

PD-AAO-915
ISN 38883

AGENCY FOR INTERNATIONAL DEVELOPMENT
PROJECT AUTHORIZATION AND REQUEST
FOR ALLOTMENT OF FUNDS PART I

1. TRANSACTION CODE
 A ADD
 C CHANGE
 D DELETE

2. DOCUMENT CODE
PAF
5

3. COUNTRY ENTITY
DPA 1, Worldwide Type B, DS/AGR/ESP

4. DOCUMENT REVISION NUMBER
Original

5. PROJECT NUMBER (7 digits)
[931-0236.09]

6. BUREAU/OFFICE
A SYMBOL B. CODE
DSB [10]

7. PROJECT TITLE (Maximum 40 characters)
[Technical Assist. in Irrigation Economics]

8. PROJECT APPROVAL DECISION
 A APPROVED
 D DISAPPROVED
 DE DEAUTHORIZED

9. EST. PERIOD OF IMPLEMENTATION
YRS. [03] QTRS [0]

10. APPROVED BUDGET AID APPROPRIATED FUNDS (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY 79		H. 2ND FY 80		K. 3RD FY 81	
		C GRANT	D LOAN	F GRANT	G LOAN	I GRANT	J LOAN	L GRANT	M LOAN
(1) FN	1897	064	-	541	-	0	-	273	-
(2)									
(3)									
(4)									
TOTALS				541	-	0	-	273	-

A. APPROPRIATION	N. 4TH FY 82		O. 5TH FY 83		LIFE OF PROJECT		11. PROJECT FUNDING AUTHORITY (ENTER APPROPRIATE CODE(S)) 1 - LIFE OF PROJECT 2 - INCREMENTAL LIFE OF PROJECT	A GRANT	U. LOAN
	D GRANT	P LOAN	R GRANT	S LOAN	T GRANT	V. LOAN			
(1) FN	0	-	0	-	814,000	-			
(2)									
(3)									
(4)									
TOTALS		0	-	0	-	814,000	-		

11. PROJECT FUNDING AUTHORITY (ENTER APPROPRIATE CODE(S))
1 - LIFE OF PROJECT
2 - INCREMENTAL LIFE OF PROJECT

12. INITIAL PROJECT FUNDING ALLOTMENT REQUESTED (\$000)

13. FUNDS RESERVED FOR ALLOTMENT

14. SOURCE/ORIGIN OF GOODS AND SERVICES
 000 341 LOCAL OTHER

12. INITIAL PROJECT FUNDING ALLOTMENT REQUESTED (\$000)

A. APPROPRIATION

B. ALLOTMENT REQUEST NO. [1]

A. APPROPRIATION	B. ALLOTMENT REQUEST NO.	
	C. GRANT	D. LOAN
(1) FN	541	
(2)		
(3)		
(4)		
TOTALS		

13. FUNDS RESERVED FOR ALLOTMENT

TYPED NAME (Chief, SFR, FM, FSI)

SIGNATURE

DATE

14. SOURCE/ORIGIN OF GOODS AND SERVICES
 000 341 LOCAL OTHER

15. FOR AMENDMENTS, NATURE OF CHANGE PROPOSED

000063

FOR PPC/PIAS USE ONLY

16. AUTHORIZING OFFICE SYMBOL

17. ACTION DATE
MM DD YY

18. ACTION REFERENCE (Optional)

ACTION REFERENCE DATE
MM DD YY

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS
PART II

ENTITY : Bureau for Development Support

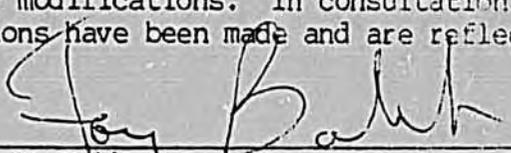
PROJECT : EXPANDED PROGRAM - Technical Assistance in Irrigation Economics

PROJECT NO: 931-0236.09

1. I hereby authorize grant funds not to exceed \$813,376 for a three year cooperative agreement with the University of Minnesota and Colorado State University to finance the costs of applied research in irrigation systems and technical assistance in water resource problems through "Technical Assistance in Irrigation Economics." The project - to be implemented under the Expanded Program for Economic Analysis - involves the analysis of several selected irrigation projects to determine what aspects of the project's management and operation have led to either their success or failure. The studies of these individual projects will in turn be used to develop more general models of optimal irrigation systems. During the life of the project, conferences will be held and reports published to ensure widespread dissemination of project results. Concurrent with these research activities, technical assistance totalling thirty (30) man-months over the life of the project will be provided on demand to USAIDs.

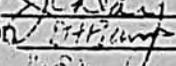
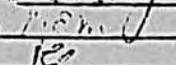
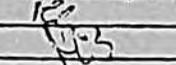
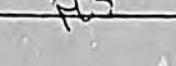
2. The project will be incrementally funded with \$541,000 provided in FY 79 for the first two years of the cooperative agreement and \$272,376 provided in FY 81 to cover the last year of the project, depending on the availability of funds.

3. The Activity Paper for this project was reviewed by the Agricultural and Rural Sector Planning (ARSP) Committee on July 30, 1979 and was endorsed for funding subject to minor modifications. In consultation with committee members, these modifications have been made and are reflected in the current Activity Paper.


E. N. Babb
Deputy Assistant Administrator for
Food and Nutrition
Bureau for Development Support

Date: 8/27/79

Clearances:

DS/AGR/ESP: JCDay		Date 8/9/79	LAC/DR: WGoodwin	date 8/17/79
DS/AGR:DFPeterson		Date 8/14/79	AFR/DR: SKrause	Date 8/17/79
DS/AGR:MZozynski		Date 8/17/79	ASIA/TR: DMitchell	Date 8/17/79
DS/PO:PGage		Date 8/14/79	NE/TECH: KSherper	Date 8/17/79
DS/PO:RSimpson		Date 8/21/79		

References:

1. Action Memo
2. Activity Paper
3. Minutes of ARSP Committee meeting, July 30, 1979

\$813,376 by signing the attached PAF and Environmental Threshold Decision.

Attachments:

- A. Activity Paper
- B. Environmental Threshold
- C. Minutes from ARSP Committee meeting, 7/30/79
- D. PAF

Clearances:

DS/AGR/ESP: JCDay	<u>J. Day</u>	Date	<u>8/1/79</u>
DS/AGR: M Mozynski	<u>M. Mozynski</u>	Date	<u>7/27/79</u>
DS/PO: PGage	<u>P. Gage</u>	Date	<u>7/27/79</u>

De
DS/AGR/ESP: JSchoettler:mmb:8/9/79:x58924

LAC/DR:	WGoodwin	Date	<u>7/27/79</u>
AFR/DR:	SKrause	Date	<u>8/1/79</u>
ASIA/TR:	DMitchell	Date	<u>7/27/79</u>
NE/TECH:	KSherper	Date	<u>7/27/79</u>

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ENVIRONMENTAL THRESHOLD DETERMINATION

TO: DAA/DS/FN, Tony Babb

THRU: DS/PO, Robert Simpson

AUG 22 1979

FROM: DS/AGR, Dean F. Peterson *DFP*

SUBJECT: Environmental Threshold Determination

EXPANDED PROGRAM - Technical Assistance in Water Resource
Project Title: Economics: Planning and Policy Analysis for Irrigation
Project #: 931-0236.09
Specific Activity (if applicable) N/A
REFERENCE: Initial Environmental/Examination (IEE) contained in
PP Activity Paper, pp.43-44 dated June 21, 1979

On the basis of the Initial Environmental/Examination (IEE) referenced above and attached to this memorandum I recommend that you make the following determination:

- X 1. The proposed agency action is not a major Federal action which will have a significant effect on the human environment.
- 2. The proposed agency action is a major Federal action which will have a significant effect on the human environment, and:
 - a. An Environmental Assessment is required; or
 - b. An Environmental Impact Statement is required.

The cost of and schedule for this requirement is fully described in the referenced document.

 3. Our environmental examination is not complete. We will submit the analysis no later than with our recommendation for an environmental threshold decision.

Approved: _____

Disapproved: _____

Date: _____

Clearances:

DS/AGR/ESP: JDay *JDay* Date 8/9/79
DS/AGR: MZozynski *MZozynski* Date 8/13/79
DS/PO: PGage *PGage* Date 8/16/79

LAC/DR: WGoodwin *WGoodwin* Date 8/17
AFR/DR: SKrause *SKrause* Date 8/17
ASIA/TR: DMitchell *DMitchell* Dt 8/17
NE/TECH: KSherper *KSherper* Date 8/25/79

W

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET
000064

TRANSACTION CODE
 A ADD
 C CHANGE
 D DELETE

PP
 3 DOCUMENT CODE
 3

1. COUNTRY/ENTITY DS/AGR/ESP RDA - 1
 Type b - Adaptation and Application

4. DOCUMENT REVISION NUMBER Original

5. PROJECT NUMBER (7 digits) [931-0236.09]

6. BUREAU OFFICE
 A SYMBOL DSB B. CODE [10]

7. PROJECT TITLE (Maximum 40 characters) [Technical Assistance in Irrigation Econ.]

8. ESTIMATED FY OF PROJECT COMPLETION FY [8][2]

9. ESTIMATED DATE OF OBLIGATION
 A. INITIAL FY [7][9] B. QUARTER [4]
 C. FINAL FY [8][1] (Enter 1, 2, 3, or 4)

10. ESTIMATED COSTS (\$000 OR EQUIVALENT \$) -

A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. TOTAL	E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL	541	-	541	814	-	814
GRANT	(541)	-		814	-	814
LOAN						
OTHER U.S.						
OTHER COUNTRY						
OTHER DONOR(S)						
TOTALS	541	-	541	814	-	814

11. PROPOSED BUDGET APPROPRIATED FUNDS (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY 79		H. 2ND FY 80		K. 3RD FY 81	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
FN	189I	064	-	541	-	0	-	273	-
TOTALS				541	-	0	-	273	-

A. APPROPRIATION	N. 4TH FY 81		O. 5TH FY 82		LIFE OF PROJECT		12. IN-DEPTH EVALUATION SCHEDULED
	C. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN	
FN	0	-	0	-	814	-	MM YY 1 2 8 0
TOTALS	0	-	0	-	814	-	

13. DATA CHANGE INDICATOR WERE CHANGES MADE IN THE PID FACESHEET DATA BLOCKS 12, 13, 14, OR 15 OR IN PPP FACESHEET DATA BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 NO
 2 YES

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE
 TITLE
 Dean F. Peterson *Dean F. Peterson*
 Director, DS/AGR

DATE SIGNED
 MM DD YY
 08 15 79

15. DATE DOCUMENT RECEIVED IN AID/W OR FOR AID/W DOCUMENTS. DATE OF DISTRIBUTION
 MM DD YY

ACTIVITY PAPER

TECHNICAL ASSISTANCE TO LDC'S IN WATER RESOURCE ECONOMICS:
PLANNING AND POLICY ANALYSIS FOR IRRIGATION

A Cooperative Agreement Project
under the
Expanded Program for Agricultural and Rural Sector Planning

Economics and Sector Planning Division

Office of Agriculture

Development Support Bureau

June 21, 1979

ACTIVITY PAPER OUTLINE

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PART I. PROJECT SUMMARY

A. Statistical Information

Project Title: Technical Assistance to LDC's in Water Resources, Economics, Planning and Policy Analysis

Cooperating Institutions: University of Minnesota and Colorado State University

Status: New Cooperative Agreement Project under Expanded Program for Agriculture and Rural Sector Planning

Total Estimated Cost: \$813,376 for 3 years

Principal Investigators: Dr. William K. Easter, Agricultural Economist, Department of Agricultural and Applied Economics, University of Minnesota, St. Paul, Minnesota 55108

Dr. Robert A. Young, Agricultural Economist
Department of Economics
Colorado State University
Fort Collins, Colorado 80523

Project Manager: DS/AGR/ESP, John C. Day

B. Narrative Summary: Water resources are increasingly important in a world of growing population, industrialization, and constrained food supplies. From an economic perspective, water is both a consumptive good (for drinking, sanitation, and other household uses), and an intermediate good used in the production of food and fiber. The notion that water is a limiting factor in the growth and development of the agricultural sector in LDC's is widely held to be true in many countries. While physical availability of water supplies is undoubtedly an issue, institutional factors which result in rigid allocation of existing supplies and poor resource use decisions are also an important determinant of water related growth bottlenecks.

The basic problem with which this project is concerned is the failure

of many irrigation water development and management schemes to achieve expected and potential changes in income. It is known that water allocation policies and irrigation system operating procedures play a significant part in determining the performance of projects in terms of income generated and the distribution of that income. In this context a fundamental concern is the capacity of development practitioners to properly evaluate complex water resources development and policy alternatives and to design and implement appropriate projects.

The proposed project seeks to improve the knowledge base and increase the technical talent available for irrigation policy formation and project design and management work in LDCs. The project involves integrated components of applied research and direct technical assistance to USAID missions and/or LDC agencies.

The applied research component is seen as a "core" effort of project ~~contract staff with direct technical assistance in the form of TDY field~~ consultancies. Core activities will be: review of literature pertaining to worldwide experiences in irrigation economics, planning and policy formulation and implementation; assessments of analytical methodologies appropriate for irrigation policy evaluation; case studies of selected irrigation projects and related policy measures in LDCs; synthesis and dissemination of all information collected, study results, and general findings on a worldwide basis. Cases chosen for study will be irrigation projects wherein the respective USAID mission and/or LDC government has a direct interest in study conclusions. This approach links field data collection/analysis directly to expressed needs. Technical assistance will also be available to others upon request and as contractor scheduling permits.

for what?

The project will be implemented by the University of Minnesota and Colorado State University through the Cooperative Agreement mechanism. The initial Agreement will be for three years, but it is anticipated that project activity will be continued for at least an additional two years. A three phase implementation plan is proposed for the first three years. Phase I estimated at 9-10 months will involve general literature survey and synthesis, selection of countries and case study sites, and preparation of a plan of work for the balance of the project life. Preliminary analytical procedures for each country analysis will also be prepared and linkages established between the contract team, respective USAID missions and host governments. Some TDY technical assistance is possible. In Phase II core activities will continue, case study analytical procedures will be finalized, data will be collected and comparative analysis of irrigation policies and management practices will be carried out. Direct technical assistance efforts will increase. Phase III involves summary reporting and final seminars and a workshop. Total direct technical assistance to USAIDs and/or LDCs is estimated at thirty man months of professional staff over the initial three-year life of the project.

The project represents one component in a series of water resources activities developed by the Office of Agriculture. These activities address key issues which bear upon the performance of irrigation systems in LDCs and range from research dealing with on-farm channel improvements to broad technical support services to field missions. The proposed project complements

the Pakistan on-farm water management work (recently transferred from TSWM to Asia Bureau) by focussing on the economic impact of policies and water allocation institutions at the service area level of aggregation. In a similar vein, the project extends the type of work Cornell is programming in the Philippines, Indonesia, and Sri Lanka to other locations. It also includes a technical assistance component and provides for more in-depth economic analysis than does the Cornell effort. The proposed project, therefore both adds and strengthens dimensions to ongoing irrigation work in DSB and will thereby improve the quality of technical assistance which the Office is programmed to carry out through TSWM's water management Synthesis and Support Services projects. In order to bring about the benefits of a synergistic approach to water resource project development/management in the Office of Agriculture, professional staff in TSWM will be consulted on all technical matters pertaining to final design, implementation, and monitoring of the project. Close coordination will also be carried out with DS/RAD.

Opportunities for mutual utilization of information and talent generated through ESP, TSWM, and DS/RAD projects will be fully explored.

PART II. BACKGROUND AND PROBLEM STATEMENT

A. BACKGROUND

The idea that limited water supply is a bottleneck or inhibiting factor in the growth and development of agriculture in many developing countries is undoubtedly valid. Irrigation projects are generally built to reduce the variability and uncertainty of water supply in agriculture. However, many projects fail to do this for one or more reasons. While a wide range of physical and institutional arrangements for allocating water among project participants are available, if the measures employed are not appropriate for

the particular setting involved project potentials will not be achieved [Reidinger, 1974]. Under these circumstances output and net incomes may increase much less than expected or even decrease. Irrigation projects are also carried out in many countries so as to reach a large number of farmers. Yet, due to operational and design problems, frequently only part of the command area is adequately served. In addition, those who are served tend to be the large and more influential farmers with the result that, although average incomes may be increased, beneficiaries are often large scale or more well-to-do farmers and not the ones in greatest need of assistance; hence, distributional objectives are not met.

It is recognized that institutional and management factors which result in a rigid allocation of existing water supplies among users are also important sources of growth bottlenecks. Reallocating water from the lowest value uses to high value uses and better water resource management practices can facilitate continued growth and expansion even with fixed or sharply increasing-cost supplies. Also, changes in water management procedures within systems can favorably affect the distribution of project benefits. If desirable changes within LDCs are to occur there is a need to develop data and information necessary for improving decision making.

B. PROBLEM STATEMENT

The problem this project addresses is the tendency for water resource development/utilization to be hampered by ineffective and/or counterproductive policy and irrigation system management practices. Of particular concern in this project is the way in which these factors affect (a) water distribution

at the (generally) government controlled main conveyance system level, (i.e., that part of "systems" which operate from the water sources to service area headgates), and (b) allocations of water which are made within, or at, the service area level. Decisions which are made at these levels in turn act as constraints upon the farm level water use decisions made by individuals. Thus, water resource policies and project operating rules play a significant role in determining the levels of income generated and the distribution of that income among the rural population.

In this context it is felt that a major factor which inhibits better policy and management decisions is the lack of knowledge and understanding concerning the economic impacts of these decisions. If more information about the economic consequences of specific policy and project management practices were known and made available, presumably rational decisionmakers would use this information to make appropriate changes.

The proposed project addresses the need for information and technical expertise necessary for improved irrigation system planning and operation. Applied research work is programmed which will augment the knowledge base pertaining to the economics of water/irrigation policies and management. Technical assistance resources are programmed to provide additional technical experts for USAID and LDC program planning and management.

The specific policy and management issues which this project will focus upon in applied research activity are as follows. ^{1/}

- (1) Water allocation rules, policies, and/or customs
- (2) Institutional arrangements for irrigation project management
- (3) Public policies regarding design, scale, and geographic dispersement of irrigation projects.

^{1/} These issues have been selected for study based upon a formalized survey of USAID mission needs and interests in the water resources area. For detailed reporting of the survey and the relationship to this project see p. 26 and Attachment 3.

In the following material these issues are discussed further.

Water Allocation Rules, Policies, and/or Customs.

A wide range of procedures have been used which both directly and indirectly affect distribution of water ranging from fixed shares to market pricing. Allocations made at different levels in the overall system have an interactive effect upon the deliveries ultimately made to farms. Distribution rules at the farm level may be different than at the conveyance system level.

In deciding on water allocations the following objectives are usually important: equity, efficiency, growth, justice, and local control. The particular weights given to each will vary but all or some are important in most irrigation projects. Weighting usually leads to a conflict among interest groups viz., water managers, farmers and politicians, as to how water should be allocated.

Some of the more common methods of allocating water are indicated here and briefly described in Attachment Four.

- a. No formal allocation procedure
- b. Shares
- c. Turn
- d. Rotation
- e. Farm Priorities
- f. Crop Priorities
- g. Market
- h. Demand

Guidelines for selecting desirable water allocation methods deserve special attention. What criteria should be used to select the method for allocating irrigation water and under what conditions does each tend to perform best in terms of efficiency, equity, etc.? Ideally this decision would be made before a project is designed. The differences in design requirements and cost would be compared with the efficiency and distributional advantages

of market versus alternative allocation procedures. The size of land holdings and the service area to which water will be delivered, tenure systems either in operation or to be implemented, and the methods of water delivery are also important in determining which allocative procedure is preferred.

Many irrigation systems are designed to deliver water by the least cost method and to collect a fixed charge from farmers to pay some or all of the project costs. Other options can be considered that might improve water allocation such as crop charges, or charges based on the flow of water or service area association charges.

There are, in addition, pros and cons concerning whether or not the water charges should cover the operating and capital costs.^{2/} The actual impact of the project will depend on size of land holdings, the size of the project, tenure arrangements, crops grown, markets, etc. The final decision on how much of operating and capital cost should be repaid will depend on the weights given to efficiency, equity, economic growth and the particular resource and economic situation where the project is built.

Based on economic efficiency one would argue that the water charge should at least cover the marginal cost of operating the irrigation system. The contribution to capital costs would depend on the demand for water. If demand is high then the charge for water can be raised to cover some or all of the

^{2/}

On one side, the argument is made that irrigation just lowers farm prices which means the main beneficiaries are the consumers; consumers, therefore, should pay the cost through a government subsidy of public irrigation projects. In contrast, others argue that the farmers obtain a large income transfer from public irrigation projects which increases land values and displaces tenant farmers.

capital costs. The contribution to capital costs can be reinvested, and, again, contribute to the country's growth and development.

Water charges could also depend on the certainty of water supply. This would include both the certainty in quantity and timing. Another option available would be to vary the charge by season of the year.

Thus, a major part of the project will involve study of alternative methods for allocating water. The analysis will include an investigation of how different allocation procedures influence water distribution, service area output and the distribution of irrigation benefits.

Institutional Arrangements for Irrigation Project Management

Institutional questions can be divided into three levels.

The first consists of institutions that directly affect the level and distribution of benefits. These include both customary and legal institutions that deal with land tenure, crop tenure, access to resources, division of production, access to water, rights to water, etc. This level of institutions has considerable influence on the attainment of management objectives^{3/} in an irrigation system.

^{3/}

One of the important management problems facing a number of LDC's is how to best utilize surface and groundwater supplies. For optimum use the two sources of supply should be managed jointly (conjunctively). There are a number of options for accomplishing conjunctive use. Water charges can be used to encourage the use of either surface water or groundwater throughout the season. The charge for surface water would be below the pumping cost during periods of plentiful surface water supplies. When the supplies are limited the charge would be raised above pumping costs. Such a pricing system allows one to regulate pumping without actually owning the groundwater. The Cuavery Basin in South India provides a good example of the need for conjunctive water management. The scope of this proposed project allows for examination of conjunctive use situations.

The second level consists of institutions in the sense of organizations of structures that deal with distribution of irrigation water, maintenance of irrigation systems, etc. Geographically these institutions are usually at the local or regional level, i.e, not at the conveyance level. Generally they involve farmers e.g., a water user's association. An irrigation department or bureau office in charge of a particular sub-project is another example. It is at this level, where the farmer-user and the system interact, that the success or failure of "management" is determined.

The third level of institutions is at the national level. It consists both of organizational structures, such as a ministry of irrigation or a national planning authority, and of "rules" or ways of doing things, such as how the national budget people decide to go ahead with an irrigation project, how the irrigation people decide to allocate water to irrigation rather than to power generation, whether all signals come from the top down or whether some signals come from the bottom up.

The study of institutions and their problems, with institutions as defined above, leads directly to the question of efficiency in service area operation, which may be the most crucial or critical issue facing irrigation, both development and rehabilitation, in many countries.^{4/} How to reform

^{4/}

There is another level of institutions that should also be mentioned. This is the kind or type of institution that deals with providing inputs and services at the local level that will enhance the productivity made possible by irrigation. An institutional infrastructure, consisting of distribution channels for farm inputs and a farm marketing system and a credit system to tie the two together, needs to be in place to maximize the impact of any system.

or revitalize institutions that are having a negative effect on income, how to start new institutions that are needed to achieve economic efficiency and better distribution of gains, and how to manage each part of the system, are crucial and unanswered questions for many countries.

Public Policies Regarding Scale, Design and Geographic Dispersement of Irrigation Projects

Many countries must make choices as a matter of policy between large and small systems and concentrated versus dispersed systems. Often, some aspects of a system can be large scale (diversion, storage and main canal), while other aspects can be small scale (services are distribution, control and management systems).

Since most countries cannot develop all viable irrigation supplies at once, choices must be made between concentration of investments in limited areas, as is often the case in large scale projects, and investment in small/medium scale ~~projects, scattered throughout the country.~~

One question that needs to be addressed is the viability and ^edisirability of small scale irrigation projects. In many regions natural conditions are not suited for large irrigation projects. In addition, many countries as a matter of policy opt for small irrigation projects in order to spread irrigation investment throughout the country.

What practices and policies make some small scale projects highly beneficial and others not? Operation and water handling should be easier on small scale projects as compared to large scale projects. Information about on-farm water needs should be easier to obtain in a small scale project. In addition, the distance between water source and irrigated farms should be

much shorter. However, there may be such a diversity of operating procedures involved with small scale irrigation that it may be very difficult to generalize.

An important issue that needs to be addressed is the reason why design expectations in project performance very frequently are not realized. It is probable that estimation procedures followed and or assumptions made concerning expected benefits and costs were in error. The scope of this project (and the analytical framework established) provides an opportunity to analyze these problem. Comparisons between actual performance and expected performance (ex ante) and identification of the methodologies, procedures, and assumptions that lead to forecasting errors concerning project benefits and costs would be an important output of the project.

As a first step in looking at policies concerning the scale of investment, the project would investigate small scale irrigation in several countries. We know a great deal more about large scale irrigation and pump irrigation than we do about small scale reservoir irrigation. Thus, several specific studies are badly needed to provide us with basic information about the performance and operation of small reservoir irrigation.

An example of such a case is the tank (small reservoirs) irrigation in northeastern Thailand. Because of the semi-arid climate and the topography tanks are the primary means for improving irrigation in this region. The Thai government has constructed tanks in this region since 1975. There are now more than 180 tanks scattered throughout the region and more are planned for the future. In fact, the Royal Irrigation Department has plans to construct an additional 890 tanks.

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Schick

The success of existing tanks has been much below expectations in terms of increasing production and income. The Thai government as well as donor agencies would like to know why. One of the basic problems seems to be that the tanks were originally built for political or local military reasons with little concern for cost or potential benefits. These projects also tend to serve a number of purposes besides crop irrigation such as livestock water and water for domestic use and gardens. *? not same productive use*

Such a study would involve working with local government officials, AID mission staff and possibly a university in Thailand to identify the tanks for study, identification of data sources, design of methodology, and interpretation of analytical results. One would want to study tanks that appeared to be performing well along with those with a poor performance. An important aspect of such study would be to compare the organization, operation and management among the study tanks in terms of the efficiency of production ~~and the equity with which water is distributed.~~

The study would include an economic and financial analysis of selected tanks to determine the return on investment. This would provide some basis of comparison with other potential investments including large irrigation projects and other agricultural inputs. In conjunction with this analysis, the distribution of benefits from the project should be estimated. Do small scale irrigation projects really reach the smallest farmers or, as found in eastern India, do the benefits go to the larger more politically powerful farmer [Easter, 1975]?

The final part of such a study would be to help government officials develop better procedures for planning and operating tank projects.

PART III. PROJECT OBJECTIVES

The fundamental objective of this project is to help bring about increased economic efficiency and equity in the development and management of water resources in LDC agriculture.^{5/} This project will attempt to contribute to this broad objective by assembling or otherwise mobilizing a set of informational and analytical resources (both materials and persons) which missions and LDC's can draw upon to assist in defining problems and constraints, designing programs and projects, and implementing those of highest priority. The need for technical assistance to the field has been a major consideration in the development of this project and in the design of its component outputs. Goal, Purposes, and Output statements for the project are presented below. The complete Logical Framework Matrix is contained in Attachment Two.

A. Goals

The primary goal of this project is to strengthen LDC capability to define, assess, and solve problems which lead to inefficiencies and distributional inequities associated with water resource development in agriculture. Related sub-goals are: (a) to determine the economic costs and returns of water allocation procedures including pricing policies for specific (representative) irrigation projects in LDC locations, (b) to ascertain the role of selected water institutions and management procedures in the operation of those projects, (c) to estimate economic impacts of LDC water policies

^{5/}

It is recognized that economic efficiency and improved income distributions may at times be in conflict. This conflict may be compounded by the indirect or secondary impacts. The actual trade-off between efficiency and equity will vary among countries and projects and can only be established on an individual basis.

relating to project scale and geographic dispersement, and (d) to identify critical factors for improving project output and benefit distribution. These goals have been expressed by a majority of USAID missions and regional bureaus as important subject matter for inquiry and technical assistance (See Attachment Three for a tabulation of mission priorities regarding water issues).

B. Purposes

Specific purposes will be: (a) for selected irrigation projects analyze water policies originating at different levels of aggregation viz., national, sector, and project levels, in terms of service area economic and financial performance, (b) to analyze impacts of alternative types of management institutions on service area income (including income distribution); (c) to identify data and methodological requirements for improved understanding of irrigation water development in selected LDC's; and (d) to provide technical economic assistance to AID/W, USAID missions and the various LDC's in carrying out their programs and projects for water resource development and utilization.

C. Outputs

There are three general types of outputs envisioned from the project: (1) analysis of water management problems, state-of-the art studies, development of new methodologies and training, all of which will serve to improve understanding of the water problems which constitute constraints to development and of alternative solutions to those problems; (2) dissemination of information for project reports generated by project activities to LDCs and USAIDs through publications and workshops/seminars; and (3) technical economic assistance in solving water problems to be utilized by USAID missions, AID Regional Bureaus, and LDCs.

In the following material these outputs are discussed in more detail.

(1) Literature Review and Synthesis

Published data as well as unpublished data will be collected and summarized from worldwide sources for user access to cover: (a) the range of water allocation schemes in play around the world; (b) a listing of water problems or issues in different agricultural situations; and (c) discussion of alternative ways in which LDC governments have assessed and solved agricultural water development problems in their respective countries. This information will be continually updated and bibliographies and lists of current holdings will be circulated to USAID missions, bureaus, and institutions and individuals in the less developed countries.

(2) Workshops, Conferences, Seminars

Ten to fifteen workshops, conferences/seminars will be held involving LDC personnel, project staff, consultants, and administrators working at various levels in governmental systems. Workshops will vary from informal seminars to structured presentations of issue papers and reports. Workshops within country will be scheduled following completion of each plan of work for project analysis to appraise local and national staff of specific work plans for the studies. Major conferences and international seminars will be held upon completion of country studies.

There will be at least two major (25-40 participants) conferences covering overall CSU/UM activity. The first will be early in the project life and will bring together US and foreign experts on water problems in the developing world. The purpose of this conference will be to share information and experiences on the range of water issues in LDC's.

The second major conference would occur near the end of the three-year project. This conference would bring together many of those participating in the first conference, plus those LDC water experts who have worked in close cooperation with CSU/UM and AID during the course of the project. It is anticipated that this might involve representations from five to six countries. The objective of this conference would be to report on the nature of the activity that had gone on, the lessons learned, and the prognosis for future work in water resources development in the LDC's.

As appropriate, workshop proceedings will be published and made available to interested parties. These workshops will be designed to link U.S. professionals, AID personnel and LDC staff members for the purpose of educating water resource administrators about the rationale and effects of alternative water allocation and other operational procedures. These activities will be designed to facilitate communication and feed-back to critique and measure practical acceptability of project recommendations.

(3) Project Reports

At least three overall project reports, one at the end of each project phase, will be prepared for use by AID missions overseas, foreign institutions and other interested parties. The nature of these reports will depend heavily upon the direction of interest of USAID missions, their needs and counsel.

(4) Publications

Professional publications in the form of journal articles, professional reports, and popular articles will be expected outputs.

(5) Technical Assistance

Technical assistance activities to transfer information and results will be designed working through USAID missions and LDC in-country research and planning centers. USAID missions will play an important role in identifying country studies which are compatible with their needs. The assistance requested will be provided as soon as practical. It is likely that different technical assistance activities will be required in specific cases to gain an understanding of how water policies constitute constraints to development in a particular country. It may be necessary for Minnesota and Colorado State Universities and AID/Washington to establish priorities among the requests received.

Illustrative of the activities which are expected in technical assistance assignments are:

- 1) Assess country water development and management constraints/problems and preliminary identification of assistance projects.
- 2) Assist in the preparation of necessary background paper for project design.
- 3) Assist in the preparation of project documentation, i.e., project identification document (PID) project paper (PP), or parts thereof as appropriate.
- 4) Participate in evaluations of USAID missions projects and programs.
- 5) Participate in preparation of agricultural sector analyses and sub-sector studies, involving host country water resources.
- 6) Participation in development of USAID Country Development Strategy Statement.
- 7) Improve LDC capacity for planning and analysis through close interaction with host country counterpart staff.

Funds are provided in the contract budget to provide approximately 30 mm professional time in TDY assistance to missions. It is anticipated that

such TDY assignments as are so funded will be of short term duration.

It is understood that assessment type technical assistance need not await extensive work by CSU/UM, and indeed every effort will be made to initiate contact with selected USAID's and LDC's as soon as possible. The choice of countries and irrigation systems which will be examined will be made with mission needs in mind. In other words, the data collected and analytical work performed should be of direct interest and utility to the USAID mission involved. Contract staff resources should, therefore, be able to provide direct technical assistance as an integral part of project activity.

The material for these outputs will be formulated from: (1) reviews of literature on water problems in LDC's, (2) discussions with AID personnel, (3) meetings and discussions with LDC technicians and planners, and personnel of international development assistance agencies, and (4) knowledge and experience of the CSU/UM personnel - including new knowledge gained in the course of this cooperative agreement.

DS/AGR/ESP will play a key role in integrating and linking project results with other AID activities and the work of other international assistance organizations.

PART IV. SCOPE AND ANALYTICAL FRAMEWORK

A. Scope of the Project

The proposed project seeks to improve the knowledge base for improved water resource planning and policy analysis, and to increase the availability of water resource experts available to USAIDs and LDCs. The project involves an integrated applied research and direct technical assistance effort.

The applied research component represents a set of "core" activities which contract staff will carry out during the course of the project period. Core activities are: review of literature pertaining to worldwide experiences in irrigation economics, planning and policy formulation and implementation; assessments of analytical methodologies appropriate for irrigation policy evaluation; case studies of selected irrigation projects and related policy measures in LDCs; synthesis and dissemination of information collected, study results and general findings on a worldwide basis. These activities will be ongoing efforts but which can be, if necessary, delayed in order to make contract staff available for direct involvement with mission and LDC host country programs. Cases chosen for special attention, however, will be irrigation projects wherein the respective AID mission and/or LDC government has a direct interest in study conclusions. This approach to applied research and technical assistance links project field data collection/analysis directly to expressed field needs, as well as provides ~~an opportunity for missions to draw upon experts closely in tune with country~~ problems.

Thirty (30) man months of direct technical assistance in water resource economics will be made available to the field, i.e., USAID missions and/or LDC host governments, by the project from the staff of the contractor team.

The general scope of work for the case study analyses calls for appraisals of selected policy measures and related water allocation procedures now being carried out in several carefully chosen locations. Of concern are measures and procedures implemented at the main canal/conveyance system level which help to determine the amount and timing of deliveries between competing service areas. Also, of concern are other policies and operating arrangements (institutions), e.g., farmer associations, water pricing, which determine

the allocations made among individual farmers within the service area. While such factors "operate" at these different levels, their impacts can be traced to the service area level of aggregation. In this way the project seeks to show systematically how the economic and financial performance of service areas are affected by fundamental policy and procedural arrangements. As indicated previously (p. 6) the focus of inquiry will be upon

- (1) Water allocation rules, policies, and/or customs
- (2) Institutional arrangements for irrigation project management
- (3) Public policies regarding design, scale and geographic dispersement of irrigation projects.

and their economic impact upon service projects.

Between four and eight systems in at least two, but possibly four, countries will be identified for case study analysis. The systems chosen will be those having characteristics common within regions and, to the extent possible, between regions. Specific criteria for site selection will be developed in an initial phase of the project devoted to preparation of detailed work plans. (See Part V). The analytical framework envisaged at this point is a comparative study of the different policies and management practices in terms of service area income and distribution. As appropriate, *ceteris paribus* assumptions will be imposed to identify the effect of policies and management. Sensitivity analysis of input/output price ratios, resource base, technology, and socio-economic variables will be carried out to isolate the income of differences in site-specific factors. Also, world prices for tradeables can be utilized to improve comparability between study sites.

Data collection will emphasize the use of secondary sources. Primary data will be collected when needed to supplement existing information. Since the

project's focus is at the conveyance system and service area level it is anticipated that considerable published and/or otherwise available information will be attainable. Micro level data regarding farm level costs and returns, water use, etc., may be more difficult to obtain from secondary sources. If study sites cannot be chosen with such information readily available, then supplementary field data collection will be carried out to the extent needed. While it is hoped that extensive farm level surveys can be avoided by a "partial analysis" approach, final determination on the extent of field surveys must await more information about possible study sites. In any event, data availability will be a key factor in site selection.

Overall project output, therefore, will be as follows: a series of reports synthesizing information generated through literature reviews and the case study analyses; a series of workshops and seminars involving project research staff, AID staff, and LDC planners and policy makers; and short-term direct technical ~~assistance to USAID field missions and IDCs.~~

B. Analytical Framework of the Case Studies

In dealing with the three major issues related to irrigation schemes and their management of concern here it is helpful to think in terms of three aspects of the problem: (1) the physical infrastructure or characteristics of the water delivery system; (2) the people directly responsible for agricultural development within the area irrigated by that system (scheme managers, their staff, the farmers); and (3) the overall framework of government policy and institutional setting within which the managers and farmers operate. The extent to which the poor performance of systems is related to management will depend on deficiencies in technology, the inadequacies of the physical struc-

tures and the overall policy. In some case significant improvements in performance can be achieved without recourse to major capital investments while in others physical changes will be required.

One analytical framework for this class of problems calls for a systematic comparison of the economic efficiency and equity impacts associated with different combinations of (a) physical infrastructure, (b) water allocation "rules", and (c) institutional/management policies and procedures which characterize in-place irrigation projects.

This framework can be illustrated as a matrix (see Figure 1). Across the top one would have different types of physical systems, e.g., pump irrigation, large scale government operated gravity flow systems, small scale gravity flow systems with storage and small scale systems dependent on river flow (no storage). On the left-hand side of the matrix are examples of a large number of possible policy options for changing the performance of the command area(s) served by the physical system. This would include allocation procedures, management and operation alternatives, and repayment methods.

Each project (identified in a column heading) would have associated with it a number of these left-hand-side variables. Together, the combination of physical characteristics and left-hand-side variables describe key features of that project. As indicated, performance of the project would be measured in terms of aggregate service area income parameters. Other important measures of performance could include employment including off-farm labor, and, depending on data availability and size of service area, impact on regional growth, migration rates, mobilization of local resources (labor and savings) and regional consumption levels.

The analytical task involves first of all selecting appropriate irrigation projects in selected LDC's having major features common to many systems for case study work. Then, through the use of primary and secondary data, equity and efficiency parameters associated with the command area served must be calculated and related to specific project characteristics. Comparisons between projects both within and between countries would then follow indicating, to the extent possible, how policy changes might improve performance.

Work is already underway which will be helpful in this project. For example, studies by Colorado State University and Cornell University in Pakistan, Philippines and Indonesia should provide important insights on water management practices being followed in LDC's. The Cornell study in the Philippines on the other hand is considering three types of irrigation: pump, a small community gravity system, and a part of a large national gravity system. They are attempting to determine what on-farm water management factors contribute to the "best" use of irrigation water. What is discovered in terms of the micro level impact of water management methods will be an important adjunct to the findings of the more macro oriented work proposed herein.

The response from missions to this project has been supportive. One of the major concerns in the field seems to be water allocation procedures at the general system level. This was listed as high priority by the Philippines, Somalia, Thailand, Sri Lanka, Peru, and Sudan, Jordan, Syria, Pakistan, and India. The institutional and management problems associated with irrigation project implementation and rehabilitation were felt to be of high priority by Syria, Jordan, Egypt, India, Guyana, Peru and Sudan. Irrigation project scale, design, and investment distribution problems were ranked high by Philippines, Guatemala, Thailand, Sri Lanka,

TYPES OF IRRIGATION SYSTEMS

Large Scale Gravity Flow Private Pump Tank Irrigation Conjunctive System

Allocation procedures

- 1) No formal allocation
- 2) Market allocation
- 3) Fixed period allocation
- 4) Allocation by crop
- 5) Constant share

Operation and Management (O&M)

- 1) O&M provided by government
- 2) O&M by farmers
- 3) M by farmers
- 4) No M
- 5) Local org. for water delivery

Repayment methods

- 1) Average cost
- 2) Marginal cost
- 3) Base on income or acreage
- 4) Nominal charge
- 5) Land tax

Institutional setting

- 1) Tenure system favoring large land owners
- 2) Tenure system neutral
- 3) National water policy identifies water as scarce
- 4) Water consider free resources

Government Investments

- 1) No field channels
- 2) Field channels
- 3) No govt. investment in infrastructure
- 4) Govt. investment in roads
- 4) Govt. investment in markets

Honduras, and Guyana. Scale and Dispersement of problems were recognized by Guatemala, Guyana, Honduras, Philippines, Thailand and Sri Lanka. (In Attachment Three a summary of the USAID missions response indicating priority ranking of water problems and interest in participating in the project may be found).

C. Relationship to Ongoing Work

CSU/UM personnel have firmly established linkages to numerous AID and other development projects that presently and/or in the future may relate to activities envisioned under this proposal. These linkages can be grouped as follows:

Current CSU/UM AID funded projects:

- Improving Irrigation Water Management of Farms (Pakistan)
- Water Use and Management Project (Egypt)
- Small Farm Irrigation and Fishery Development Projects in Peru
- CSU/UM Small Farmer Credit Project (Honduras, Dominican Republic)
- Lesotho Agricultural Sector Analysis
- Tunisia Agricultural Sector Analysis

Established Linkages with Various Other LDC Programs and Projects

- India (Ford Foundation, India CSWTR Institute)
- Thailand (Ford Foundation, Rockefeller Foundation, Kasetsart University, Asian Institute of Technology)
- Philippines (Kansas State Grain Project, Rockefeller Foundation,, IRRI)
- Spain (long term work on water law, delivery and pricing systems)
- Mexico (resources for the Future, National Science Foundation funded projects in international water problems and irrigation development)

The opportunity these linkages afford for sharing of ideas, information, and even technical data will undoubtedly strengthen the work of CSU/UM on this particular project.

Within AID there are four ongoing projects and one newly planned which have special significance for this project. These projects are:

1. Egypt Water Use and Management (USAID/E)

2. Improving Irrigation Water Management on Farms (ASIA/TR/ARD)
3. Determinants of Developing Country Irrigation Problems (DS/AGR/TSWM)
4. Water Management Synthesis (DS/AGR/TSWM)
5. Water Management Support and Service (DS/AGR/TSWM)

The relationship between these projects and the proposed activity is discussed in the following sections.

Egypt Water Use and Management Project

This is a five year \$8,000,000 mission funded activity wherein the Consortia for International Development (CID) is the prime contractor. The project seeks to develop and test a program of improved irrigation water management through adaptive research and demonstration. The effort is a broadly defined multi-disciplinary project. Alternative technologies for handling irrigation water will be identified and cost/benefit estimates prepared. Three major irrigation systems are identified as demonstration sites. The primary focus is upon improved on-farm water and land utilization practices.

Since this is a country specific mission project it is difficult to compare it to the proposed activity. The USAID/E project provides an opportunity to examine very closely the specific engineering and socio-economic factors which determine system performance in three projects in Egypt. Colorado State University personnel will thus gain great insight into the situation in that location. This experience will in turn improve the capacity of CSU to carry out the work suggested in the new proposal. Indeed it is very likely that the Egypt study will provide "cases" which will be combined with those of other countries for further generalization. The new proposal will, accordingly, deal with some of the issues being addressed in the Egypt study and focus on the policy/management complex, but in a broader situation framework.

Improving Irrigation Water Management on Farms

This is a centrally funded research project developed in DS/AGR/TSWM but currently being managed by ASIA/TR. It is being carried out by Colorado State University (CSU). As the title indicates the focus of the work is upon improving on-farm irrigation efficiency. Methods being examined are water course improvements, improved structure for water control, augmentation of water supply with wells and on-farm storage, and optimal utilization of increased supplies. Economics work includes computing benefit/cost ratios for these technological changes and costs of producing water from tubewells. Socio-economic benchmark studies of participating farms on water courses is also involved. The project is concentrated in Pakistan.

In relation to the Pakistan project, the proposed study addressed the question of how conveyance system (i.e., main canal from water source to farmers turn-out) performance is affected by water allocation rules including pricing and related "water based" charges, management procedures, and design scale, and geographic dispersion. The purpose of this analysis is to provide information useful in a policy framework for improving system management. The focus is upon the economic consequences of system operation as measured by direct income and income distribution effects at the service area(s) level and employment generated off the command area. Information on a limited number of important non-economic variables e.g., environmental and socio-cultural parameters as they determine economic impacts of system output will also be examined to the extent data is available. The proposed project envisions two to four country locations. The principal investigator from the CSU project has indicated that the two project are complementary and that no overlap or duplication is involved

which would mitigate against the proposed effort. He therefore supports the proposal (See Attachment Five).

The proposed project is therefore seen as complementary to the existing project; however, differences in scope and analytical framework exist, viz., the focus is broader in terms of command area performance and related management variables, and in terms of the number of countries involved. It provides for much greater in-depth analysis of economic factors and it is structured toward policy analysis as opposed to on-farm resource use. It also provides for technical assistance to USAID missions as a major output. Complementarities exist in that system efficiencies are measured by the income impact upon direct project participants (farmers); hence, the current project should be able to provide data useful in the proposed piece of work. Moreover, the insights gained from the on-farm management project regarding site selection in other countries, linkages, data sources and analytical methodology will be most beneficial.

Determinants of Developing Country Irrigation Problems

This is a centrally funded research project managed in DS/AGR/TSWM. It was received as an unsolicited proposal in 1976 from Cornell University. This project and the proposed project are highly complementary in that both are concerned with socio-economic factors as they affect project performance. These factors are examined in both projects through comparative analysis of different irrigation systems in several countries.

The "Determinants" project is programmed as a five year effort. Work began in FY 1977, a one year extension was approved for FY-1980, and project planning for FY-81/82 is underway. The overall project budget (for five years) is estimated at approximately \$814,000. The project focusses upon

Asia and is currently being carried out in the Philippines. New activity is programmed in Indonesia, with Sri Lanka scheduled for the last two years of the project. The project involves two Rural Sociologists, and Agricultural Engineer and an Agricultural Economist. The economist is budgeted at approximately one-third time.

While the proposed project deals with the same basic issues as the Determinants project there are the following differences:

1. Country Involvements

The proposed project would involve country situations not covered in the current Cornell project. Major emphasis in the new proposal would be given to developing comparative studies within the Africa, Latin America, and Near East Regional setting. The larger scope of the proposed effort (\$814,000 for three years, with an additional \$400,000 programmed for years 4 and 5) will support greater geographic coverage.

2. Problem Focus

The proposed project will focus primarily upon the economic aspects of irrigation policies and management institutions. The key parameters to be estimated are the income and income distribution generated at the service area level of aggregation. The proposal therefore earmarks the bulk of the resources committed going into economic staff and economic analysis. Some 154 mm for the first three years are accordingly budgeted for economists as opposed to some 12 mm in the Determinants project for the same length of time. The necessary input from sociologists, engineers, and other disciplines as needed is programmed in the new effort through consultancies and short time duration assignments. Input from Cornell, in the form of advice, counsel, and direct project involvement is expected to be an important aspect of this new activity.

3. Project Outputs

The proposed project is designed to maximize the technical assistance which can be provided to the field subject to the constraint that new information and understanding about irrigation systems in LDC's is needed in a variety of situations, that such information to be generated must be technically sound and it must be generalizable. The proposed activity, therefore, is based upon a plan to (a) thoroughly assess all secondary sources (published) of water resources information from the point of view of policy implications for better design and management of irrigation systems, (b) synthesize and disseminate information gathered or generated by project activities to USAIDs and LDCs, (c) carry out such field studies and primary data collection activities needed for analysis, and (d) provide professional talent through contract resources for short term field assignments to USAID missions

to assist in the economic appraisal of problems and alternative policy, program, and project options.

The information dissemination activities and the technical assistance component (programmed at 30 mm) of the project, and the depth of economic work, therefore, add a dimension not now present in the Cornell project. As an element in this, study sites to be selected will be chosen with direct mission needs in mind. In this way the resources allocated to a study site will produce outputs of immediate interest to the USAID mission involved as well as add to the store of knowledge for general use.

The work being carried out by the Cornell staff is expected to be very helpful in site (project) selection, study design and analytical phases of the proposed project are carried out. Although Cornell has focussed on Asia, information pertaining to the different situations encountered in reviewing site alternatives, the factors taken into account as final selections were made, and the experience to-date regarding analytical methodology will be extremely beneficial to CSU/UM. Also, the need to design the new activities in other regions so as to yield results that can be related to Cornell's work is extremely important. Moreover, the need to draw upon Cornell's project staff as direct participants in the new activity is fully recognized by DS/AGR/ESP and CSU/UM and arrangements for doing so will be worked out. It is worth noting that Cornell is a cooperating institution in ESP's Expanded Program for Agricultural and Rural Sector Analysis and could be brought into the proposed project in a formal way very easily. The mechanisms for tapping Cornell's talent and experience in such a way as to augment the resources of CSU/UM, therefore, already exists.

ESP sees the proposed project as a means for extending this very basic and important work beyond what is currently planned.

Water Management Synthesis and Water Management Support Services

These are two projects. Both are managed by DS/AGR/TSWM. The Synthesis project was initiated in 1978 for three years. The Support Services project is now being developed for FY-~~80~~⁸¹ funding.

The Water Management Synthesis project deals with the engineering aspects of water handling at the farm level. It seeks to synthesize world wide information about farm-level practices which affect water use efficiency. Primary output will be engineering "handbooks". The project involves extensive evaluation of irrigation projects to identify existing water handling technologies. The Support Services project is designed to provide information and technical support to USAID missions.

With respect to the proposed activity the Synthesis project has a different focus and no overlap is seen. The project assessments which are being carried out could be useful in project site selection. The Support Services project and the ESP proposal have similar intended outputs. The ESP work will focus upon economics technical assistance and provides the solid economics core to the water management analysis and technical assistance efforts which are needed.

The proposed project and the ongoing work in DS/AGR/TSWM clearly need to be coordinated. The activities in DS/AGR/TSWM all emphasize the engineering aspects of water management in agriculture (this is to be expected given the engineering specialization of that Division). While, the importance of socio-economic considerations in shaping how water resources are developed

and managed and the basic economic impact upon those both directly and indirectly affected by projects has not been ignored, these factors have not been given prominence in TSWM's program. The Cornell project is the exception; however, the level of effort given to economic issues is rather small. In order to provide the kind of "balanced" technical assistance called for in the Support Services project there is a need for more in-depth economics work than now exists or that is planned. The proposed project addresses this need.

PART V. IMPLEMENTATION PLAN

A. Time Frame

It is anticipated that this project activity will encompass a five year program. Continuation beyond even that time frame is possible because of the technical assistance nature of the project. Initially the work associated with this project is programmed over three years, with years four and five dependent upon project success as revealed in mission demand and periodic evaluations. Core activities during the first three year effort are to be carried out in three phases as follows:

- Phase I. Literature Review, Preliminary Studies, and Case Study
Site Selection
- Phase II. Data Collection and Analysis
- Phase III. Conference, Workshop, and Final Report Preparation

The work plan for each of these phases is discussed in narrative here. Project responsibilities, budget management, and evaluation information is contained in following sections.

Phase I. Literature Review, Preliminary Studies and Project Selections

This Phase of the project is estimated to require 9-10 months. The principal objective is to review background studies based on secondary data from selected

countries and to identify specific irrigation systems in LDC's for detailed analysis.

Activity A. A project planning meeting will be held in Washington, D.C. involving the AID project manager and the principal investigator from CSU/UM prior to initiation of Phase I activities. The purpose of this meeting is to prepare a work plan for this first phase of the project. The work plan shall identify the specific tasks to be carried out, the division of responsibilities between CSU/UM, and cost estimates.

Activity B. Project personnel will review studies of successful and contrasting water policies and administrative organizations in developed and developing countries. Successful systems will serve as role models to gain ideas and insights and form recommendations for less developed situations. In addition to the United States, countries considered for study as role models are Spain, Mexico, Israel, Taiwan, New Zealand, Pakistan, Sudan, and Egypt. Others may be chosen as the work in Phase I proceeds. The experiences of these countries will also help form the agenda for conferences and workshops planned during the course of the project. It is not contemplated that field work will be required in this preliminary phase.

Activity C. Discussions with AID/W and field personnel regarding possible country locations for project case study. Preliminary data collection on specific water resource economics issues relevant to these possible locations will be collected.

Activity D. Final selection of countries and project sites in those countries for detailed analysis in Phase II. Projects in LDCs will be selected by the contractors, USAID mission staff, host government representatives, AID Regional Bureaus and DS/AGR staff members. Project selection will thus involve country visits and the establishment of collaborative working arrangements between host governments, missions and the contractors. Not all countries of the world which have water policy and pricing problems can be included in this study. Consequently, care must be taken in the selection of sites for analysis to insure that the problems presented are not atypical. So far as resources permit, the following factors will be included as criteria in the selection of countries or portions of countries for specific study:

- Experience among project
- Distribution among continents
- Nature of existing institutions administering water
- Source of water as between surface and ground water
- Seasonal vs. year-around water availability
- Irrigated vs. supplemented rainfed situations
- Water surpluses vs. water shortages
- Potentials for in-country cooperation

Phase I initial discussions regarding participation will involve the USAID missions in Egypt, the Sudan, India, Peru, Thailand, Guyana, Honduras, Guatemala, Somalia, and Syria.

Activity E. Development of preliminary research plans of work for each study site will be prepared. A joint planning session in Washington, D. C. of the principal investigators and AID staff including mission personnel to the extent possible will be held for this purpose. This planning session will focus upon the following issues:

- a. the specific countries and sites within countries for investigation;
- b. division of responsibility among the universities and individuals involved;
- c. the framework and content of data and information to be collected at each level of analysis within each country;
- d. the plans for reporting results and progress through the duration of the project; and
- e. plans for an effective additive product at the end of the project

Activity F. Once countries have been selected and preliminary work plans prepared, a workshop will be held in Washington D.C. to discuss water policy issues to be addressed, the study plans, the methodologies to be followed and the division of responsibilities between UM and CSU staff.

Activity G. Preparation of a Phase I Completion Report and plan of work for Phases II and III.

Activity H. Direct technical assistance as possible in conjunction with Phase I activity.

An important aspect of project implementation is preparation by the end of Phase I of a plan of work for the remainder of the project life. This plan should identify specific activities to be carried out in Phases II and III the locations for field studies, linkages and relationships with AID missions and host country counterparts, and cooperators, qualified personnel for involvement in later phases of the project, activity budgets, and other information necessary for sound project planning and management. ESP staff and representatives from AID regional bureaus and involved mission staff (to the extent possible) will participate in preparation of this plan of work.

Phase II: Data Collection and Analysis

It is estimated that this phase of the project will require approximately 20 to 22 months. The objective of this phase is to become involved with four to eight in-place irrigation "problem" situations and to assist in resolution of those and related issues. It is expected that analyses will be needed to assess the relative performance of these systems using the performance indicators previously measured and to relate that performance to system characteristics. Contract resources will also be available during the phase for additional short term technical assistance assignments to various USAID missions upon request

The activities of the phase are:

Activity A. Finalize literature review pertaining to each irrigation system and related projects which are to be analyzed.

Activity B. Finalize working arrangements with respective host countries and USAID missions.

Activity C. Finalize plans of work for each case study system/project analysis and analytical methodology to be followed.

Activity D. Carry out necessary field work according to the plan of work developed in C above. Data collection will primarily involve secondary sources; however, when necessary primary data will be collected to supplement that which is already available. Data collection will be appropriate for examining service area economic efficiency and equity performance vis-a-vis system participants as well as for evaluation of the economic consequences off-site of the immediate service areas. Data would be procured on the effects of allocation policies among farms, institutional arrangements, scale or size of project, system management variables, and other physical characteristics. The case studies will be compared and interpreted to isolate the effects of alternative allocation, management, or pricing policies. The data will be analyzed via methodology to be developed in item C.

Activity E. Preparation of reports and resource material outlining the nature of the water resource economics problem encountered in each case, assessments of policy options relieving or mitigating those problems, and the analytical procedures followed in arriving at those

conclusions.

Extended assignments of project personnel overseas is not anticipated. Rather the project will be accomplished by TDY travel combined with solicited cooperation with U.S. institutions and research institutes, and with universities and ministries in the countries involved. To the extent that long term primary data collection is required, attempts will be made to enlist graduate research assistants from cooperating U.S. universities but native to the countries being studied. These research assistants will work under the direct supervision of principal project staff who will travel in-country as needed to provide strong direction to the work. Data collection through cooperative arrangements with host country agencies is also a possibility.

Phase III. Conferences, Workshops, and Final Report Preparation

This phase of the project is expected to require 4 to 6 months. The objective is to synthesize the results of literature reviews, state of art assessments and case study analyses undertaken, and to communicate findings to interested individuals. This phase involves presentation of conferences and/or workshops by the contractors, and preparation of appropriate final reports suitable for general distribution. The activities to be carried out under this phase are:

Activity A. Preparation of preliminary completion reports synthesizing information generated in the various case activity case and the experiences gained in TDY consultancies by project contractors.

Activity B. At least one general conference and/or workshop will be organized in which AID, LDC and other personnel interested in water policy and pricing will be invited. A conference and/or workshop will be held within each country where case studies were carried out. Primary focus to be the specific findings of the relevant case studies.

Activity C. Finalization of project completion report.

B. General Project Responsibilities

The primary CSU/UM inputs to this activity are the time of key personnel and support staff, including selected research assistants in training at the two universities who can contribute to the project objectives via their thesis research and/or expertise and experience in key LDC's to which project activities will be directed.

Professional and support staff to be committed to the project can be subdivided into five broad categories, as follows:

1. Project Management

Project Director, E. Shuh, UM
UM Project Manager, K. C. Nobe, CSU

Total of 9.0 months over the life of the initial 3-year agreement. 3 months will be devoted to project management with the remaining 6 months allotted for professional involvement in project research and/or technical assistance.

2. Project Leaders/Principal Investigators

R. A. Young, CSU
W. Easter, UM

Total of 5 months each year or a total of 15 months over the life of the initial 3-year agreement.

3. Associated Professional Staff*

M. Lowdermilk, CSU
M. D. Skold, CSU
G. Radosevich, CSU
D. Seckler, CSU
J. Seagraves, CSU (UNC)
L. Martin, UM
J. Waelti, UM
D. Welsch, UM
*(or equivalent faculty)

An average of 15 months each year, drawn from these personnel as project needs may dictate, or a total of 40 months over the life of the initial 3-year agreement.

Total Professional Staff

64 months over the life of the initial 3-year agreement.

4. Support Staff

Graduate Assistants (3)

Total of 54 months for GRA's and 36 months of secretarial services over the life of the initial 3-year agreement.

5. Consultants - Selected specialists at other universities, federal agencies and/or in the private sector.

Total of 40 days per year or a total of 120 days over the life of the initial 3-year agreement.

It is understood that the project management aspects will be budgeted as illustrated by the sub-total lines Table 1. While project staff commitments and related funding needs will be initially divided between CSU and UM as outlined in Table 1, the two universities reserve the right to make internal adjustments between them, in consultation with AID, as the needs of the project may dictate. It was agreed that CSU and UM will enter into a formal memorandum of agreement to facilitate the technical and administrative requirements of this joint project effort.

In terms of CSU/UM specific responsibilities, it is agreed that:

1. The agricultural economists designated above will be available to conduct the work specified under the Outputs section. Professors Young (CSU) and Easter (UM) will comprise the lead professional staff for CSU/UM respectively. The principal Investigator from UM Dr. W.K. Easter will serve as the overall project coordinator and will be the primary point of contact for technical project matters. Associated professional staff will be utilized on a need basis and will expend a portion of their time on the technical assistance phase, particularly in servicing requests from AID missions and in-country agencies from those LDC's in which they have particular experience and expertise.

2. CSU/UM will assign other support personnel such as graduate assistants and secretaries as needed, within the funding levels requested. As needed, consultants will be utilized and selected in close coordination with AID/Washington project personnel.

3. CSU/UM will provide the necessary on-campus office space, equipment and supplies, in part budgeted in the project proposal, in order for the professional staff to effectively carry out the proposed project activities.

4. UM as the lead university has appointed an overall project director, Ed Shuh, to be responsible for liaison with the CSU project manager, K. C. Nobe, and to maintain liaison with the AID activity manager, as well as with Mission personnel who elect to utilize the outputs and services of this project.

C. Project Budget

The total cost of the three year cooperative agreements with Colorado State University and the University of Minnesota is estimated to be approximately \$814,000 (see Table 1). Of this total \$322,000 is allocated to wages and salaries of the long term staff at CSU/UM. Of the balance of \$473,000, \$39,000 is estimated for consultants and \$453,000 for travel, overhead, training, and other direct and indirect costs. The U.S. technical assistance component including travel and per diem total to \$240,000. The estimated budget for the general literature review and country/site selection of Phase I is \$200,000. A estimated budget for Phase I is contained in Table 2. The Phase I completion report shall contain a similarly detailed plan of work including identification of field activity sites, and budget for Phases II and III. ESP and AID Regional Bureaus technical office staff representatives will review and approve the Phase II and III plans of work and budgets prior to implementation.

University of Minnesota
in cooperation with
Colorado State University

Revised

Table 1: Proposed Budget for Water Resources Policy and Pricing Project (RVP/DSAN-50134)

	FY-1980		FY-1981		FY-1982		Total Months	Total Budget
	Months	Dollars	Months	Dollars	Months	Dollars		
I. SALARIES								
Project Management								
Co-Director, E. Schuh	.5	2088	.5	2213	.5	2350	1.5	6651
Co-Director, K. Nobe	.5	1875	.5	2000	.5	2100	1.5	5975
Sub-totals	1.0	3963	1.0	4213	1.0	4450	3.0	12626
Other Professional Staff								
			(+6X)		(+6X)			
CSU Staff								
R.A. Young, Coordinator ^{1/}	2.0	7,600	2.0	8,000	2.0	8,500	6.0	24,100
K. Nobe ^{1/}	1.0	3,750	1.0	4,000	1.0	4,200	3.0	11,950
H. Lowdermilk ^{1/}	2.0	5,000	2.0	5,300	2.0	5,500	6.0	15,800
H.D. Skold ^{1/}	2.0	6,300	2.0	6,700	2.0(1)	7,100	6.0	20,100
G. Radosevich ^{1/}	2.0	5,000	2.0(1)	5,300	2.0(1)	5,600	6.0	15,900
J. Seagraves ^{1/}	2.0	5,000	2.0	5,300	2.0(1)	5,600	6.0	15,900
D. Seckler ^{1/}	-	-	2.0	6,350	2.0(1)	6,700	4.0	13,050
Sub-totals	11.0	32,650	13.0	40,950	13.0	43,200	37.0	116,800
UM Staff								
W. Easter, Coordinator ^{1/}	3.0(1)	8,100	3.0(1)	8,600	3.0(1)	9,100	9.0	25,800
E. Schuh ^{1/}	1.0	4,175	1.0	4,425	1.0	4,700	3.0	13,300
L. Martin ^{1/}	2.0(1)	6,300	2.0(1)	6,700	2.0(1)	7,100	6.0	20,100
J. Waelti ^{1/}	2.0	5,000	2.0	5,300	2.0(1)	5,600	6.0	15,900
D. Welch ^{1/}	2.0	5,900	2.0(1)	6,250	2.0(1)	6,600	6.0	18,750
Sub-totals	10.0	29,475	10.0	31,275	10.0	33,100	30.0	93,850
Total Professional Staff	22.0	66,088	24.0	76,438	24.0	80,750	70.0	223,276
Support Staff								
CSU Staff								
Grad Research Assistant (1)	6.0	5,800	6.0	6,150	6.0	6,500	18.0	18,450
Secretarial (1-B)	6.0	5,800	6.0	6,150	6.0	6,500	18.0	18,450
Sub totals	12.0	11,600	12.0	12,300	12.0	13,000	36.0	36,900
UM Staff								
Grad Research Assistant (2)	12.0	13,600	12.0	14,400	12.0	15,300	36.0	43,300
Secretarial	6.0	5,800	6.0	6,150	6.0	6,500	18.0	18,450
Sub-totals	18.0	19,400	18.0	20,550	18.0	21,800	54.0	61,750
Total Support Staff	30.0	31,000	30.0	32,830	30.0	34,800	90.0	98,650
TOTAL SALARIES		97,088		109,288		115,550		321,926

^{1/} Includes 10% salary differential while on TDY's in LDC's.

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	FY-1980		FY-1981		FY-1982		Totals Months	Total Budget
	Months	Dollars	Months	Dollars	Months	Dollars		
II. CONSULTANTS								
(Agricultural Economists, Rural Sociologists, Agricultural Engineers, and Anthropologists)								
TOTAL	3.0	12,000	3.0	13,200	3.0	14,400	9.0	39,600
III. FRINGE BENEFITS								
CSU Staff 10.64%		3,750		4,600		4,800		13,150
UM Staff 22.0%		8,700		9,200		9,700		27,600
Total Fringe Benefits		12,450		13,800		14,500		40,750
IV. OVERHEAD								
CSU 76.8%		30,900		37,600		39,700		108,200
UM 53.7%		28,500		30,200		32,000		90,700
Total Overhead		59,400		67,800		71,700		198,900
V. TRAVEL AND TRANSPORTATION								
Inter-University Travel		3,000		5,400		1,500		9,900
Travel to D.C.		2,400		2,300		1,500		6,200
International Travel		15,000		19,000		12,000		46,000
Total Travel and Transportation		20,400		26,700		15,000		62,100
VI. ALLOWANCES								
Post Differential		-		-		-		-
Per Diem		7,600		15,900		12,000		35,500
Total Allowances		7,600		15,900		12,000		35,500
VII. OTHER DIRECT COSTS								
Data Collection and Analysis		10,000		30,000		10,000		50,000
Computer Charges		1,000		3,000		2,600		6,600
Overseas Insurance		1,400		2,000		1,500		4,900
Total Other Direct Costs		12,400		35,000		14,100		61,500

4/20/82

	FY-1980		FY-1981		FY-82		Total Months	Total Budget
	Months	Dollars	Months	Dollars	Months	Dollars		
VIII. EQUIPMENT AND SUPPLIES								
Equipment								
Programmable Calculators (4)		2,000		-		-		2,000
Library Materials and Storage		1,000		3,000		1,000		5,000
Miscellaneous Office Equipment		1,000		500		-		1,500
Materials and Supplies		<u>2,000</u>		<u>3,500</u>		<u>1,500</u>		<u>7,000</u>
Total Equipment and Supplies		6,000		7,000		2,500		15,500
XI. PARTICIPANT TRAINING								
Workshops and Conferences								
Participant Fees or Honoraria		3,000		3,400		4,000		10,400
Travel and Subsistence		<u>7,600</u>		<u>10,600</u>		<u>9,000</u>		<u>27,200</u>
Total Participant Training		10,600		14,000		13,000		37,600
X. SUB-CONTRACTS								
		-		-		-		-
XI. ROYALTIES								
		-		-		-		-
XII. GENERAL ADMIN. RATE								
		-		-		-		-
XIII. SUBTOTAL								
		237,938		302,688		272,750		813,376
XIV. FIXED FEE OR PROFIT								
		-		-		-		-
XV. GRAND TOTAL								
		237,938		302,688		272,750		813,376

X-100

TABLE 2: DETAILED BREAKDOWN OF PHASE I BUDGET

ACTIVITY	ACTIVITY A	ACTIVITY B	ACTIVITY C	ACTIVITY D	ACTIVITY E	ACTIVITY F	ACTIVITY G	ACTIVITY H	TOTAL
	Project Planning	Literature Survey	Initial Site Selection	Final Site Selection	Planning Session	Workshop	Completion Panel	Technical Assistance	Phase I
Personnel									
- professional	2,000	3,450	1,550	16,400	4,207	2,225	1,350	2MM 23,000	55,182
- other	-	10,634	967	3,868	2,901	484	2,417	384	21,255
- fringe benefits	280	832	277	3,605	693	416	277	4,048	10,428
Travel & Per Diem									
- to AID/W	2 @ 910	-	2 @ 910	-	-	2 @ 910	-	-	2,740
- to IDCs	-	-	-	9 @ 26,570	-	-	-	-	26,570
- interuniversally	-	1 @ 300	2 @ 600	2 @ 600	2 @ 600	-	-	-	2,100
Overhead	1,305	9,842	1,642	13,225	4,638	1,768	2,458	15,323	50,201
Equipment									
- misc. office equipment	-	1,000	-	-	-	-	-	-	1,000
- off. supplies	-	600	600	200	200	100	300	-	2,000
- calculators	-	2,000	-	-	-	-	-	-	2,000
- libr. materials & storage	-	1,000	-	-	-	-	-	-	1,000
Other									
- data coll. & processing	-	5,500	5,500	-	-	-	-	-	11,000
- consultants	-	-	-	2,000	-	2,000	-	-	4,000
- overseas insur.	-	-	-	900	-	-	-	-	900
- workshop costs	-	-	-	-	-	6,500	-	-	6,500
TOTAL	4,495	36,158	12,046	67,368	13,239	14,403	6,802	42,855	197,366

*Includes 3 visits to US by IDC officials

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D. Project Management

As indicated it is proposed that this project be handled through a Cooperative Agreement. Colorado State University and the University of Minnesota have already submitted a proposal for this work in keeping with project implementation procedures of the Expanded Program. The activity paper now presented is a product of the cooperative efforts of CSU/UM and AID.

The project will be managed by DS/AGR/ESP. Staff of DS/AGR/TSWM and DS/RAD will be closely involved in all technical matters. By so doing, the coordination needed between the three offices viz-a-viz this and other water projects should be achieved.

It is recognized that the input of social scientists other than economists will be necessary at appropriate stages in this project. The proposal provides for a continuing input from a rural sociologist as part of the project contract team. In addition, it is suggested herein that there should be close interaction between ESP staff and the staff of DS/RAD so that the programs of each office are fully complimentary and mutually supportive. To that end, ESP will consult with DS/RAD regarding all aspects of this project pertaining to input required in the field of anthropology, sociology, and political science. Moreover, opportunities for mutual utilization of information and talent generated through ESP and DS/RAD projects will be fully explored as this project is developed and carried out.

As the sponsoring office, DS/AGR/ESP will have responsibility for (1) insuring that the required reports, evaluations, approvals, etc., are completed on time, (2) insuring that project problems are identified and solved as quickly as possible, (3) insuring that periodic evaluations of the project are carried out, (4) exercising the right of approval or disapproval of project

personnel proposed by UM/CSU (in consultation with TSWM and DS/RAD), (5) keeping AID/W informed on project activities, (6) assisting AID missions in the utilization of the technical assistance resources and other outputs of the project (with TSWM and DS/RAD), and (7) clearance on all domestic and international travel proposed by UM/CSU staff with notification of ESP at least one month in advance regarding itinerary, traveler biodata, and explanation of trip objectives and relationship to work plan. ESP will have responsibility for obtaining all USAID mission clearances for international travel. ESP, together with TSWM and DS/RAD will insure that appropriate and timely coordination necessary for success occurs with other water resource development projects in AID.

E. Project Evaluation

Three major evaluations will be carried out during the course of the project life. The first evaluation will be carried out at the completion of Phase I activities. The first evaluation will be designed primarily to verify that the country/sites selected for evaluation and the preliminary analytical scope of work for Phases II and III are consistent with project objectives and that appropriate linkages between UM/CSU, and the respective AID missions and host government agencies can be established. The evaluation team will be comprised primarily of AID agricultural staff members with DS/AGR, mission, and regional bureau representation, and will recommend changes as deemed necessary in the design of project activities and in administrative arrangements.

The second evaluation will take place approximately two-thirds of the way into Phase II. This should occur at or near the end of the second year of the project life and occur early enough into Phase II to allow for any needed ad-

justments in data collection and analysis procedures. The primary purpose of this evaluation is to verify that the analytical work is proceeding in good order, that the linkages established between the contractors, the USAID missions, and the host governments are effective, and that the technical assistance component of the project is being utilized as planned.

The final evaluation will take place during the last month or two of the project life. It is anticipated that this review will include assessment of a draft of the project completion report and therefore will be timed so as to coincide with availability of such a draft. Comments and suggestions forthcoming from an overall evaluation of the project should improve the content and format of the final completion report. Basic questions which this evaluation will address include:

1. Has the project been successful in achieving its objectives?
2. Would similar projects, or an extension of this project to other locations be of value to other LDC's?
3. Has the technical assistance component of the project been successful in mobilizing talent sufficient for AID needs in the water resource policy area?

Following completion of all reports, workshops, seminars, etc., a standard AID project termination evaluation will be conducted.

PART VI. SPECIAL CONCERNS

A. Environmental Assessment

Since this project does not entail the construction of any physical facilities, it will have no direct impact on the environment. Nevertheless, through the incorporation of environment impacts associated with existing irrigation systems and evaluation of related income affects of environmental changes the

indirect effects upon the environment are expected to be positive. A negative environment impact determination is therefore recommended.

The activities of this project fall into the area described in environmental procedure regulations, paragraph 216.2(c) "Analyses, studies, academic or investigative research, workshops and meetings." These classes of activities will not normally require the filing of an Environmental Impact Statement or the preparation of an Environmental Assessment. Under these guidelines, this activity qualifies for a Negative Determination at the time when a threshold decision is determined.

B. Role of Women

This project will have only an indirect influence on the role of women in development. The project is designed to examine broad institutional, managerial and economic operating rules for alternative irrigation systems. The focus is upon policy changes necessary for improved economic efficiency and income distribution among farming units affected by those policies. The scope of the project, thus, precludes micro determinations of the effects of on-farm water use changes and of household/family member impacts.

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Water Resources Policy Analysis: Pre-project Field Study

In order to solicit input from the field regarding the focus and scope of the proposed project, the Division of Economics and Sector Planning (ESP) has conducted a global field survey of twenty seven USAIDs for the purpose of: (1) determining priority ranking of seven basic water resources policy analysis issues; and (2) determining USAID interest in participation in the proposed project activities.

I. Determination of Priority Issues: Ranking by USAIDs

A. USAID Missions Contacted

Latin America-Caribbean Region (6)

*Chile
 *Guatemala
 *Guyana
 *Honduras
 *Peru
 Costa Rica

Asia Region (7)

*India
 *Indonesia
 *Pakistan
 *Thailand
 Nepal
 Philippines
 Sri Lanka

Africa Region (7)

*Mali
 *Niger
 *Senegal
 *Sudan
 Chad
 Kenya
 Somalia

Near East Region (7)

*Afghanistan
 *Jordan
 *Morocco
 *Syria
 *Tunisia
 *Yemen
 Egypt

Total Number of Missions Contacted: 27

*USAIDs identified by AID/W Regional Bureau Agricultural staff as potential sites for project activity. All other missions were nominated by desk officers.

B. USAID Mission Response: Ranking of Issues

Based upon extensive discussions with the ARSP Water Sub-committee, representatives from the Regional Bureaus, and with the principal cooperators from Colorado State University and the University of Minnesota, the following issues were selected for ranking and comment by the twenty-seven USAID missions contacted. (Note: the order of listing is not indicative of priority.)

1. Water Allocation Policies
2. Policies Concerned with the Design, Scale and Distribution of Irrigation Investments
3. Institutional Problems Associated with Water Policy Implementation
4. Policies Related to Irrigation Vs. Alternative Investments to Achieve Given Development Agricultural and Rural Sector Objectives
5. Information Formulation
6. Water Use Policies - Irrigation vs. Alternative Water Supplies
7. Policies Affecting System Wide Performance

Table I presented below displays the individual and collective judgement of the queried USAIDs. These results indicate, on a global basis, that of the seven issues presented for ranking the preferred order of ranking is: 3, 1, 2, 7, 4, 5, 6. The specific policy and general system management problems which the project will address (see p. 4 of activity paper) are based upon these priority issues. These problems are:

1. Institutions and management problems associated with irrigation systems (issue 3 ranked first priority).
2. Water allocation methods and pricing schemes in irrigation systems (issue 1 ranked second priority).
3. Policies concerned with the design, scale and distribution of irrigation investments (issue 2 is ranked third priority).

Table I: USAID Ranking Response

Region/USAID Mission	Response Received X=Yes, O=No	Issues/USAID Ranks ^{1/}						
		1	2	3	4	5	6	7
<u>LAC Region</u>								
* Chile	O	0	0	0	0	0	0	0
Costa Rica	O	0	0	0	0	0	0	0
* Guatemala	X	3	1	2	4	6	7	5
* Guyana	X	5	2	1	4	7	6	3
* Honduras	X	4	2	3	5	1	7	6
* Peru	X	2	4	3	1	7	6	5
SUBTOTAL		14	9	9	14	21	26	19
<u>AFR Region</u>								
Chad	O	0	0	0	0	0	0	0
Kenya	O	0	0	0	0	0	0	0
* Mali	X	4	6	5	1	3	2	7
* Niger	O	0	0	0	0	0	0	0
* Senegal	O	0	0	0	0	0	0	0
Somalia	X	1	6	5	4	7	3	2
* Sudan	X	H	M	H	H	L	H	H
SUBTOTAL		6	15	11	6	15	6	10
<u>ASIA Region</u>								
* India	X	3	4	1	7	5	6	2
* Indonesia	X	3	4	2	7	1	5	6
Nepal	O	0	0	0	0	0	0	0
* Pakistan	X	4	5	2	7	3	6	1
Philippines	X	1	2	4	3	6	5	7
Sri Lanka	X	H	H	M	M	M	M	H
* Thailand	X	1	2	4	3	7	6	5
SUBTOTAL		13	18	16	30	25	31	22
<u>NE Region</u>								
* Afghanistan	O	0	0	0	0	0	0	0
Egypt	X	3	5	2	4	7	6	1
* Jordan	X	1	5	2	7	6	4	3
* Morocco	X	5	4	3	1	6	7	2
* Syria	X	4	6	2	5	3	7	1
* Tunisia	O	0	0	0	0	0	0	0
* Yemen	O	0	0	0	0	0	0	0
SUBTOTAL		13	20	9	17	22	24	7
Global Totals		46	52	45	67	83	87	58
Global Rankings of Issues:		2	3	1	5	6	7	4

*Indicates country USAIDs recommended by Regional Bureau Technical Offices

1/ See p. 2 of attachment for identification of issues;

2/ Code: High=1, Medium=3, Low=5

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II. USAID Participatory Interest in Proposed Project*

The following USAIDs included special comments relating to their interest in participating in this proposed Water Resources Policy project.

Indonesia - Letter 5/29/79, McAleer to Day

"At this time USAID does not have need for additional assistance as proposed in DSB project to deal with water resources management issues."

Sri Lanka - REFTEL COLOMBO 02570

". . . Mission would appreciate receiving your final scope of work and related documentation to be used as basis of our possible participation. . ."

Nepal - REFTEL KATHMANDU 02686

". . . We expect to need assistance in fleshing them [WRP projects] out."

India/Thailand - Letter 5/3/79, Riggs, USAID/I to Day

Letter 9/18/78, Easter to Sunquist

Memo 10/78, Welsh to Sunquist

- All indicate positive response to proposed project and list contacts in Indian institutions with whom collaboration would be most beneficial.
- Queener, USAID/T - Day conversation indicates strong interest on part of of Mission in project.

Egypt - REFTEL CAIRO 08218

"We will analyze materials sent to us and attempt to provide response. . . as we would not want to miss out on this rather rare opportunity."

Honduras - REFTEL TEGUCIGALPA 02543

"Mission. . . considers project to be directed at concerns and issues confronting water resources development in Honduras. Since output of ref project could benefit the GOH program. . . mission association with the proposal would warrant further discussion."

- REFTEL TEGUCIGALPA 02287

"USAID/H is extremely interested in possible inclusion of Honduras as participating country in subject project."

*These documents are on file in the project manager's office for further reference.

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Guatemala - Letter 4/19/79, Koone to Day

". . . the CSU/UM team may wish to take a look at some of the experiences and opportunities as the project evolves.

Guyana - REFTEL GEORGETOWN 01961

". . . projects focused on water resource issues. . . should be helpful to Guyana's development efforts."

- Memo 5/7/79, Steen to Day

"current (irrigation) schemes placing tremendous strain on available technical expertise and it is doubtful that any participation in the proposed project would be possible."

Somalia - REFTEL MOGADISCIO 01416

". . . presently designing large water resource development project and would find two way communications very useful."

Sudan - Letter 5/24/79, Carpenter to Day

". . . the GOS can not avoid the issues that are emerging with respect to administering Sudan's share of the Nile Basin. . . USAID will be interested in keeping abreast of the progress of the project and will be pleased to be of further assistance."

As a further reference to project preparation and background work it should be noted that careful discussions and communications have been conducted with the World Bank, LAC/DR/ARD, NE/TECH, ASIA/TR/ARD and AFR/DR/ARD.

These documents are also on file with the project manager.

ATTACHMENT 4

- a. No formal allocation procedure. Water is allowed to flow continuously in the channels. This occurs in areas of high water supply. However, those at the head of the system get all the water they need while those at the tail of the system may be short of water and will receive water late so that land preparation and planting will be late. This type of system essentially allocates water based on location on the canal. It should be considered for use if water has very low value (wet season irrigation).
- b. Shares. Each farm receives in each period a fixed percentage of water available for the period. A farmer's percentage is based on ownership of shares in the system where it is normally based on farm size. If a farmer doesn't want his share it is passed on to others and may even be wasted during times of plentiful water. Unless share can be sold the system does not allow for use of water on farms of highest need
- c. Turn. Each farm is served in order of location along the canal. When water reaches a farmer, he takes all he needs before the next farmer is served. Water distribution in any period usually begins where it stopped in the previous period. Otherwise those at the end are disadvantaged. During drought periods the time between irrigations is increased. This procedure tends to be inefficient during drought periods since water cannot be used in areas of highest need. It also leads to over-irrigation as farmers attempt to take enough water to carry them over until the next irrigation or turn.
- d. Rotation. Each farm has a reserved or set time in which to irrigate in each period. The water delivered in this time will vary on each rotation depending on flow in the ditch. The time assigned is normally based on farm size. If a farmer does not use the water in his assigned time, the water is available to other irrigators. The set time period usually does not allow farmers enough time to over-irrigate. In addition, unless the reserved time is transferable among farms or farmers it does not allow water to be allocated to areas of highest need. Finally, if no water is in the ditch during a farmer's reserved time, he will not get water until his next rotation period.
- e. Farm Priorities. Farms are served in an order of priority based on time of settlement. When water reaches a farmer, he takes all he needs before the farmer next in order of priority is served. This is similar to the turn system except that water distribution in any period starts with first-priority farms or farmers. During periods of drought the first-priority farms are the only ones to obtain a crop. This method does not rank high in terms of equity but will allow for some production in dry periods while other methods may not.

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- f. Crop priorities. Crops are assigned orders of priority based normally on the economic value or importance to a country's development. When water is sufficient all crops receive irrigation. When water is short, priority crops receive water first. If water remains after irrigating priority crops it is distributed to non-priority crops. Allocation by crop can be fairly equitable and efficient in drought periods if all farmers grow some priority crops. It basically allow some crops to be saved during drought periods.
- g. Market. All water users bid each period for water needed to irrigate their crops or to buy water shares for future irrigation. Thus water is allocated to the highest value uses in each period. Some losses may occur because of lack of knowledge about seasonal water supply. Crops may be planted that cannot be irrigated due to imperfect knowledge about the seasonal water supplies. With proper information water tends to be allocated to the highest valued uses. Thus, it ranks high in terms of efficiency.
- h. Demand. Water supply for the full season is stored and available at the beginning of the season and each farm is allotted a fixed quantity for the season. A farm receives, in each irrigation period, the quantity of water that the farmer requests (demands). Farmers, knowing at the beginning of the season what their seasonal water supplies will be, can plan the areas of their crops to get the highest return for the available water. This tends to produce the highest returns for the area. It is an equitable system if farms are of about equal size. A demand system would not produce the highest return if soils ~~and other natural conditions made some farms more productive.~~ One could achieve increased returns from allocating more water to farms with the highest productivity and/or best management.

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