, improves the terms of trade, and therefore reduces the prices faced by Yemeni agricultural producers. Increased assistance flows also create more nonagricultural employment opportunities in Yemen. Whether this increased demand for construction workers and government employees raises the domestic wage rate depends on the elasticity of supply of migrants. If Yemeni workers will change location for the slightest change in Yemeni/Arabian Peninsula wage differentials, an increase in employment opportunities in Yemen will simply result in the return of migrants with no change in wage rates paid by Yemeni employers. If, on the other hand, the supply of migrants is not

perfectly elastic, increased opportunities for government employment will result in higher wages in Yemen and incentives for Yemeni workers to leave agriculture. In the latter case, agricultural production will be further reduced beyond the depressive effects of a change in the terms of trade. To summarize, increases in foreign assistance tend to have similar qualitative effects on agriculture and on the design of agricultural assistance efforts as do increases in opportunities to work outside Yemen.

Decreased assistance flows will have opposite effects on the terms of trade as those identified above. Reduced aid will also reduce domestic employment and perhaps also wage rates if the government responds to reduced aid by cutting government expenditures. Each of these changes will indirectly stimulate agricultural production.

Decreased assistance flows may also lead to the kinds of adjustment problems identified in the Second Alternative Scenario. If the government is slow to reduce expenditures by the same amount as the reduction in foreign assistance, government deficits will occur. If these deficits are financed by money supply changes and/or if the government is reluctant to devalue the currency, balance-of-payments adjustment problems are likely to occur. As was indicated in the discussion of the Second Alternative Scenario, the government's response to the adjustment problems can have profound impacts on agricultural producers and hence on the design of optimal agricultural assistance programs. These impacts depend on the nature of the government's response. For a detailed discussion of some key alternatives, see the discussion contained in the section entitled Second Alternative Scenario.

Fourth Alternative Scenario: Forced or Self-Imposed Food Self Sufficiency

Within Yemen there is concern about the country's heavy dependence on

food imports. One of the stated objectives of the First Five Year Plan is a reduction in dependence on food imports. It is conceivable that the YARG will take meaningful steps to achieve food self sufficiency. Another possibility is that political conflict could result in a cutoff of food imports and force Yemeni consumers to depend entirely on domestic food sources. This section explores the implications of these possibilities for the size and composition of Yemeni agricultural production.

Whether the movement toward food self sufficiency occurs because of subsidies to food producers, tariffs on food imports, exchange controls which discriminate against food imports, or outside forces which interdict food shipments, the effects on Yemeni agricultural producers will be similar. Food prices, especially for items currently imported (see Table 13 for a list of these products) will rise sharply. The net effect will be to greatly increase incentives for the production of import substitutes. Under these conditions agricultural assistance to producers of crops and livestock could be expected to have large payoffs in the form of increased agricultural productivity.

Fifth Alternative Scenario: Gradual Abandonment of Preferences
for a Subsistence Lifestyle

It is evident that substantial numbers of Yemeni have a strong affinity for the way of life associated with subsistence agriculture. Elements include preference for one's own milk, meat, and bread and for the work and leisure patterns associated with traditional agriculture. For many Yemeni farmers agriculture does not offer the best economic opportunity available. Agricultural activities on these farms continue because at least some family members prefer it to other viable alternatives. In this section we investigate the implications of the gradual loss of this affinity.

Suppose that with the passage of time and of generations, preferences for the traditional way of life centering around agriculture declines. The result will be abandoned farms, farm consolidation and/or more extensive farming practices with fewer manhours per hectare. Such a result will not necessarily mean reduced agricultural production. Since the farmers being replaced are the ones least likely to adopt efficient agricultural practices and to use capital intensive methods and those who take over their lands are likely to be the most progressive farmers, it is conceivable that agricultural production will rise. Certainly labor productivity in agriculture will rise and water will be used more efficiently. These more progressive farmers will better utilize extension services. They are also more likely to produce cash crops and to abandon the subsistence pattern of sorghum, a cow, sheep, and goats.

Sixth Alternative Scenario: Gradual Abandonment
of Preferences for Local Meats and Cereals

The previous scenario recognized that some Yemeni prefer the lifestyle associated with production primarily for their own use. There are other Yemeni working for wages who retain a strong preference for locally produced agricultural products. Some of these people assert that animals and grains from their own villages and regions "taste better" than imported products or products from other regions in Yemen. Still others prefer for religious or sanitary reasons to purchase live animals and have these animals slaughtered in their own presence. In this section, we investigate the implications of a gradual vanishing of these preferences.

Preferences for local products help protect local producers from nonlocal competitors. The result is price differentials in favor of local products, more incentives for local production, increased total domestic agricultural

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production, and a bias in composition of output toward those products for which local preferences are greatest. Indeed it can be argued that strong Yemeni consumer preferences for domestically produced cereals, meat, and milk helps explain why Yemeni production of cereals and livestock has held up so well in the face of competition from the world's most efficient producers of cereal grains and meat.

A gradual abandonment of preferences for local products reduces and finally removes the protection afforded to local producers. The result would be reduced total agricultural output with a particularly sharp decline in production for those products (including sorghum, wheat, lamb, and poultry) which previously enjoyed the protection afforded by preferences for local products. In this event agricultural producers would require substantial assistance in the form of cost reducing innovations just to maintain current production levels.

Seventh Alternative Scenario: Deterioration of Soil and Water Resources

There exists a potential for substantial natural resource deterioration in Yemen. Recently available tubewell technology and the resources to finance well drilling have led to falling water tables and the possibility that limited water resources will be depleted. Rising real wages appear to have reduced efforts to repair terraces, creating the possibility of accelerating erosion and accompanying destruction of previously valuable capital assets. This section identifies the implications of these possibilities for total agricultural production, for the regional distribution of production, and for assistance efforts.

A reduction of soil and water resources will surely tend to reduce agricultural production. Soil erosion will impact the traditional agricultural

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areas, the mountainous terraced areas where rainfed agriculture thrives. (The forces of erosion could conceivably extend to the lower wadi areas and extensively damage spate irrigation production there.) Depletion of groundwater, on the other hand, will impact the new agricultural areas where output per hectare is highest.

An obvious implication for assistance efforts is to assess whether deterioration of natural resources is a serious problem and, if so, to design efforts to slow down or reverse resource erosion. Proposals which address these problems have been developed by CID Design Teams. Among these proposals are a research design for assessing terrace erosion as well as the proposed water inventory, water policy, and watershed management demonstration activities described in the Agricultural Water Resources Draft Projection Identification Document. Another possible implication is that deterioration is irreversible and, therefore, assistance to the agricultural sector would be fruitless.

Summary of the Effects of Different Scenarios on the Volume and
Composition of Agricultural Production

The preceding discussion of alternative scenarios may have left the reader bewildered by the array of possibilities. This section identifies similarities and differences among the scenarios in the patterns in the volume and composition of agricultural production which they generate.

There are striking parallels in the implications for the volume and composition of agricultural production among the Prevailing Conditions Case and the First, Second, Third and Fourth Alternative Scenarios. Both the Prevailing Conditions Case and the increasing foreign assistance aspect of the Third Alternative Scenario tend to reduce incentives for agricultural production and to direct remaining production toward output for which distance, time delays,

and preferences provide considerable protection from competition with foreign producers. The First Alternative Scenario and the decreasing foreign assistance aspect of the Third Alternative Scenario are the opposites of those cases. They create additional incentives for agricultural production and make it easier for Yemeni producers to export specialized products and to compete against foreign producers of cereals and livestock. The Second Alternative Scenario emphasizes that the volume and composition of increased production is heavily dependent upon the policy the government uses to deal with the problems of rising food prices and declining foreign exchange reserves. The Fourth Alternative Scenario (Forced or Self-Imposed Food Self Sufficiency) results in increased agricultural production with special incentives for producing import substitutes. These results are much like those of the Second Alternative Scenario when the government chooses to deal with the problem of declining foreign exchange reserves by increasing tariffs on food imports.

The effects of the Fifth, Sixth, and Seventh Alternative Scenarios have little in common either with each other or with other scenarios. They are indeed special cases which have unique effects on the volume and composition of agricultural production.

Summary of the Implications of Alternative Scenarios for Agricultural Assistance Efforts

A key implication of the preceding analysis is that different scenarios have differing implications for the volume and composition of agricultural production. Agricultural assistance efforts, whose success will depend on the economic and social forces which affect the volume and composition of agricultural production, should surely be based on whatever information is available about underlying economic trends. In this section we assess the sensitivity

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of success of particular assistance programs to underlying socio-economic trends. Among the types of assistance considered are institutional support to the Ministry of Agriculture, particularly in the area of policy planning and analysis, support for agricultural secondary schools, for a university faculty of agriculture, and for short and long term out-of-country training, for water resource inventory and policy, and for direct assistance to farmers in the form of improved on-farm water management, technical assistance in selecting improved farming systems (including cropping patterns and optimal use of fertilizer and other factors), in identifying improved seeds and soil fertility practices, and watershed management.

If observers evaluate the success of particular programs by monitoring total agricultural output, program success will be assured for any of the scenarios which result in increased agricultural production. If performance is measured in this way (an hypothesis which cannot be rejected out of hand), program planners should concentrate on forecasting underlying socio-economic trends and then provide assistance only if their forecasts indicate that conditions are appropriate for expanding agricultural production.

A more subtle way to measure program performance is to compare what agricultural production for the appropriate scenario would have been with and without the program and use the difference to measure program performance. Even when performance is measured in this way, assistance programs are more likely to be judged successful if underlying conditions are favorable for agricultural production. One reason for this is that farmers are more likely to be receptive to improved agricultural techniques and cropping patterns when their economic situation is improving than when it is deteriorating. Another reason is that favorable conditions for agricultural production are associated with lower wages and fewer employment opportunities. Under those circumstances the

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government will find it easier to attract and retain qualified employees, thus making institution building efforts more successful.

The design of direct assistance to farmers is particularly sensitive to the underlying determinants of labor costs and composition of output. This is true when agricultural assistance takes the form of development of new seeds and plants and extension assistance with cropping patterns and other agricultural practices. Those who offer extension assistance must be fully aware of cost conditions and relative prices of different outputs faced by their clients if they are to provide effective assistance. The value of newly developed seeds and plants also depends very much on the profit opportunities for those particular products. Direct assistance in the form of improved on farm water management techniques is, on the other hand, relatively insensitive to the relative prices of different outputs. Farmers will welcome and presumably adopt improved water management techniques no matter what crops they happen to be producing on irrigated land.

Assessing the Probabilities of Alternative Scenarios

It is apparent that the optimal design of agricultural assistance programs as well as their likely success when measured conventionally depends heavily upon the underlying socio-economic conditions which will prevail in the future. There is a considerable premium to be achieved from accurately forecasting future conditions. This section contains some tentative forecasts and offers some estimates of the reliability of those forecasts.

There exists considerable controversy over the future of work opportunities on the Arabian Peninsula. Underlying these controversies are major disagreements over future Saudi Arabian policies. Included are disagreements over the size and direction of Saudi development plans, over Saudi intentions to replace

Yemeni workers with lower cost Asian contract laborers, and over the possibility that Saudi Arabia for political reasons may decide to deport large numbers of Yemeni workers¹.

This author will offer three alternatives for the future of real wages on the Arabian Peninsula together with the author's subjective probability for each alternative. These are, for the next five years²,

- (a) little if no change in existing real wage levels and opportunities for migration. Probability = .4,
- (b) relatively slow but steady decline in real wages and opportunities for migration. Probability >.5,
- (c) a sharp decline in opportunities for migration, most likely precipitated by political events in Saudi Arabia. Probability <.1.

These estimates suggest that further increases in real wages are very unlikely, that the most likely event is slow but steady decline in real wages, and that one cannot dismiss the possibility that opportunities for migration will be abruptly cut off.

Likely changes in opportunities for migration are not the entire story. Complementary scenarios include the likely assistance levels of outside donors. In the absence of sharp declines in real income in Yemen, real assistance levels will decline as donors slowly adjust their allocations to the rapid increase in Yemeni income which has occurred during the last decade. Thus the most likely joint scenario is that both migration opportunities and real levels

¹ For a summary of these issues together with conflicting estimates of probabilities, see the Conference Proceedings on Near East Labor Migration: Implications for AID Policy.

² For a similar formulation, see Lee Ann Ross, "Current Trends in Yemeni Remittances and Migration," USAID/Sana'a, November 1979.

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of assistance will decline slowly. If migration opportunities decline precipitously, real assistance levels might possibly rise to offset the depressive effects of loss of migration opportunities. This assumption is surely appropriate for all donors except one. It may or may not be appropriate for assistance from Saudi Arabia, the largest single donor. One can imagine circumstances in which Saudi Arabia would simultaneously expel Yemeni workers and increase assistance levels and still other circumstances in which the Saudis would expel Yemeni workers and halt assistance payments.

The combined probabilities for foreign assistance and migration opportunities have clear implications for incentives for agricultural production. The likely joint events are:

- (a) stable real wages and declining real foreign assistance, leading to slight increases in incentives for agricultural production,
- (b) slowly declining real wages and stable to slowly declining levels of real assistance which result in somewhat larger increases in agricultural incentives than specified in event (a),
- (c) sharply declining opportunities for migration which are partially offset by rising assistance levels, leading to sharply increased incentives for agricultural production.
- (d) a simultaneous cutoff of migration to Saudi Arabia and Saudi assistance, which results in very sharp increases in incentives for agricultural production.
- (e) each of (a) - (d) with incentives for increased agricultural production dampened but not entirely diminished by foreign trade regimes which attempt to perpetuate cheap food imports.

To summarize, the directional implications for agricultural production of likely future changes in real wages and assistance levels are clear. These

changes are quite likely to lead to increased agricultural production with the extent of the increase varying from slight to extremely large. The extent of the increase could very well depend on whether the YARG uses exchange controls and/or changes in tariff structures to dampen increases in food prices.

The implications of other possible scenarios (4th-7th) can be assessed more briefly. A movement toward forced or self-imposed food self sufficiency is rather unlikely, with a probability of less than .1. If this movement were to occur, it would result in greatly increased incentives for agricultural production. This author judges that gradual abandonment of both preferences for a subsistence lifestyle (Fifth Alternative Scenario) and for local meat and cereals (Sixth Alternative Scenario) are inevitable. These changes in preferences, however, are likely to occur slowly enough that they will be relatively unimportant to planners for the next five - ten years. Probabilities of serious deterioration of soil and water resources will not be estimated in this paper. Both matters are scheduled for further study in the near future, so assessments will be deferred until additional information becomes available.

The implications of these likely events for the composition of agricultural production are less clear. This is particularly true for relative incentives to produce exports versus import substitutes. As was indicated in the discussion of the Second Alternative Scenario, the government's policy response to the loss of foreign exchange reserves will be a critical determinant of these relative incentives. This author is unwilling to offer forecasts of what those policy responses are likely to be. In addition, there is some difficulty in forecasting exactly which import substitutes will expand most rapidly. Important imports include meat, wheat for human consumption, and a wide range of fresh and preserved fruits and vegetables. The problem is to determine whether consumption patterns will change as real income falls. Will Yemeni consumers go

back to eating sorghum bread or will they continue to insist on wheat bread, large amounts of animal protein, fruits, vegetables and qat? While we would dearly like to know the value of these important income elasticities, it is unlikely that they can be estimated from existing data series which reflect periods of rising, not falling real income.

Possible Approaches to Assistance Planning When the Future is Uncertain

The implication of the preceding section is that while there exists some information about future prospects for Yemeni agriculture, there is not nearly enough information to allow designers of agricultural assistance to identify precisely the payoffs from all the alternative assistance programs which are feasible. In this section we consider the problem of planning under uncertainty and examine the options which are available.

Consider the circumstances under which perfect information about future agricultural prospects would result in better design decisions for agricultural assistance programs. One circumstance is when net benefits are sufficiently sensitive to different information so that net benefits are positive under one information set and negative with an alternative information set. Under these circumstances the information used to design an assistance program will affect the "go, no go" decision. From a decisionmaking point of view, superior information is valuable (i.e., worth the use of valuable resources) in these circumstances.

Another circumstance in which information is valuable is when it allows one to choose between two designs with positive net benefits. For example, consider a choice between allocating resources between sorghum research and horticulture research. It is conceivable that under one scenario sorghum research yields the greatest net benefits while under an alternative scenario

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horticulture research delivers maximum net benefits. The choice among different types of sorghum research may also depend on underlying socio-economic trends. Under some conditions sorghum varieties with high grain yields will be preferable while under other circumstances varieties with high fodder content will be most valuable. The optimal direction of breeding programs depends on, among other things, income levels, income elasticities for meat consumption, for sorghum for human consumption, and the level of protection from foreign producers which Yemeni farmers receive on grain versus livestock production. Accurate socio-economic forecasts makes it possible to choose intelligently among alternative research programs.

In general, superior information will contribute most to program design when long lead times are involved and/or when decisions are not easily (i.e., cheaply) reversed. Examples include research programs like plant breeding and fertilizer trials. If valid trials require three - four years for completion, one would want to test ranges of fertilizer applications which will be economically relevant given fertilizer prices five to ten years in the future. Also included are decisions by farmers to make large capital investment decisions which are costly to reverse, e.g., establishing orchards, enlarging fields, purchasing tractors, acquiring specialized irrigation equipment and structures, and major terrace construction and repair. If extensionists are to retain their credibility with farmers, they must be careful not to encourage the planting of orchards if the prices of fruit are likely to fall significantly before the orchard reaches peak production. Assistance to the YARG in policy planning and analysis will also benefit from superior forecasts if most YARG policy choices are decisions about the volume and composition of public investment.

The design of other types of assistance may not be so sensitive to medium to long range forecasts of socio-economic variables. Assistance to farmers in

choosing between planting tomatoes and sorghum is not likely to be sensitive to much more than the expected relative prices of tomatoes and sorghum for this year and to the farmer's confidence in the extension agent's ability to help him solve the problems of successfully producing tomatoes. While farmers would obviously prefer assistance which provides them with completely reliable one to two year price forecasts, they may not require such information before planting. Any farmer with cash crop experience has learned to cope with such uncertainties. Neither are education and training programs very sensitive to such forecasts. The objective of most programs is to teach principles and develop basic skills which allow the person to function efficiently in a wide range of environments.

Since uncertainty about future conditions is surely inevitable, it seems best to consider alternatives for decisionmaking under uncertainty. It is useful to consider two strategies. The first strategy could be characterized as one-for-all decisionmaking based on most likely alternatives. A caricature of this approach to program design consists of comprehensive studies which lead to cost estimates under most likely future conditions. The next stage is to design a program based exclusively on the scenario judged most likely to occur. At this stage the program is exhaustively set out in detail and launched with no further provision for monitoring and redesign. In effect the design team creates a detailed life-of-program workplan based on most likely future conditions, a workplan which is never altered. A second strategy is to deliberately design a program which recognizes that uncertainty exists. One component of the program consists of a wide spectrum of research, including end products appropriate for a variety of environments. The designers fully recognize that some, perhaps most, of the products of research will not be economically viable in whatever environment happens to occur. Another

component of the strategy is to build in capabilities for continuous program monitoring and redesign. Elements would include contractual flexibility to modify programs and a team of specialists with the skills required to continually monitor programs and the judgement required to determine when redesign is desirable. Finally, the program should be applied at the farm level by a team skilled in applying a farming systems approach to extension efforts. This includes the ability to adjust technical assistance to the current and prospective environments.

Agricultural Assistance as Insurance Against Possible
Events Which Will Reduce Yemeni Income

In all but one of the scenarios discussed above, disturbances leading to decreases in aggregate real income tended to be cushioned by increased agricultural production, and events generating increased income depressed agricultural production. The only exception to this pattern was deteriorating natural resources, which reduced both agricultural and total income. These patterns reveal that when economic conditions deteriorate, agricultural production contributes to stability by providing a floor below which total production will not decline. The insurance aspects of assistance to agriculture as helping to provide a floor for total production and earned income is considered in this section.

The goal of food self sufficiency as protection against foreign political and economic pressures illustrates the key role of agriculture. In the event that food imports were embargoed, food consumption would decline with the depth of the decreases determined by the responsiveness of the agricultural sector to the increased production incentives which are sure to appear. If an effective agricultural assistance program were already in place when the

embargo on food imports occurred, the inevitable decline in living standards would be cushioned.

Less dramatically but more realistically, an enlarged agriculture sector would also serve to cushion the depressive effects on the Yemeni economy of a reduction in work opportunities in Arabian Peninsula countries. A reduction in work opportunities would result in rising unemployment and a deteriorating terms of trade as remittances declined. The reduction in earned income and rising prices of imports, including food, due to the deteriorating terms of trade would deal a double blow to the Yemeni standard of living. The extent of rising food prices and unemployment would be determined in large part by the capacity of the agricultural sector to absorb returning workers and to use them to produce food. Appropriate agricultural assistance in advance of such an event would surely soften the decline in the Yemeni standard of living.

The role of agricultural producers in ameliorating the effects of a decline in remittances is not limited to their ability to produce import substitutes at reasonable prices. If remittances were to decline sharply, Yemen would be forced to increase exports in order to continue to pay for necessary imports such as fuel and other raw materials. The agricultural sector seems to possess greater export potential than any other sector of the economy, excepting, of course, the potential for exporting labor services.

Finally, the agricultural sector appears to have a lower import content than any other productive sector in Yemen. As a result its production costs will rise less in response to a deteriorating terms of trade than the costs of other sectors. For this reason as well as others mentioned above, expansion of the agricultural sector offers the best insurance against the most likely sources of income decline.

STATISTICAL TABLES

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N O T E - DRAFT REPORT: NOT FOR GENERAL DISTRIBUTION

The opinions stated in this report are the author's
only and are not necessarily those of CID.

July 16, 1980

TABLE 1

استخدام الأراضي حسب المحافظات (بالالف هكتار)
لعام ٧٧/٧٨م

جدول رقم (١٠) LAND USE BY GOVERNORATE 77/78.

Governorate	الساحة الاجمالية	الساحة المكن زراعتها سنويا	الساحة الحدية	غابات وتشجير	استخدامات اخرى	المحافظة
	Total Area	Cultivable Area	Marginal Area	Forest & Shrubs	Other Uses	
Sana'a.....	8,000	400	600	100	6,900	صنعا
Hodeidah....	3,500	235	500	450	2,315	الحدية
Taiz.....	1,200	250	100	500	350	تمز
Ibb.....	1,300	300	50	400	550	اب
Hajja.....	1,700	130	250	50	1,270	حجة
Saada.....	1,300	60	200	-	1,540	صعدة
Dhamar.....	1,000	100	200	100	600	ذمار
Beida	1,500	40	100	-	1,360	البيضاء
TOTAL	20,000	1,515	2,000	1,600	14,885	المجموع

*Mukhit and South Government Districts are included in the Governorates to which they were previously attached.

* : ارقام محافظات الحويت وما وراء بحسوة
ضمن المحافظات التي نلت منها .

Source: Ministry of Agriculture.
Reproduced from CPO Statistical Year Book, 1977-1978, Table 10.

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الاراضي المزروعة سنويا حسب مصادر الري (بآلاف هكتار) لعام ٧٧/٧٨م

TABLE 2

CULTIVABLE AREA BY SOURCE OF IRRIGATION 77/78.

AND GOVERNORATE (000 HECTARS).

جدول رقم (٩)

GOVERNOR- ATE	المساحة الاجمالية	تروى بالامطار	فيضان	ري مستديم	الآبار	المحافظة
	Total	Rainfed	Flood	Perennial	Wells	
Sana'a	400	373.3	--	20	6.7	صنعاء
Hodeidah	235	98.9	100	5	31.1	الحديدة
Taiz	250	219.8	10	18	2.2	تعز
Ibb	300	277.8	--	20	2.2	إب
Hajja	130	115	10	5	--	حجة
Saada	60	60	--	--	--	صعدة
Dhamar	100	90.6	--	5	4.4	ذمار
Al Beida	40	36.7	--	--	3.3	البيضاء
Total	1515	1272.1	120	73	49.9	الجموع

* Mahwit and Mareb Governorate Figures are included in the Governorates to which they were previously attached.
 * رقم محافظتي الحويت ومارب محسوبه ضمن المحافظات التي فصلت عنها .

Source Ministry of Agriculture.

المصدر: وزارة الزراعة .

Reproduced from CPO Statistical Year Book, 1977-1978, Table 9.

TABLE 3

Area of Main Agricultural Crops
(000's hectares)

<u>Crop</u>	<u>1971/72</u> <u>Area</u>	<u>1972/73</u> <u>Area</u>	<u>1973/74</u> <u>Area</u>	<u>1974/75</u> <u>Area</u>	<u>1975/76</u> <u>Area</u>	<u>1976/77</u> <u>Area</u>	<u>1977/78</u> <u>Area</u>	<u>1978/79</u> <u>Area</u>
Coreals								
Sorghum & millet	920	1,080	952	1,215	1,145	786	842	799
Maize	20	50	52	50	50	61	63	64
Wheat	25	50	70	50	50	55	56	55
Barley	125	110	77	73	68	60	61	59
Legumes, Vegetables								
Legumes	60	60	65	71	76	72	76	75
Green Vegetables	15	17	16	18	20	22.2	23.6	23.9
Potatoes	5	6	6	7	7	8.6	9.3	9.5
Fruits, tree crops								
Fruits	5	10	10	12	12	13.4	13.9	13.9
Grapes	8	8	8	9	9	10	10	10
Dates	-	-	-	-	-	-	-	-
Coffee	5	5	9	8	7	7.5	7.7	7.7
Industrial Crops								
Cotton	15	20	20	28	14	6.3	4.7	5.6
Tobacco	4	4	4	4	5	5.3	5.6	5.6
Sesame	8	8	8	9	10	10.2	10.2	10.2

Source: Directorate of Statistics, Ministry of Agriculture, June 1980

TABLE 4

Production of Main Agricultural Crops
(000's tons)

<u>Crop</u>	<u>1971/72</u> <u>Production</u>	<u>1972/73</u> <u>Production</u>	<u>1973/74</u> <u>Production</u>	<u>1974/75</u> <u>Production</u>	<u>1975/76</u> <u>Production</u>	<u>1976/77</u> <u>Production</u>	<u>1977/78</u> <u>Production</u>	<u>1978/79</u> <u>Production</u>
Cereals								
Sorghum & millet	627	809	639	1,000	859	660	641	686
Maize	16	70	80	79	72	89	89	94
Wheat	25	50	71	56	52	52	44	53
Barley	140	120	85	80	75	54	50	54
Legumes, Vegetables								
Legumes	60	56	64	71	76	82	77	79
Green vegetables	137	150	150	168	183	210	226	230
Potatoes	58	64	64	71	76	100	107	116
Fruits, tree crops								
Fruits	28	60	60	60	65	72	77	73
Grapes	35	35	31	40	42	47	45	49
Dates	5	5	5	5	5	6.3	6.3	6.3
Coffee	4	4	4	3	3	3.4	3.9	3.6
Industrial Crops								
Cotton	15	19	20	27	13	5.3	3.9	4.8
Tobacco	5	5	5	5	6	6.4	4.6	6.4
Sesame	5	4	4	5	6	6.4	6.3	6.3

Source: Directorate of Statistics, Ministry of Agriculture, June 1980.

TABLE 5

عدد الحيوانات الزراعية خلال الاعوام ٢٣-٢٤-٢٢
(بالالف)

NUMBER OF LIVESTOCK 1973-74 - 1977/78
(in thousands)

جدول ((١٦))

YEAR	الابقار CATTLE	الافنام والحاز SHEEP & GOATS	الجمال CAMELS	الخيول HORSES	الحمير ASSES	السنة
1973	810	9,500	100	4	600	١٩٢٣
1974	900	10,000	100	4	600	١٩٢٤
1975	950	10,500	105	3	650	١٩٢٥
1976	800	10,000*	100*	3	700	١٩٢٦
1977	840	10,400	105	3	700	١٩٢٧
Sana'a	40	2,900	5	.4	100	صنعا
Hodeidah	320	4,200	50	1.5	300	الحديدة
Taiz	150	1,400	20	.4	70	تمز
Ibb	170	500	5	.3	50	اب
Hajja	30	300	5	.2	100	حبة
Dhamar	90	500	7	.1	40	نمار
Others	40	600	13	.1	40	بقية المحافظات

- المصدر : وزارة الزراعة

*Corrected figures.

* ارقام صححها

Source Ministry of Agriculture.

Reproduced from CPO Statistical Year Book, 1977-1978, Table 16.

TABLE 6
الحيوانات المذبوحة في مراكز المحافظات ١٩٧٧-٧٢م

Slaughtered Animals in Governorate Centres. 1973/1977

جدول (١٧)

YEAR	الجمال CAMELS	عجول CALVES	الابقار COWS	الماعز GOATS	الضأن SHEEP	السنة
1973	77	-	46,277	98,819	109,961	١٩٧٣
1974	169	-	29,990	65,996	111,898	١٩٧٤
1975	594	12,049	26,390	80,833	80,233	١٩٧٥
1976	485	11,971	26,575	87,164	81,743	١٩٧٦
1977	609	10,115	28,725	67,308	56,090	١٩٧٧
Sana'a	-	5,884	11,748	5,300	31,628	سنة
Taiz *	-	2,948	4,333	19,814	3,159	تمز *
Hodeidah	449	2,105	1,663	36,607	14,198	الحديدة
Ibb	-	1,138	4,034	481	956	اب
Dhanar	160	2,151	3,351	2,118	2,169	ذمار
Al-Deida *	-	1,122	1,267	2,037	2,451	البيضا *
Sa'ada *	-	710	288	711	1,529	صعدة *
Hajje *	-	2,057	2,041	240	-	حجة *

Source: Ministry of Agriculture.

* Est. numbers.

المصدر : وزارة الاشغال قطاع البلديات

* ارقام تقديرية .

Reproduced from CPO Statistical Year Book, 1977-1978, Table 17.

TABLE 7

Meat, Milk, Egg, and Wool Production
(In tons except for eggs)

<u>Livestock Product</u>	<u>1969/70</u>	<u>1970/71</u>	<u>1971/72</u>	<u>1972/73</u>	<u>1973/74</u>	<u>1974/75</u>	<u>1975/76</u>	<u>1976/77</u>
Sheep and Goat Meat	37,330	32,340	22,800	24,860	24,700	25,230	25,510	26,000
Cattle Meat	12,932	11,468	10,919	12,078	10,858	11,651	12,383	10,560
Camel Meat	280	280	280	640	560	560	490	490
Chicken Meat	1,250	1,275	1,300	1,325	1,350	1,375	1,400	1,425
Milk	327	298	324	339	322	322	332	332
Eggs (millions)	186	190	194	198	203	206	210	215
Wool	4,776	4,340	4,849	5,047	4,765	4,801	4,879	4,953

Source: Directorate of Statistics, Ministry of Agriculture, June 1980

TABLE 8

Fish Production
(tons)

<u>Year</u>	<u>Dried for Export</u>	<u>Fresh for Local Consumption</u>	<u>Total</u>
1974/75	737	11,663	12,400
1975/76	1,000	13,600	14,600
1976/77	1,100	15,400	16,500
1977/78	1,000	16,500	17,500

Source: Directorate of Statistics,
Ministry of Agriculture, June 1980.

TABLE 9

Population, Labor Force and Employment
('000 Persons)

	<u>February 1975</u>			<u>Estimates February 1979</u>		
	<u>Total</u>	<u>Male</u>	<u>Female</u>	<u>Total</u>	<u>Male</u>	<u>Female</u>
Total Population	5,037	2,566	2,471	5,447	2,774	2,673
Labor Force Potential ^{/1}	2,805	1,430	1,375	3,149	1,604	1,545
Percent of Total Population	55.6	55.7	55.6	57.8	57.8	57.8
Active Labor Force	1,468	1,320	148	1,794	1,570	224
Agriculture	832	715	117	720	545	175
Employed	785	675	110	684	518	166
Unemployed	47	40	7	36	27	9
Non-Agriculture	304	284	20	388	356	32
Employed	287	268	19	368	338	30
Unemployed	17	16	1	20	18	2
Total Resident	1,136 ^{/2}	999	137	1,108	901	207
Employed	1,072	943	129	1,052	856	196
Unemployed	64	56	8	56	45	11
Migrants	332	321	11	686	669	17
As percent of economically active labor-force	22.6	32.1	8.0	38.2	42.6	7.6

^{/1} All of age groups 15 through 64.

^{/2} From Table 15, Page 60, 1976-1977 Statistical Year Book, CPO

Source: IBRD Mission estimates derived from the Swiss Team Census Verification Study; the Yemen Arab Republic Country Case Study, by Birks, Sinclair and Socknat, University of Durham, September 1978; and other sources as well as mission's own survey findings.

TABLE 10

Average Daily Wages for Unskilled Workers
in Saudi Arabia and Yemen
(YR1s)

	<u>1975</u>	<u>1977</u>	<u>1979</u>
<u>Saudi Arabia</u>			
Current prices	40	85	120
Constant prices	36	40	44
<u>Yemen</u>			
a) Urban Areas			
current prices	18	45	80
constant prices	16	21	30
b) Rural Areas			
current prices	10	37	50
constant prices	9	17	19

Note: Daily wages for 1975, 1977 and 1979 are deflated by the construction GDP index as follows: 1972 = 1.02, 1975 = 1.11, 1977 = 2.13 and 1979 = 2.70.

Sources: For Saudi Arabia, American-Saudi Arabian Joint Economic Commission (1979), YAR; Ministry of Public Works (1979); FAO Agricultural Assessment of Yemen, Appendix III by Mr. El-Cmeri (Draft Report). For YAR, CPO National Accounts Data.

Reproduced from IBRD Agricultural Sector Memorandum, June 1979, Table 7.

TABLE 11

Value of Agricultural Production
(YRls million at 1971/72 constant prices)

	<u>1969/70</u>	<u>1970/71</u>	<u>1971/72</u>	<u>1972/73</u>	<u>1973/74</u>	<u>1974/75</u>	<u>1975/76</u>	<u>1976/77</u>
Crops	676.6	871.2	821.1	1,024.9	920.8	1,186.2	1,090.5	1,046.6
Livestock	193.9	264.4	333.5	239.7	220.8	275.6	270.3	237.9
Fisheries	20.8	21.0	21.3	16.3	12.7	12.0	12.3	12.6
Forestry	45.9	44.6	43.3	42.0	40.7	39.5	38.3	31.9
Total	<u>937.2</u>	<u>1,201.2</u>	<u>1,219.2</u>	<u>1,322.9</u>	<u>1,195.0</u>	<u>1,513.3</u>	<u>1,411.4</u>	<u>1,329.0</u>

Source: IERD Agricultural Sector Memorandum, June 1979, Table 5

TABLE 12

Gross Domestic Product at Constant 1971/72 Prices
(YR1s million)

	<u>1969/70</u>	<u>1970/71</u>	<u>1971/72</u>	<u>1972/73</u>	<u>1973/74</u>	<u>1974/75</u>	<u>1975/76</u>	<u>1976/77</u>
<u>Primary Sectors</u>	<u>1,004</u>	<u>1,283</u>	<u>1,324</u>	<u>1,449</u>	<u>1,376</u>	<u>1,667</u>	<u>1,604</u>	<u>1,638</u>
Agriculture, Fisheries & Forestry	832	1,091	1,113	1,208	1,091	1,401	1,305	1,221
Industry, Mining & Electricity	87	98	109	126	148	153	165	200
Construction	85	94	102	115	137	113	134	217
<u>Distribution Sectors</u>	<u>388</u>	<u>415</u>	<u>453</u>	<u>491</u>	<u>513</u>	<u>557</u>	<u>677</u>	<u>860</u>
Trade	322	336	360	386	394	411	511	656
Finance & Banking	21	26	25	32	41	59	75	101
Transport & Communications	45	53	68	73	78	87	91	103
<u>Service Sectors</u>	<u>264</u>	<u>295</u>	<u>314</u>	<u>337</u>	<u>354</u>	<u>397</u>	<u>426</u>	<u>482</u>
Government	146	169	185	201	212	247	271	320
Housing	78	81	83	86	89	92	94	99
Other Sectors	40	45	46	50	53	58	61	70
<u>Gross Domestic Product</u>	<u>1,656</u>	<u>1,993</u>	<u>2,091</u>	<u>2,277</u>	<u>2,243</u>	<u>2,621</u>	<u>2,707</u>	<u>2,987</u>
GDP Deflator (1971/72 = 100)	85	88	100	110	145	170	191	253

Source: CPO, Statistical Year Book 1977/78, Table 93.

TABLE 13Yemen Imports By Commodity
(OOO YR)

<u>No.</u>	<u>Commodity</u>	<u>1975/76</u>	<u>1976/77</u>	<u>1977/78</u>
0	Food & Live Animals	1,706,894	3,035,329	6,194,926
00	Live Animals	9,513	13,811	27,530
01	Meat & Meat Products	3,831	30,416	193,812
02	Dairy Products & Eggs	34,627	69,850	193,381
03	Fish & Fish Preparations	7,125	16,124	21,080
04	Cereal & Preparations	325,126	299,862	369,209
05	Vegetables & Fruits	70,407	180,367	347,143
06	Sugar & Honey	242,141	166,535	208,012
07	Coffee, Tea, Spices	48,055	29,931	122,482
08	Animal Feedstuffs	644	249	1,552
09	Misc.	90,080	63,561	59,185
1	Bev. & Tobacco	44,375	48,985	134,645
11	Bev.	1,376	3,154	15,711
12	Tobacco	42,999	45,831	118,934
2	Raw Materials	6,599	12,689	31,155
21	Hides & Skins		4,025	615
22	Oil Seeds	2,398	4,281	9,914
23	Rubber			862
26	Textiles	13	95	277
27	Fertilizer		492	4,406
28	Metal Cres		163	116

TABLE 14

Balance of Payments
(In Millions of Rials)

<u>Items/End Period</u>	<u>1976/77</u>	<u>1977/78</u>	<u>1st Qtr 1978/79</u>	<u>2nd Qtr 1978/79</u>	<u>3rd Qtr 1978/79</u>	<u>4th Qtr 1978/79</u>
<u>Current Account</u>	<u>1,257.4</u>	<u>1,531.4</u>	<u>53.1</u>	<u>-278.1</u>	<u>605.6</u>	<u>688.9</u>
<u>Trade Account</u>	<u>3,199.9</u>	<u>-4,044.0</u>	<u>-1,163.2</u>	<u>-1,729.5</u>	<u>-1,536.4</u>	<u>-1,898.7</u>
<u>Exports</u>	<u>83.9</u>	<u>31.8</u>	<u>0.4</u>	<u>9.8</u>	<u>0.6</u>	<u>2.4</u>
Cotton	56.6	20.6	-	8.8	0.1	0.1
Others	27.3	11.2	0.4	1.0	0.5	2.3
<u>Imports</u>	<u>-3,293.3</u>	<u>-4,075.8</u>	<u>-1,163.6</u>	<u>-1,739.3</u>	<u>-1,537.0</u>	<u>-1,901.1</u>
Import by FVT Sector	-2,992.1	-3,525.2	-898.3	-1,319.5	-1,268.8	-1,410.5
Government Imports	-291.7	-546.6	-265.3	-419.8	-268.2	-490.6
<u>Invisible Account</u>	<u>4,457.3</u>	<u>5,575.4</u>	<u>1,216.3</u>	<u>1,451.4</u>	<u>2,142.0</u>	<u>1,209.8</u>
<u>Receipts</u>	<u>5,453.4</u>	<u>7,401.7</u>	<u>1,865.8</u>	<u>2,166.2</u>	<u>2,816.4</u>	<u>1,935.7</u>
Against Services	422.3	589.7	166.7	309.8	204.3	316.7
PVT Transfers	4,561.2	6,350.7	1,553.1	1,598.1	1,763.3	1,489.5
Official Transfers Cash	417.9	409.3	153.0	245.3	835.8	116.5
Official Transfer in Kind	52.0	52.0	13.0	13.0	13.0	13.0
<u>Payments</u>	<u>-996.1</u>	<u>-1,926.3</u>	<u>-669.5</u>	<u>-714.8</u>	<u>-674.4</u>	<u>-725.9</u>
Against Services	-255.7	-371.0	-109.7	-113.8	-97.6	-100.2
PVT Transfers	-770.4	-1,446.3	-359.8	-601.0	-576.8	-625.7
Official Transfers	-	-9.0	-	-	-	-
Capital Account	188.2	281.7	123.2	257.7	94.8	128.9
<u>Drawing of Loans</u>	<u>207.6</u>	<u>307.8</u>	<u>124.2</u>	<u>296.0</u>	<u>101.3</u>	<u>132.5</u>
Development & Commodity Loans	<u>188.1</u>	<u>271.1</u>	<u>58.0</u>	<u>289.9</u>	<u>101.3</u>	<u>125.5</u>
Cash Loans	19.5	36.7	11.6	4.9	-	7.0
Other Investments	-	-	54.6	1.2	-	-
Payment Loans	19.4	26.1	-1.0	-38.3	-6.5	-3.6
Error & Commission including (FVT) Capital Movement (Net)	53.5	202.1	259.0	56.3	-31.1	172.6
Balance of Payments Position	1,499.1	2,015.2	446.2	+35.9	669.3	-387.4
Monetary Movement in Assets	-1,499.1	-2,015.2	446.2	-35.9	-669.3	387.4
<u>Central Bank</u>	<u>-1,990.2</u>	<u>-1,735.6</u>	<u>334.7</u>	<u>-88.7</u>	<u>-753.4</u>	<u>275.2</u>
<u>Commercial Banks</u>	<u>+491.1</u>	<u>-279.6</u>	<u>-111.5</u>	<u>+52.8</u>	<u>94.1</u>	<u>112.2</u>

Source: Central Bank of Yemen, Financial Statistical Bulletin, April-June 1979.